



Innovative Systems Integration...

AV • Security • Presentation Technology

PUBLIC COPY

State of Rhode Island

Division of Purchases

BID 7548935 RESPONSE

ON-CALL CAMERA & VIDEO EQUIP/INSTALL—DOT

40 Worthington Road, Cranston, RI 02920

Tel: 401-941-4222 Fax: 401-941-4333

www.shanix.com . info@shanix.com



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RIVIP BIDDER CERTIFICATION FORMS

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State of Rhode Island and Providence Plantations Contract Offer
RIVIP BIDDER CERTIFICATION COVER FORM

SECTION 1 - VENDOR INFORMATION

Bid/RFPNumber: 7548935
Bid/RFP Title: ON-CALL CAMERA AND VIDEO EQUIPMENT/INSTALLATION - DOT (68 PGS)

Opening Date & Time: 9/3/2014 11:00 AM

RIVIP Vendor ID #: 2450
Vendor Name: Shanix, Inc.
Address: 40 Worthington Road
Cranston , RI 02920-7940
USA

Telephone: (401) 941-4222
Fax: (401) 941-4333
E-Mail: mustapha@shanix.com
Contact Person: Mustapha Gharaee
Title: Vice President
R.I. Foreign Corp #:

NOTICE TO VENDORS

Each bid proposal for a *public works project* must include a "public copy" to be available for public inspection upon the opening of bids. **Bid proposals that do not include a copy for public inspection will be deemed nonresponsive.** For further information on how to comply with this statutory requirement, see R. I. Gen. Laws §§ 37-2-18(b) and (j). Also see Procurement Regulation 5.11, and in addition, for highway and bridge projects, also see Procurement Regulation 5.13, accessible at www.purchasing.ri.gov.

NOTE: AWARD OF CONTRACTS AND PURCHASE ORDERS SHALL BE SUBJECT, AT THE DISCRETION OF THE PURCHASING AGENT, TO THE OFFEROR COMPLETING AN ON-LINE RIVIP REGISTRATION at www.purchasing.ri.gov. It is THE RESPONSIBILITY OF THE VENDOR to make on-line corrections/updates using the Vendor maintenance program on the RI Division of Purchases Web Site.

SECTION 2 – REQUIREMENTS

ALL OFFERS ARE SUBJECT TO THE REQUIREMENTS, PROVISIONS AND PROCEDURES CONTAINED IN THIS CERTIFICATION FORM. Offerors are expected to READ, SIGN and COMPLY WITH all requirements. Failure to do so may be grounds for disqualification of the offer contained herein.

Section 2.1 - RULES FOR SUBMITTING OFFERS

2.1A. This CERTIFICATION FORM MUST BE ATTACHED IN ITS ENTIRETY TO THE FRONT OF THE OFFER and shall be considered an integral part of each offer made by a vendor to enter into a contract with the State of Rhode Island, Division of Purchases. As such, submittal of the entire Bidder Certification Cover Form, signed by a duly authorized representative of the offeror attesting that he/she (1) has read and agrees to comply with the requirements set forth herein and (2) to the accuracy of the information provided and the offer extended, is a mandatory part of any contract award.

To assure that offers are considered on time, each offer must be submitted with the specific Bid/RFP/LOI number (provided above) and the date and time of opening marked in the upper left hand corner of envelope. Each bid/offer must be submitted in separate sealed envelopes.

A complete, signed (in ink) offer package must be delivered to the Division of Purchases (via any mail or messenger service) by the time and date specified for the opening of responses in a sealed envelope.

Bids must be submitted on the RI bid solicitation forms provided, indicating brand and part numbers of items offered, as appropriate. Bidders must submit detailed cuts and specs on items offered as equivalent to brands requested WITH THE OFFER. Bidders must be able to submit samples if requested. Mail To: Division of Purchases, One Capitol Hill, Second Floor, Providence, RI 02908-5855.

Documents misdirected to other State locations or which are not present in the Division of Purchases at the time of opening for whatever cause will be deemed to be late and will not be considered. For the purposes of this requirement, the official time and date shall be that of the time clock in the Division of Purchases. Postmarks shall not be considered proof of timely submission.

2.1B. RIVIP SOLICITATIONS. To assure maximum access opportunities for users, public bid/RFP solicitations shall be posted on the RIVIP for a minimum of seven days and no amendments shall be made within the last five days before the date an offer is due. Except when access to the Web Site has been severely curtailed and it is determined by the State Purchasing Agent that special circumstances preclude extending a solicitation due date, requests to mail or fax hard copies of solicitations will not be honored. When the result of an Internet solicitation is unsuccessful, the State of Rhode Island will cancel the original solicitation and resolicit the original offer directly from vendors.

2.2. PRICING. Offers are irrevocable for sixty (60) days from the opening date (or such other extended period set forth in the solicitation) and may not be withdrawn, except with the express permission of the State Purchasing Agent. All pricing will be considered to be firm and fixed unless otherwise indicated. The State of Rhode Island is exempt from Federal excise taxes and State Sales and Use Taxes. Such taxes shall not be included in the bid price. PRICES QUOTED ARE FOB DESTINATION.

2.3. DELIVERY and PRODUCT QUALITY. All offers must define delivery dates for all items; if no delivery date is specified, it is assumed that immediate delivery from stock will be made. The contractor will be responsible for delivery of materials in first class condition. Rejected materials will be at vendor's expense.

2.4. PREVAILING WAGE, OSHA SAFETY TRAINING, and APPRENTICESHIP REQUIREMENTS.

Bidders must comply with the provisions of the Rhode Island labor laws, including R. I. Gen. Laws §§ 37-13-1 *et seq.* and occupational safety laws, including R. I. Gen. Laws §§ 28-20-1 *et seq.* These laws mandate for public works construction projects the payment of prevailing wage rates, the implementation and maintenance of occupational safety standards, and for projects with a minimum value of \$1 Million, the employment of apprentices. The successful Bidder must submit certifications of compliance with these laws from each of its subcontractors prior to their commencement of any work. Prevailing wage rates, apprenticeship requirements, and other workforce and safety regulations are accessible at www.dlt.ri.gov.

2.5. PUBLIC RECORDS. Offerors are advised that all materials submitted to the State for consideration in response to this solicitation will be considered without exception to be Public Records pursuant to Title 38 Chapter 2 of the Rhode Island General Laws, and will be released for inspection immediately upon request once an award has been made. Offerors are encouraged to attend public bid/RFP openings to obtain information; however, bid/RFP response summaries may be reviewed after award(s) have been made by using the RIVIP at any time or appearing in person at the Division of Purchases Mondays through Fridays between 8:30 a.m. and 3:30 p.m. Telephone requests for results will not be honored. Written requests for results will only be honored if the information is not available on the RIVIP.

SECTION 3 - AWARD DETERMINATION

Award will be made to the responsive and responsible offeror quoting the lowest net price in accordance with specifications, for any individual item(s), for major groupings of items, or for all items listed, at the State's sole option.

3.1. BID SURETY. Where bid surety is required, bidder must furnish a bid bond or certified check for 5% of the bid total with the bid, or for such other amount as may be specified. Bids submitted without a required bid surety will not be considered.

3.2. SPECIFICATIONS. Unless specified "no substitute," product offerings equivalent in quality and performance will be considered (at the sole option of the State) on the condition that the offer is accompanied by detailed product specifications. Offers which fail to include alternate specifications may be deemed nonresponsive.

SECTION 4 – CONTRACT PROVISIONS

4.1. VENDOR AUTHORIZATION TO PROCEED.

4.1A. When a purchase order, change order, contract/agreement or contract/agreement amendment is issued by the RI Division of Purchases, no claim for payment for services rendered or goods delivered contrary to or in excess of the contract terms and scope shall be considered valid unless the vendor has obtained a written change order or contract amendment issued by the Division of Purchases PRIOR TO delivery.

4.1B. Any offer, whether in response to a solicitation for proposals or bids, or made without a solicitation, which is accepted in the form of an order OR Pricing Agreement made in writing by the Purchasing Agent, or a state official with purchasing authority delegated by the Purchasing Agent, shall be considered a binding contract.

4.2. REGULATIONS, GENERAL TERMS AND CONDITIONS GOVERNING STATE CONTRACTS. This solicitation and any contract or purchase order arising from it are issued in accordance with the specific requirements described herein, and the State's Purchasing Laws and Regulations and other applicable State Laws. The Regulations, General Terms and Conditions are incorporated into all state contracts. These regulations and basic information on How To Do Business with the State of Rhode Island are posted on the Rhode Island Vendor Information Program Website (www.purchasing.ri.gov).

4.2A. ARRA SUPPLEMENTAL TERMS AND CONDITIONS. Contracts and sub-awards funded in whole or in part by the American Recovery and Reinvestment Act of 2009. Pub.L.No. 111-5 and any amendments thereto, such contracts and sub-awards, shall be subject to the Supplemental Terms and Conditions For Contracts and Sub-awards Funded in Whole or in Part by the American Recovery and Reinvestment Act of 2009. Pub.L.No. 111-5 and any amendments thereto located on the Division of Purchases website at www.purchasing.ri.gov.

4.3. EQUAL EMPLOYMENT OPPORTUNITY. Compliance certificate and agreement procedures will apply to all awards for supplies or services valued at \$10,000 and more. Minority Business Enterprise policies and procedures, including subcontracting opportunities as described in Title 37 Chapter 14.1, of the Rhode Island General Laws, also apply.

4.4. PERFORMANCE BONDS. Where indicated, successful bidder must furnish a 100% performance bond and labor and payment bond for contracts subject to Title 37 Chapters 12 and 13 of the Rhode Island General Laws. All bonds must be furnished by a surety company authorized to conduct business in the State of Rhode Island. Performance bonds must be submitted within 21 calendar days of the issuance of a tentative notice of award.

4.5. DEFAULT and NON-COMPLIANCE. Default and/or non-compliance with the RIVIP requirements and any other aspects of the award may result in withholding of payment(s), contract termination, debarment, suspension, or any other remedy necessary that is in the best interest of the state.

4.6. COMPLIANCE. Vendor must comply with all applicable federal, state and local laws, regulations and ordinances.

4.7. SPRINKLER IMPAIRMENT AND HOT WORK. The Contractor agrees to comply with the practices of the State's insurance carrier for sprinkler impairment and hot work. Prior to performing any work, the Contractor shall obtain the necessary information for compliance from the Risk Management Office at the Department of Administration or the agency for which work will be performed.

SECTION 5 – CERTIFICATIONS AND DISCLOSURES
ALL CONTRACT AWARDS ARE SUBJECT TO THE FOLLOWING DISCLOSURES & CERTIFICATIONS

Offerors must respond to every disclosure statement.
A person authorized to enter into contracts must sign the offer and attest to the accuracy of all statements.

Indicate Yes (Y) or No (N):

- N 1. State whether your company, or any owner, stockholder, officer, director, member, partner, or principal thereof, or any subsidiary or affiliated company, has been subject to suspension or debarment by any federal, state, or municipal government agency, or the subject of criminal prosecution, or convicted of a criminal offense within the previous five (5) years. If so, then provide details below.
- N 2. State whether your company, or any owner, stockholder, officer, director, member, partner, or principal thereof, or any subsidiary or affiliated company, has had any contracts with a federal, state or municipal government agency terminated for any reason within the previous five (5) years. If so, then provide details below.
- N 3. State whether your company or any owner, stockholder, officer, director, member, partner, or principal thereof, or any subsidiary or affiliated company, has been fined more than \$5000 for violation(s) of Rhode Island environmental laws by the Rhode Island Department of Environmental Management within the previous five (5) years. If so, then provide details below.
- Y 4. I/we certify that I/we will immediately disclose, in writing, to the Chief Purchasing Officer any potential conflict of interest, which may occur during the course of the engagement authorized pursuant to this contract.
- Y 5. I/we acknowledge that, in accordance with Chapter 37-2-54(c) of the Rhode Island General Laws "no purchase or contract shall be binding on the state or any agency thereof unless approved by the Department [of Administration] or made under general regulations which the Chief Purchasing Officer may prescribe", including change orders and other types of contracts and under State Purchasing Regulation 8.2.1.1.2, "any alleged oral agreement or arrangements made by a bidder or contractor with any agency or an employee of the Office of Purchases may be disregarded and shall not be binding on the state".
- Y 6. I/we certify that I/we or my/our firm possesses all licenses required by Federal and State laws and regulations as they pertain to the requirements of the solicitation and offer made herein and shall maintain such required license(s) during the entire course of the contract resulting from the offer contained herein and should my/our license lapse or be suspended, I/we shall immediately inform the Rhode Island State Purchasing Agent in writing of such circumstance.
- Y 7. I/we certify that I/we will maintain required insurance during the entire course of the contract resulting from the offer contained herein and should my/our insurance lapse or be suspended, I/we shall immediately inform the Rhode Island State Purchasing Agent in writing of such circumstance.
- Y 8. I/we certify that I/we understand that falsification of any information herein or failure to notify the Rhode Island State Purchasing Agent as certified herein may be grounds for suspension, debarment and/or prosecution for fraud.
- Y 9. I/we acknowledge that the provisions and procedures set forth in this form apply to any contract arising from this offer.
- Y 10. I/we acknowledge that I/we understand the State's Purchasing Laws (37-2 of the General Laws of Rhode Island) and Purchasing Regulations and General Terms and Conditions available at the Rhode Island Division of Purchases Website (www.purchasing.ri.gov) apply as the governing conditions for any contract or purchase order I/we may receive from the State of Rhode Island, including the offer contained herein.
- Y 11. I/We certify that the bidder: (i) is not identified on the General Treasurer's list, created pursuant to R.I. Gen. Laws § 37-2.5-3, as a person or entity engaging in investment activities in Iran described in § 37-2.5-2(b); and (ii) is not engaging in any such investment activities in Iran.
- Y 12. I/we certify that the above vendor information is correct and complete.



Request for Quote

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
ONE CAPITOL HILL
PROVIDENCE RI 02908

BUYER: Hill, Lisa
PHONE #: 401-574-8118

CREATION DATE : 14-AUG-14
BID NUMBER: 7548935,
TITLE: ON-CALL CAMERA AND VIDEO
EQUIPMENT/INSTALLATIONS- DOT

BLANKET START : 01-OCT-14
BLANKET END : 30-SEP-16
BID CLOSING DATE AND TIME:03-SEP-2014 11:00:00

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DOT ACCOUNTS PAYABLE
TWO CAPITOL HILL, RM 230
SMITH ST
PROVIDENCE, RI 02903
US

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DOT TRAFFIC MANAGEMENT CENTER
TWO CAPITOL HILL, RM 144
PROVIDENCE, RI 02908
US

Requisition Number: 1382039

Note to Bidders: BID SURETY IS NOT REQUIRED HOWEVER, SUCCESSFUL BIDDER SHALL FURNISH A 100% PAYMENT AND PERFORMANCE BOND WITH INSTALLATION ORDERS PLACED BY THE DEPARTMENT WHICH ARE EQUAL TO OR EXCEED \$50,000.00.

Amendment Description: a

Line	Description	Quantity	Unit	Unit Price	Total
22	10/1/14-9/30/16 BALLAST FOR PLANAR VIDEO WALL MODULE	8.00	Each	485.00	3,880.00
23	10/1/14-9/30/16 ANALOG-TO-IP CONVERTER (VERACITY MODEL VHW-HW-01)	10.00	Each	136.00	1,360.00
24	10/1/14-9/30/16 AIMETIS CAMERA LICENSE	20.00	Each	190.00	3,800.00
25	10/1/14-9/30/16 AIMETIS 1-YEAR SUPPORT AGREEMENT	3.00	Each	6100.00	18,300.00
26	10/1/14-9/30/16 CAT 6 ETHERNET CABLING	2,000.00	Linear Foot	0.16	320.00
27	10/1/14-9/30/16 CRESTRON DM CABLING	500.00	Linear Foot	0.48	240.00
28	10/1/14-9/30/16 CRESTRON PROGRAMMER	40.00	Hour	120.00	4,800.00
29	10/1/14-9/30/16 TELECOM TECHNICIAN	40.00	Hour	85.00	3,400.00
30	10/1/14-9/30/16 CRESTRON MATRIX EXPANSION CARD	1.00	Each	1575.00	1,575.00

Delivery: FOUR(4) WEEKS FROM RECEIPT OF PURCHASE ORDER

Terms of Payment: NET 30 DAYS

It is the Vendor's responsibility to check and download any and all addenda from the RIVIP. This offer may not be considered unless a signed RIVIP generated Bidder Certification Cover Form is attached and the Unit Price column is completed. The signed Certification Cover Form must be attached to the front of the offer



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 PHONE #: 401-574-8118

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DOT ACCOUNTS PAYABLE
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DOT TRAFFIC MANAGEMENT CENTER
 TWO CAPITOL HILL, RM 144
 PROVIDENCE, RI 02908
 US

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Amendment Description: a

Line	Description	Quantity	Unit	Unit Price	Total
1	10/1/14-9/30/16 FURNISH ONLY: IP POE THERMAL NETWORK CAMERA (Q-1922-E) 0507-001	1.00	Each	6275.00	6,275.00
2	10/1/14-9/30/16 FURNISH AND-INSTALL: IP POE THERMAL NETWORK CAMERA (Q-1922-E) 0507-001	1.00	Each	6945.00	6,945.00
3	10/1/14-9/30/16 FURNISH ONLY: HD IP POE NETWORK CAMERA (Q-1604-E) 0463-001	1.00	Each	1115.00	1,115.00
4	10/1/14-9/30/16 FURNISH AND INSTALL: HD IP POE NETWORK CAMERA (Q-1604-E) 0463-001	4.00	Each	1785.00	7,140.00
5	10/1/14-9/30/16 FURNISH ONLY: PTZ DOME IP CAMERA, POE, WITH 36X ZOOM (Q-6032-E) (Q-6042-E) 0560-004	1.00	Each	2510.00	2,510.00
6	10/1/14-9/30/16 FURNISH AND INSTALL: PTZ DOME IP CAMERA, POE, WITH 36X ZOOM (Q-6032-E) (Q-6042-E) 0560-004	33.00	Each	3180.00	104,940.00
7	10/1/14-9/30/16 FURNISH ONLY: HD PTZ DOME IP POE NETWORK CAMERA (Q-6035-E) (6-6045-E) 0566-004	1.00	Each	3008.00	3,008.00
8	10/1/14-9/30/16 FURNISH AND INSTALL: HD PTZ DOME IP POE NETWORK CAMERA (Q-6035-E) (Q-6045-E) 0566-004	4.00	Each	3678.00	14,712.00

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 DOT TRAFFIC MANAGEMENT CENTER
 TWO CAPITOL HILL, RM 144
 PROVIDENCE, RI 02908
 US

Requisition Number: 1382039

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Amendment Description: a

Line	Description	Quantity	Unit	Unit Price	Total
9	10/1/14-9/30/16 VIDEO MANAGEMENT PROCESSOR (PROLIANT DL380P G8, W/2 VIDEO CARDS)	1.00	Each	12375.00	12,375.00
10	10/1/14-9/30/16 DUAL DISPLAY VIDEO PROCESSOR (PROLIANT DL380E G8, W/2 VIDEO CARDS)	1.00	Each	7248.00	7,248.00
11	10/1/14-9/30/16 48 PORT NETWORK SWITCH (2960S-48TD-L)	1.00	Each	1395.00	1,395.00
12	10/1/14-9/30/16 48 PORT CORE NETWORK SWITCH (WS-C3750X-47T-S)	1.00	Each	4195.00	4,195.00
13	10/1/14-9/30/16 FURNISH AND INSTALL: CISCO ROUTER WITH T1 INTERFACE (CISCO1941W-A/K9)	12.00	Each	1495.00	17,940.00
14	10/1/14-9/30/16 FURNISH AND INSTALL: NETGEAR PROSAFE 8-PORT 1GB ETHERNET SWITCH (GS108E) (TEG-S80G)	36.00	Each	125.00	4,500.00
15	10/1/14-9/30/16 FURNISH 65 FOOT BUCKET FOR CAMERA INSTALLATION ABOVE 30 FEET IN HEIGHT	8.00	Hour	180.00	1,440.00
16	10/1/14-9/30/16 FURNISH AND INSTALL: 2? GALVANIZED RIGID STEEL CONDUIT, SURFACE MOUNT	50.00	Linear Foot	10.00	500.00
17	10/1/14-9/30/16 FURNISH AND INSTALL: 2? GALVANIZED RIGID STEEL CONDUIT, UNDERGROUND	25.00	Linear Foot	12.00	300.00
18	10/1/14-9/30/16 FURNISH AND INSTALL: 2? PVC PLASTIC CONDUIT, SCHEDULE 40, SURFACE MOUNT	50.00	Linear Foot	9.00	450.00
19	10/1/14-9/30/16 FURNISH AND INSTALL: 2? PVC PLASTIC CONDUIT, SCHEDULE 40, UNDERMOUNT	25.00	Linear Foot	11.00	275.00
20	10/1/14-9/30/16 FILLER FOR PLANAR VIDEO WALL MODULE	24.00	Each	55.00	1,320.00
21	10/1/14-9/30/16 HALOGEN BULB FOR PLANAR VIDEO WALL MODULE	24.00	Each	645.00	15,480.00

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Contract Terms and Conditions

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Terms and Conditions

BID STANDARD TERMS AND CONDITIONS

TERMS AND CONDITIONS FOR THIS BID

WAGE REQUIREMENTS

BIDDERS ARE ADVISED THAT ALL PROVISIONS OF TITLE 37 CHAPTER 13 OF THE GENERAL LAWS OF RHODE ISLAND APPLY TO THE WORK COVERED BY THIS REQUEST, AND THAT PAYMENT OF THE GENERAL PREVAILING RATE OF PER DIEM WAGES AND THE GENERAL PREVAILING RATE FOR REGULAR, OVERTIME, AND OTHER WORKING CONDITIONS EXISTING IN THE LOCALITY FOR EACH CRAFT, MECHANIC, TEAMSTER, OR TYPE OF WORKMAN NEEDED TO EXECUTE THIS WORK IS A REQUIREMENT FOR BOTH CONTRACTORS AND SUBCONTRACTORS. THE PREVAILING WAGE TABLE MAY BE OBTAINED AT THE RI DIVISION OF PURCHASES HOME PAGE BY INTERNET at www.purchasing.ri.gov. SELECT "BIDDING INFORMATION", THEN "GENERAL INFORMATION", AND THEN SELECT "PREVAILING WAGE TABLES". PRINTING THE ENTIRE DOCUMENT AVERAGES APPROXIMATELY ONE MINUTE PER PAGE - YOU MAY WANT TO PRINT ONLY THE PAGES APPLICABLE TO YOUR BID. BIDDERS NOTE: IN THE EVENT THIS BID SPECIFIES PRICE OFFERS ON A TIME-AND-MATERIALS BASIS, i.e., AN HOURLY RATE, ANY OR ALL BIDS SUBMITTED IN AN AMOUNT LESS THAN THE PREVAILING RATE IN EFFECT FOR THE WORK COVERED BY THIS REQUEST AS OF THE DATE OF BID ISSUANCE SHALL BE REJECTED BY THE DIVISION OF PURCHASES.

INSURANCE REQUIREMENTS

AN INSURANCE CERTIFICATE IN COMPLIANCE WITH PROVISIONS OF ITEM 31 (INSURANCE) OF THE GENERAL CONDITIONS OF PURCHASE IS REQUIRED FOR COMPREHENSIVE GENERAL LIABILITY, AUTOMOBILE LIABILITY, AND WORKERS' COMPENSATION AND MUST BE SUBMITTED BY THE SUCCESSFUL BIDDER(S) TO THE DIVISION OF PURCHASES PRIOR TO AWARD. THE INSURANCE CERTIFICATE MUST NAME THE STATE OF RHODE ISLAND AS CERTIFICATE HOLDER AND AS AN ADDITIONAL INSURED. FAILURE TO COMPLY WITH THESE PROVISIONS MAY RESULT IN REJECTION OF THE OFFEROR'S BID. ANNUAL RENEWAL CERTIFICATES MUST BE SUBMITTED TO THE AGENCY IDENTIFIED ON THE PURCHASE ORDER. FAILURE TO DO SO MAY BE GROUNDS FOR CANCELLATION OF CONTRACT.

NOTE: IF THIS BID COVERS CONSTRUCTION, SCHOOL BUSING, HAZARDOUS WASTE, OR VESSEL OPERATION, APPLICABLE COVERAGES FROM THE FOLLOWING LIST MUST ALSO BE SUBMITTED TO THE DIVISION OF PURCHASES PRIOR TO AWARD: * PROFESSIONAL LIABILITY INSURANCE (AKA ERRORS & OMISSIONS) - \$1 MILLION OR 5% OF ESTIMATED PROJECT COST, WHICHEVER IS GREATER. * BUILDER'S RISK INSURANCE - COVERAGE EQUAL TO FACE AMOUNT OF CONTRACT FOR CONSTRUCTION. * SCHOOL BUSING - AUTO LIABILITY COVERAGE IN THE AMOUNT OF \$5 MILLION. * ENVIRONMENTAL IMPAIRMENT (AKA POLLUTION CONTROL) - \$1 MILLION OR 5% OF FACE AMOUNT OF CONTRACT, WHICHEVER IS GREATER. * VESSEL OPERATION - (MARINE OR AIRCRAFT) - PROTECTION & INDEMNITY COVERAGE REQUIRED IN THE AMOUNT OF \$1 MILLION.

LICENSE REQUIREMENTS

VENDOR (OWNER OF COMPANY) IS RESPONSIBLE TO COMPLY WITH ALL LICENSING OR STATE PERMITS REQUIRED FOR THIS TYPE OF SERVICE. A COPY OF LICENSE/PERMIT SHOULD BE SUBMITTED WITH THIS BID. IN ADDITION TO THESE LICENSE REQUIREMENTS,

BIDDER, BY SUBMISSION OF THIS BID, CERTIFIES THAT ANY/ALL WORK RELATED TO THIS BID, AND ANY SUBSEQUENT AWARD WHICH REQUIRES A RHODE ISLAND LICENSE(S), SHALL BE PERFORMED BY AN INDIVIDUAL(S) HOLDING A VALID RHODE ISLAND LICENSE.

RIVIP INFO - BID SUBMISSION REQUIREMENTS

It is the Vendor's responsibility to check and download any and all addenda from the RIVIP. This offer may not be considered unless a signed RIVIP generated Bidder Certification Cover Form is attached and the Unit Price column is completed. The signed Certification Cover Form must be attached to the front of the offer. When delivering offers in person to One Capitol Hill, vendors are advised to allow at least one hour additional time for clearance through security checkpoints.

MAILING ADDRESS FOR BID PROPOSALS ISSUED BY THE STATE OF RHODE ISLAND,
DIVISION OF PURCHASES

All Bid Proposals must be submitted by mail or hand delivered to:

- State of Rhode Island
- Department of Administration
- Division of Purchases, Second floor
- One Capitol Hill
- Providence, RI 02908-5855

DIVESTITURE OF INVESTMENTS IN IRAN REQUIREMENT:

No vendor engaged in investment activities in Iran as described in R.I. Gen. Laws §37-2.5-2(b) may submit a bid proposal to, or renew a contract with, the Division of Purchases. Each vendor submitting a bid proposal or entering into a renewal of a contract is required to certify that the vendor does not appear on the list maintained by the General Treasurer pursuant to R.I. Gen. Laws §37-2.5-3.

PURCHASE AGREEMENT BID

BIDDING (a) A single price shall be quoted for each item against which a proposal is submitted. This price will be the maximum in effect during the agreement period. Any price decline at the manufacturer's level shall be reflected in a reduction of the agreement price to the State. (b) Quantities, if any, are estimated only. The agreement shall cover the actual quantities ordered during the period. Deliveries will be billed at the single, firm, awarded unit price quoted regardless of the quantities ordered. (c) Bid price is net F.O.B. destination and shall include inside delivery at no extra cost. (d) Bids for single items and/or a small percentage of total items listed, may, at the State's sole option, be rejected as being non-responsive to the intent of this request. ORDERING (a) The User Agency(s) will submit individual orders for the various items and various quantities as may be required during the agreement period. (b) Exception - Regardless of any agreement resulting from this bid, the State reserves the right to solicit prices separately for any extra large requirements for delivery to specific destinations.

DELIVERY PER AGENCY

DELIVERY OF GOODS OR SERVICES AS REQUESTED BY AGENCY.

MULTI YEAR AWARD

THIS IS A MULTI-YEAR BID/CONTRACT. PER RHODE ISLAND STATE LAW 37-2-33, CONTRACT OBLIGATIONS BEYOND THE CURRENT FISCAL YEAR ARE SUBJECT TO AVAILABILITY OF FUNDS. CONTINUATION OF THE CONTRACT BEYOND THE INITIAL FISCAL YEAR WILL BE AT THE DISCRETION OF THE STATE. TERMINATION MAY BE EFFECTED BY THE STATE BASED UPON DETERMINING FACTORS SUCH AS UNSATISFACTORY PERFORMANCE OR THE DETERMINATION BY THE STATE TO DISCONTINUE THE GOODS/SERVICES, OR TO REVISE THE SCOPE AND NEED FOR THE TYPE

OF GOODS/SERVICES; ALSO MANAGEMENT OWNER DETERMINATIONS THAT MAY PRECLUDE THE NEED FOR GOODS/SERVICES.



Specifications for

On-Call Camera and Video Equipment Procurement Services

to be performed at various statewide locations TBD, for the

Rhode Island Department of Transportation
Transportation Management Center

2 Capitol Hill, Room 140
Providence, RI 02903



July 2014

GENERAL PROVISIONS – CONTRACT SPECIFIC

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1. BRIEF SCOPE OF WORK:

The work under this Contract is for On-Call Camera and Video Equipment Procurement Services for the Rhode Island Department of Transportation's Transportation Management Center (TMC) for a period of TWO (2) YEARS from written Notice to Proceed. At RIDOT'S discretion, this Contract may be renewed annually for up to TWO (2) additional YEARS. Annual renewal of this Contract shall be pending: a) federal funding approval and, b) the State's satisfaction and acceptance of the selected Contractor's services upon completion of each anticipated contract year.

The project includes, but is not limited to, the furnishing and installation of video cameras and all associated utility connections and wiring; spare parts; and software support for various headend video management system components. This bid solicitation includes a list of items anticipated to be procured and installed under this Contract, however no guarantee is made that all items will be used, or the quantities bid for each item will be ordered and delivered. Some items may exceed the estimated bid, and some may not meet the bid quantities. However, Respondents are required to bid on ALL ITEMS on the associated bid list. Bids that do not include all items may be considered unresponsive and removed from consideration.

All work will be performed on State owned, limited access and/or arterial type roadways, or on site at the RIDOT/TMC. It will be the Contractor's responsibility to provide all tools and other equipment needed to complete the work.

2. NOTICE TO CONTRACTOR:

This Contract, and the submitted bid prices, are for a period of TWO (2) YEARS from written Notice to Proceed, and shall include any option year that RIDOT exercises. Bid prices are subject to the mutual agreement of the State and the Contractor.

The basis of award of the Contract will be the **Total Bid Price** at the mutual agreement of the State and the Contractor for all quantities of work in this bid solicitation, subject to the review and correction as provided for in the State of Rhode Island Department of Transportation Standard Specifications for Road and Bridge Construction and Standard Details. The State reserves the right to make a single award or multiple awards or to reject any or all proposals based on what it considers to be in its best interest.

The State of Rhode Island Department of Transportation Standard Specifications for Road and Bridge Construction and Standard Details consist of the following:

- The Rhode Island Standard Specifications for Road and Bridge Construction, 2004 Edition, with all revisions.
- The Rhode Island Standard Details, 1998 Edition with all revisions.

3. CONTRACTOR REQUIREMENTS AND SUBMISSION:

In addition to the **Total Bid Price** the Contractor must comply with the following project requirements including a list of qualified personnel and equipment in order to be eligible for contract award. The list shall include:

- The Contractor must provide evidence that the firm possesses all electrical licenses required to perform the work specified herein in the State of Rhode Island, and shall maintain valid licenses for the duration of the Contract.
- The Contractor must possess and submit a copy of a valid Rhode Island Telecommunications Contractor License.
- The Contractor must identify **key personnel** to be assigned to the project. Assignment of key personnel must be for the duration of the project. Provide a detailed resume for each such individual. In the event such personnel are not employees of the bidder, submit documentation of the relationship. Describe the individuals' responsibilities on previous projects and proposed responsibility on this project.
- Additionally, the Contractor must provide a minimum year-round staff of **FIVE (5)** Rhode Island licensed Telecommunications Technicians. Respondent shall provide proof of current state licensing for staffing proposed. Each technician must be fully licensed in video, sound, and data.
- The Contractor must own or have access to the following **equipment** in a legally registered and operational state. Proof of said ownership or leasing agreement is required.
 - **ONE (1) Insulated Bucket Truck with a minimum 40-foot reach.**
- The Contractor must have a minimum of **TEN (10) YEARS** of experience as an integrator. The Contractor must provide Technicians who have completed all aspects of proposed system integration.
- The Contractor must prove that they possess training certifications as relates to the equipment selected. Proof of Certifications must be submitted with the bid package.
- Due to the on-call nature of these services, the Contractor is allowed a maximum **48-HOUR RESPONSE TIME** to physically report to project site for emergency services and a maximum **72-HOUR RESPONSE TIME** for non-emergency services.
- The Contractor must demonstrate previous experience installing equivalent video and networking equipment at **THREE (3)** or more field sites. Client reference and contact information is required.
- The Contractor must coordinate installation with communication service providers. Most camera installation sites are served by Verizon T1s, COX metro cable, or Verizon Wireless service.

ADDITIONAL REQUIRED FORMS (All forms included in the solicitation)

Besides the *RIVIP Bidder Certification Cover Form*, obtained through the RI Division of Purchases' website (www.purchasing.ri.gov), RIDOT also requires that the following **FIVE (5) FORMS** be completed and included in your submission package in line with federal regulations and departmental policy. With the exception of a W-9 form, these forms will be made part of the contract award.

- **W-9 Form**: Must be completed and signed by authorized agent of your firm. This may be downloaded at www.purchasing.ri.gov.
- **CERTIFICATION FOR TITLE VI ASSURANCE**: Shall be fully completed and submitted accordingly.
- **CERTIFICATION REGARDING DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS-PRIMARY COVERED TRANSACTIONS**: Shall be fully completed and submitted accordingly.
- **CERTIFICATION REGARDING DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS-LOWER TIER COVERED TRANSACTIONS**: Shall be fully completed and submitted accordingly.
- **ANTI-COLLUSION CERTIFICATE FOR CONTRACT AND FORCE ACCOUNT**: Shall be fully completed and submitted accordingly.

Sealed bid proposals addressed to the Rhode Island Department of Administration, Division of Purchases, One Capitol Hill, Providence, RI 02908 will be opened and read in public on September 3, 2014 at 11:00 a.m. All bidders must register on-line at www.purchasing.ri.gov. A completed Bidder Certification Cover Form, obtained at said website, must accompany each bid. Should assistance be required for registering or downloading this solicitation, call the RIVIP Help Line at 401-574-8100.

Required Contract Provisions - The attention of prospective bidders is called to the fact that this project is to be bid upon and the Contract executed under the rules and regulations for carrying out the provisions of the Federal-Aid Highway Act, subject to all appropriate Federal Laws, including Title VI of the Civil Rights Act of 1964, as amended and supplemented, and the required provisions for Federal-Aid Contracts, as provided for in Chapters 85, 86, and 88 of the Public Laws of Rhode Island, 1960.

Wages of labor on Federal-Aid Highway Projects - the prevailing rate of wages for laborers and mechanics employed by Contractors or Subcontractors on the initial construction of highway projects on the Federal-Aid Highway System, authorized under the Federal Highway Act of 1968, shall be paid wages at rates not less than those prevailing on the same type of work on similar construction in the immediate locality as determined by the United States Secretary of Labor, in accordance with the Act of August 30, 1935, known as the Davis - Bacon Act, under Decision Nos. 1 through 6 as applicable.

Prevailing wage rates and Davis - Bacon Wage Determination Reference Materials are available online at www.purchasing.gov . It is advisable to print only the pages applicable to this bid; the rates active on the Rhode Island Vendor Information Program's bid solicitation date for this project are applicable for the duration of the Contract resulting from this bid.

Work Hours Act of 1962 - This Contract is subject to Work Hours Act of 1962, Public Law 87-581 and implementing regulations.

An **insurance certificate** (ACORD 25) in compliance with provisions of Item 31 (Insurance) of the General Conditions of Purchase is required for comprehensive general liability, automobile liability, and workers' compensation and must be submitted by the successful bidder(s) to the Division of Purchases prior to award. The insurance certificate must name the State of Rhode Island as certificate holder and as an additional insured. Failure to comply with these provisions may result in rejection of the Offeror's bid. Annual renewal certificates must be submitted to the Agency location identified on the Purchase Order. Failure to do so may be grounds for cancellation of this Contract.

Pre-Bid Conference - A Pre-Bid Conference will be on **Tuesday, August 19, 2014 at 9:00 AM** to be held in the RIDOT Transportation Management Center, Room 140, Two Capitol Hill, Providence, Rhode Island for the purpose of reviewing problems and/or questions concerning the project. Individuals requesting interpreter services for the hearing impaired must notify 401-222-4971 (T.D.D.) a minimum of three (3) business days (seventy-two (72) hours), prior to the conference date.

Contractor Submittals:

Shop Drawing Submittals: If requested by the Engineer, the Contractor must develop/submit shop drawings, product data and/or catalog cut-sheets in accordance with Subsection 12.105.02; Plans and Shop Drawings of the Rhode Island Standard Specifications for Road and Bridge Construction, 2004 Edition and the latest revisions for all items involved in this Contract.

Shop drawings shall consist of catalog/cut sheets specifying details indicating enough information so that the item can be evaluated in accordance with these specifications. The Contractor shall submit seven (7) sets of shop drawings when requested by the Engineer. Shop drawings shall be accompanied by three (3) sets of design computations, cuts from manufacturer's catalogs, and/or supporting technical bulletins.

Shop drawings and design computations for this item shall be stamped only by a Rhode Island registered Professional Engineer.

Submitted shop drawings will be reviewed by the Engineer and returned to the Contractor for appropriate action. Shop drawings that are found erroneous, lacking information necessary to control construction, or not in conformance with accepted design criteria will be rejected and returned to the Contractor. The Contractor shall address the Engineer's comments and resubmit revised shop drawings and/or design computations.

The Contractor shall submit Shop Drawings for all required job specific items within 14 days when requested by the Engineer. Shop drawings must be approved by the Engineer prior to performance of the work involved. Such approval shall not relieve the Contractor of any responsibility under the Contract for the successful completion of the work. Contractor's failure to make submittals and obtain approval of a submittal will not be grounds for contract time extensions. The cost for preparation of shop drawings and design computations shall be borne by the Contractor and shall be included in the bid price for each related bid item.

Materials Storage

The Contractor shall place all stockpiled material in the Contractor's yard or at a site approved by the Engineer. In no case shall stockpiled material remain within the clear zone of any roadway during non-working hours.

4. LIST OF CONTRACT DRAWINGS:

<u>Sheet No.</u>	<u>Description</u>
N/A	N/A

5. PROTECTION OF UTILITIES AND PROPERTY

The Contractor, in constructing or installing facilities alongside or near sewers, drains, water or gas pipes, electric or telephone conduits, fiber optic lines and conduits, poles, sidewalks, walls, vaults or other structures shall sustain them securely in place. The Contractor shall coordinate with the officers and agents of the various utility companies and municipal departments to assure that the services of these structures are maintained. The Contractor shall also be responsible for the repair or replacement, at no additional cost to the owner, of any damage to such structures caused by construction operations. The Contractor is responsible to leave them in the same condition as they existed prior to commencement of the work. In case of damage to utilities, the Contractor shall promptly notify the utility owner and shall, if requested by the Engineer, furnish labor and

equipment to work temporarily under the utility owner's direction. Pipes or other structures damaged by the operation of the Contractor may be repaired by the Department or by the utility owner which suffers the loss. The cost of such repairs shall be borne by the Contractor, without compensation therefore.

If during construction there is an existing utility and/or structure found to be in conflict with the proposed work under this Contract, the Contractor shall protect and maintain the services to the utilities and structures. The Engineer will, as soon as possible, identify the utilities to be relocated or other such activities deemed suitable for resolution.

Full compensation for furnishing all labor, materials, tools, equipment and incidentals for doing all the work involved in protecting or repairing property as specified in this Section, shall be considered included in the Contract bid price and no additional compensation will be allowed therefore.

6. OTHER COORDINATION CONTACTS:

The Contractor is to coordinate all work at all locations with the Contractors of the other concurrent construction projects occurring at, or in the vicinity of, the work as requested by the RIDOT.

7. DISPOSAL OF SURPLUS MATERIALS

All existing and other materials not required or needed for use on the project, and not required to be removed and stacked, shall become the property of the Contractor and shall be removed from the site during the construction period and legally disposed of. No separate payment will be made for this work, but all costs in connection therewith shall be included in each Contract item bid price.

8. SEQUENCE OF CONSTRUCTION:

This is an On-Call Contract. The Contractor shall be available for meetings within a 48-hour timeframe and available to begin construction work requested within fourteen (14) days of said request. Within fourteen (14) days of said work request, the Contractor shall furnish the Engineer a construction schedule detailing the completion of the requested work. The schedule shall be mutually agreeable between the State and the Contractor.

Special Camera Installation Requirements:

Cameras are to be installed on existing structures, which may include poles, lowering devices, bridge abutments, buildings, or sign structures, at a height of between 20 feet and 50 feet.

The State will provide police detail/traffic control as deemed required by the State. However, the State requires a 14 day advance notice of installation.

For each camera installation, Contractor shall:

- Install power injectors, routers, switches, and other field equipment in existing cabinets adjacent to camera locations. The State will provide 110 VAC Power.
- Provide mounting hardware appropriate to the requested mounting location and camera device, as needed, including wall mount, parapet mount, pendant mount, pole adaptor, and other attachment brackets and hardware, as appropriate.
- Provide all cables and connectors required for field installation, installed in conduit, and in compliance with the latest edition of the National Electric Code.
- Provide a standard 40 foot bucket truck if required at no additional cost to the State for installation of equipment at heights up to 30 feet. For installations above 30 feet, the State will provide a bucket truck, or at the option of the State, the State will request the Contractor to provide a 65 foot bucket truck at the hourly rate provided for under this price agreement.

Special TMC Installation Requirements:

Video Management Processors, Display Video Processors, Network Switches, and other parts related to the Video Management and Distribution System shall be installed in the RIDOT Transportation Management Center Equipment Room as directed by the TMC Manager.

The TMC'S existing Video Management System is *Symphony*, by **Aimetis**. The Contractor must be certified (as an authorized dealer/partner/reseller) by **Aimetis** to purchase items and provide software support for **Aimetis** systems.

Aimetis Americas (HQ)
500 Weber Street North
Waterloo, Ontario, Canada
N2L 4E9
Phone: +1 (519) 746-8888
Fax: +1 (519) 746-6444
info@aimetis.com

The TMC'S existing Video Distribution System is **Crestron-based**. The Contractor must be certified (as an authorized dealer/partner/reseller) by **Crestron** to purchase items and provide software support for **Crestron** systems.

Crestron Electronics, Inc. (Corporate Headquarters - Sales & Support)
15 Volvo Drive
Rockleigh, New Jersey 07647
United States
Phone 1: 800.237.2041
Phone 2: 201.767.3400
Fax: 201.767.1903

9. ENVIRONMENTAL PERMITS:

No Environmental Permits or assents are required for this project.

10. WORK SCHEDULE

Work on this project is restricted to a normal eight-hour day, five-day week, with the Contractor and all Subcontractors working on the same shift.

No work shall be done on this Contract on Saturdays, Sundays or holidays or on the day before or the day after a long weekend which involves a holiday without prior approval by the Engineer.

No work that will disrupt travel on the existing roadways (lane closures, lane shifts, trenching, etc.) shall be done from 6:00 AM to 9:00 AM and from 3:00 PM to 7:00 PM.

Winter Shutdown

The "Winter Shutdown" as defined in Section 12.101.80 and as allowed for in Section 12.108.07 of the *Rhode Island Standard Specifications for Road and Bridge Construction*, 2004 Edition and all changes and addenda, is hereby waived for this contract. "THERE SHALL BE NO WINTER SHUTDOWN FOR THIS PROJECT". However, time extensions may be granted for documented adverse winter weather conditions causing construction delays.

11. MISCELLANEOUS MATERIALS AND SERVICES:

If materials are required for the completion of the work at a contracted site and those materials are not included as a bid item in the Contract, those materials will be supplied by the State from existing inventories, purchased by the State and supplied to the Contractor, or the Contractor may be directed to purchase materials directly. When directed by the TMC to purchase materials eligible for reimbursement, or to outsource services which are not

provided by the Contractor under the bid items in the Contract, but necessary to complete the work, the Contractor shall employ the following as general purchasing practice:

All purchases by the Contractor shall be made in the most cost-effective manner possible. Equipment necessary to carry out work, including vehicles, shall not be reimbursable unless specifically itemized within this bid document or specifically authorized in writing by the TMC.

Only materials and services with a purchase value of \$5,000.00 or less are eligible for reimbursement under the Miscellaneous Materials and Services bid item. All items purchased shall require written confirmation of the price quotation to the TMC and approval of the quoted price by the TMC prior to purchase of the materials or services. For purchases exceeding \$500.00, but not to exceed \$5,000.00, the Contractor shall provide written confirmation of at least three quotations, and the lowest quoted price shall be used. If no competition exists for the requested materials or services, the Contractor

shall provide written justification for why the quoted vendor is the only source for the materials or services.

The Contractor will be required to submit copies of all purchases listing specific model numbers and quantities, services, shipping and handling costs. The Contractor will be reimbursed for approved materials and services purchased at total cost plus FIVE (5) PERCENT.

12. TESTING, ACCEPTANCE, WARRANTY AND CLOSEOUT OF WORK:

When performing work under this Contract, the Contractor shall perform relevant acceptance testing as directed by the TMC Manager. This may include, but not be limited to, providing a test plan when requested to, performing the equipment manufacturer's recommended acceptance test procedures, and submitting test results and reports, as appropriate.

The Contractor shall provide a warranty on all installed equipment for a period of three (3) years from the date of acceptance, or for the duration of the manufacturer's warranty, whichever is greater.

The Contractor shall provide as-built drawings within thirty (30) days after the date of acceptance, when requested by the TMC Manager.

13. JOB-SPECIFIC ITEMS:

Selected functional requirements for special items appear on the following pages.

IP POE THERMAL NETWORK CAMERA

DESCRIPTION:

An IP POE Thermal Network Camera shall include all hardware, software, and cabling required to make a complete system. The camera shall meet the minimum recommended hardware guidelines as outlined below, and be fully compatible with the TMC'S Video Management System. Cameras shall be installed in locations as directed by the TMC Manager, and utilizing the manufacturer's recommended installation procedures. Contractor shall supply all mounting hardware required for a complete installation. The model type is **Axis Q-1922-E, or approved equivalent.**

The camera shall:

- Be manufactured with an outdoor ready IP66-rated metal casing and shall operate between -40°C to +60°C (-40°F to +140°F), powered using Power over Ethernet
- Be equipped with a 10BASE-T/100BASE-TX Ethernet interface
- Be equipped with a an un-cooled Microbolometer with a FPA Format of 640x480 and 17 µm pixel size
- Provide thermal images with NetD sensitivity below 100 mK
- Support simultaneous individually configured Motion JPEG and H.264 thermal video streams with a native resolution of at least 640x480 pixels with at least 8.3 frames per second, and shall have the ability to scale video up to 800x600 pixels
- Support both unicast and multicast H.264 with support for both Constant and Variable Bit Rate
- Support Power over Ethernet according to IEEE 802.3af
- Accept static IP addresses as well as addresses provided by a DHCP
- Support both IPv4 and IPv6 based addresses
- Be equipped with one RS422/485 port providing the ability to control third party PT devices, support guard tour, and at least 100 presets
- Provide text overlay that includes date/time support synchronized with an NTP server, and the ability to apply a graphical image as an overlay or privacy mask into the video image.
- Provide multiple user password levels, support for HTTPS and SSL/TLS and incorporate IEEE 802.1X authentication
- Be equipped with a built-in web server
- Be supported by an open and published API
- Be conformant to the network video standard as defined by the ONVIF organization

METHOD OF MEASUREMENT:

Item "IP POE THERMAL NETWORK CAMERA" will be measured by "EACH" unit actually installed in accordance with the Contract Documents and/or as directed by the Engineer.

BASIS OF PAYMENT:

The accepted quantity of Item "IP POE THERMAL NETWORK CAMERA" will be paid for at its respective contract unit price per "EACH" as listed in the Proposal. The price so stated shall constitute full and complete compensation for all hardware, components, software, installation and testing, as well as all labor, additional materials, tools and equipment, and all other incidentals (including cabling) required to complete the work as described in these Special Provisions and elsewhere in the Contract Documents, complete in place and accepted by the Engineer.

PTZ DOME IP POE NETWORK CAMERA WITH 36X ZOOM

DESCRIPTION:

A PTZ Dome IP POE Network Camera with 36x zoom shall include all hardware, software, and cabling required to make a complete system. The camera shall meet the minimum recommended hardware guidelines as outlined below, and be fully compatible with the TMC'S Video Management System. Cameras shall be installed in locations as directed by the TMC Manager, and utilizing the manufacturer's recommended installation procedures. Contractor shall supply all mounting hardware required for a complete installation. The model type is Axis Q-6042-E, or approved equivalent.

The camera shall:

- Be manufactured with an all-metal body
- Be both IP66 and NEMA 4X-rated, and operate between -40°C to +50°C (-40°F to +122°F)
- Be equipped with a 10BASE-T/100BASE-TX Ethernet interface. A stand alone injector shall provide required power to camera, heaters and fans over the network cable.
- Be equipped with a progressive scan sensor, support Wide Dynamic Range and provide images down to 0.5 lux in day mode and 0.008 lux in night mode
- Be equipped with 36x optical zoom and Day/Night functionality
- Provide at least 3 streams of resolutions up to 704x480 (NTSC) pixels at 30 frames per second per stream
- Support simultaneous individually configured Motion JPEG and H.264 video streams
- Support both unicast and multicast H.264 with support for both Constant and Variable Bit Rate
- Accept static IP addresses as well as addresses provided by a DHCP
- Support both IPv4 and IPv6 based addresses
- Provide accurate high-speed pan-tilt functionality with 360° endless pan range and a 220° tilt range
- Provide pan and tilt speed between 0.05° - 450°/sec
- Support at least 100 presets.
- Provide text overlay that includes date/time support synchronized with an NTP server and the ability to apply a graphical image as an overlay into the video image.
- Provide multiple user password levels, support for HTTPS and SSL/TLS and incorporate IEEE 802.1X authentication
- Be supported by an open and published API
- Be equipped with a built-in web server

METHOD OF MEASUREMENT:

Item "PTZ DOME IP POE NETWORK CAMERA WITH 36X ZOOM" will be measured by "EACH" unit actually installed in accordance with the Contract Documents and/or as

directed by the Engineer.

BASIS OF PAYMENT:

The accepted quantity of Item "PTZ DOME IP POE NETWORK CAMERA WITH 36X ZOOM" will be paid for at its respective contract unit price per "EACH" as listed in the Proposal. The price so stated shall constitute full and complete compensation for all hardware, components, software, installation and testing, as well as all labor, additional materials, tools and equipment, and all other incidentals (including cabling) required to complete the work as described in these Special Provisions and elsewhere in the Contract Documents, complete in place and accepted by the Engineer.

HD PTZ DOME IP POE NETWORK CAMERA

DESCRIPTION:

An HD PTZ Dome IP POE Network Camera shall include all hardware, software, and cabling required to make a complete system. The camera shall meet the minimum recommended hardware guidelines as outlined below, and be fully compatible with the TMC'S Video Management System. Cameras shall be installed in locations as directed by the TMC Manager, and utilizing the manufacturer's recommended installation procedures. Contractor shall supply all mounting hardware required for a complete installation. The model type is Axis Q-6035-E, or approved equivalent.

The camera shall:

- Be manufactured with an all-metal body
- Be both IP66 and NEMA 4X-rated
- Start-up and operate between -40°C to +50°C (-40°F to +122°F)
- Be equipped with a 10BASE-T/100BASE-TX Ethernet interface. A stand alone injector shall provide required power to camera, heaters and fans over the network cable.
- Be equipped with a 2.3 megapixel High Definition 16:9 progressive scan sensor and provide images down to 0.8 lux in day mode and 0.04 lux in night mode
- Be equipped with 20x optical zoom and Day/Night functionality
- Provide video streams at full frame rate (30/25 fps) in HDTV 1080p (1920x1080) resolution in compliance with SMPTE 274M standard
- Support simultaneous individually configured Motion JPEG and H.264 video streams
- Support both unicast and multicast H.264 with support for both Constant and Variable Bit Rate
- Accept static IP addresses as well as addresses provided by a DHCP
- Support both IPv4 and IPv6 based addresses
- Provide accurate high-speed pan-tilt functionality with 360° endless pan range and a 220° tilt range
- Provide pan and tilt speed between 0.05° - 450°/sec
- Support at least 100 presets
- Provide text overlay that includes date/time support synchronized with an NTP server, and the ability to apply a graphical image as an overlay into the video image.
- Provide multiple user password levels, support for HTTPS and SSL/TLS and incorporate IEEE 802.1X authentication
- Be equipped with a built-in web server
- Be supported by an open and published API
- Be conformant to the network video standard as defined by the ONVIF organization

METHOD OF MEASUREMENT:

Item "HD PTZ DOME IP POE NETWORK CAMERA" will be measured by "EACH" unit actually installed in accordance with the Contract Documents and/or as directed by the Engineer.

BASIS OF PAYMENT:

The accepted quantity of Item "HD PTZ DOME IP POE NETWORK CAMERA" will be paid for at its respective contract unit price per "EACH" as listed in the Proposal. The price so stated shall constitute full and complete compensation for all hardware, components, software, installation and testing, as well as all labor, additional materials, tools and equipment, and all other incidentals (including cabling) required to complete the work as described in these Special Provisions and elsewhere in the Contract Documents, complete in place and accepted by the Engineer.

HD IP POE NETWORK CAMERA

DESCRIPTION:

An HD IP POE Network Camera shall include all hardware, software, and cabling required to make a complete system. The camera shall meet the minimum recommended hardware guidelines as outlined below, and be fully compatible with the TMC's Video Management System. Cameras shall be installed in locations as directed by the TMC Manager, and utilizing the manufacturer's recommended installation procedures. Contractor shall supply all mounting hardware required for a complete installation. The model type is Axis Q-1604-E, or approved equivalent.

The camera shall:

- Be manufactured with a metal casing
- Be IP66 and NEMA 4X-rated and operate between -40°C to +50°C (- 40°F to +122°F)
- Be equipped with a 10BASE-T/100BASE-TX Ethernet interface
- Be equipped with a progressive scan sensor, and shall provide images down to 0.4 lux in day mode and 0.06 lux in night mode with WDR functionality active
- Be equipped with Wide Dynamic Range including dynamic capture and provide at least 120dB dynamic range
- Be equipped with Day/Night functionality and support both P- and DC- iris functionality
- Support remote back focus adjustment
- Provide at least two video streams at full frame rate (30/25 fps) in HDTV 720p (1280x720) resolution
- Support simultaneous individually configured Motion JPEG and H.264 video streams
- Support both unicast and multicast H.264 with support for both Constant and Variable Bit Rate
- Support both Baseline and Main profile H.264 including motion estimation
- Be powered using standard IEEE 802.3at High Power over Ethernet
- Accept static IP addresses as well as addresses provided by a DHCP
- Support both IPv4 and IPv6 based addresses
- Provide text overlay that includes date/time support synchronized with an NTP server, and the ability to apply a graphical image as an overlay into the video image
- Provide multiple user password levels, support for HTTPS and SSL/TLS and incorporate IEEE 802.1X authentication
- Be equipped with a built-in web server
- Be supported by an open and published API
- Be conformant to the network video standard as defined by the ONVIF organization

METHOD OF MEASUREMENT:

Item "HD IP POE NETWORK CAMERA" will be measured by "EACH" unit actually installed in accordance with the Contract Documents and/or as directed by the Engineer.

BASIS OF PAYMENT:

The accepted quantity of Item "HD IP POE NETWORK CAMERA" will be paid for at its respective contract unit price per "EACH" as listed in the Proposal. The price so stated shall constitute full and complete compensation for all hardware, components, software, installation and testing, as well as all labor, additional materials, tools and equipment, and all other incidentals (including cabling) required to complete the work as described in these Special Provisions and elsewhere in the Contract Documents, complete in place and accepted by the Engineer.

VIDEO MANAGEMENT PROCESSOR

DESCRIPTION:

Contractor acquisition of the Video Management Processor shall include all hardware, software, and cabling required to make a complete system. The Video Management Processor shall meet the recommended hardware guidelines of the video systems configuration software. The Video Management Processor shall be fully compatible with the Video Management System, shall be a furnished and installed utilizing a Rail installation kit with cable management trays. Contractor shall supply the compatible Rail Assembly Kit, with cable management trays, for a 19" rack setup. All cabling connections to the Video Management Processor shall be routed through integrated cable management trays and secured via Velcro cable ties. The Video Management Processor shall meet, or exceed, the following capabilities:

MATERIALS:

- A. Hardware: HP DL380p G8 or equivalent
 1. CPU Processor: (Quantity 2) Xeon E5-2690, 8-Core or equivalent
 2. Speed: 2.9 GHz, 1,600MHz FSB or greater
 3. RAM: 16 GB (per processor) PC3-12800R Dual Ranked DIMMs or greater
 4. Primary Hard Drive(s)
 - a. (Quantity 3) 300 GB or greater at RAID 5
 - b. 10K RPM SAS 6 Gbps 2.5 inch
 5. Secondary Hard Drive(s)
 - a. (Quantity 2) 500 GB or greater at RAID 1
 - b. 7.2K RPM SATA 6 Gbps 2.5 inch
 6. Network Adapter: 4GbE Onboard NIC
 7. DVD-ROM Drive, Internal, SATA
 8. Power Supply: (Quantity 2) 460W power supplies
 9. Case: 2U rack mount
 10. VGA Graphics Adapter: (quantity 2) Furnish only
 - a. Type: NVIDIA Quadro K2000 PCIE 2,024MB or equivalent
 - b. Memory: 2,048Mb GDDR5 or greater
 - c. Host Interface: PCI Express 2.0 x16
 - d. Max Resolution: 2560 x 1600 or greater
 - e. Display Port Connectors: 2
 - f. Dual link DVI: (1) or greater
- B. Operating System: Microsoft Windows Server 2008 R2 x64 Standard Edition

C. Installation

1. The Contractor shall furnish the Video Management Processor to the TMC

D. Submittals

1. Manufacturers catalog cut sheets and specifications for all equipment provided.

METHOD OF MEASUREMENT:

Item "VIDEO MANAGEMENT PROCESSOR" will be measured by "EACH" unit actually installed in accordance with the Contract Documents and/or as directed by the Engineer.

BASIS OF PAYMENT:

The accepted quantities of Item "VIDEO MANAGEMENT PROCESSOR" will be paid for at its respective contract unit price per "Each" as listed in the Proposal. The price so stated shall constitute full and complete compensation for all hardware, components, software, installation and testing, as well as all labor, additional materials, tools and equipment, and all other incidentals (including cabling) required to complete the work as described in these Special Provisions and elsewhere in the Contract Documents, complete in place and accepted by the Engineer.

DUAL VIDEO CARD DISPLAY PROCESSOR

Description

Contractor acquisition of Dual Video Card Display Processor shall include all hardware, software, and cabling required to make a complete system. The Dual Video Card Display Processor shall meet the recommended hardware guidelines of the video systems configuration software. The Dual Video Card Display Processor shall be fully compatible with the Video Management System, shall be installed in locations as directed by the TMC Manager, and shall be installed utilizing a Rail installation kit with cable management trays. Contractor shall supply the compatible Rail Assembly Kit, with cable management trays, for a 19" rack setup. All cabling connections to the Dual Video Card Display Processor shall be routed through integrated cable management trays and secured via Velcro cable ties. The Dual Video Card Display Processor shall meet, or exceed, the following capabilities:

A. Hardware:

1. CPU Processor: Xeon E5-2430, 6-Core Intel or equivalent
2. Speed: 2.2 GHz, 1,600MHz FSB or greater
3. RAM: 8 GB or greater DDR3-1600 dual ranked DIMMs or greater
4. Primary Hard Drive
 - a) (Quantity 2) 500 GB or greater
 - b) 7.2K RPM Serial ATA 6Gbps
5. Network Adapter: 4GbE Onboard NIC
6. DVD-ROM Drive, Internal, SATA
7. Power Supply: (Quantity 2) 460W power supplies
8. Case: 2U rack mount
9. VGA Graphics Adapter (quantity 2)
 - a) Type: NVIDIA Quadro K2000 PCIE 2048MB, or equivalent
 - b) Memory: 2,048MB GDDR5 or greater
 - c) Host Interface: PCI Express 2.0 x16
 - d) Max Resolution: 2560 x 1600 or greater
 - e) Display Connectors: 2
 - f) Dual link DVI (1) or greater

B. Operating System: The operating systems shall be fully compatible with the Video Management System.

C. Installation

1. The Contractor shall install the Video Display Servers as directed by the TMC Manager.
2. The Contractor shall install all software to each Video Display Server.

3. The Contractor shall connect the Video Display Servers to the Digital Media Switches as directed by the TMC Manager.
 4. The Contractor shall assign a unique IP address to each Video Display Server that follows the overall network architecture.
- D. Verification of Functionality
1. The Contractor shall verify the Video Display Servers are working as required for the design.
 2. The Contractor shall verify all connections to the LCD Display Monitors are working as needed for the design.
 3. The Contractor shall verify and test the functionality of all software installed on each Video Display Server.
 4. The Contractor shall verify that the functional processor performs as indicated by the manufacturer and as required by the specification.
 5. The Contractor shall verify that the functional hard drive performs as indicated by the manufacturer and as required by the specification.
 6. The Contractor shall verify that the functional graphics card performs as indicated by the manufacturer and as required by the specification.

METHOD OF MEASUREMENT:

Item "DUAL VIDEO CARD DISPLAY PROCESSOR" will be measured by "EACH" unit actually installed in accordance with the Contract Documents and/or as directed by the Engineer.

BASIS OF PAYMENT:

The accepted quantities of Item "DUAL VIDEO CARD DISPLAY PROCESSOR" will be paid for at its respective contract unit price per "Each" as listed in the Proposal. The price so stated shall constitute full and complete compensation for all hardware, components, software, installation and testing, as well as all labor, additional materials, tools and equipment, and all other incidentals (including cabling) required to complete the work as described in these Special Provisions and elsewhere in the Contract Documents, complete in place and accepted by the Engineer.

48-PORT CORE NETWORK SWITCH

1. 1000 Mbps Port(s): 48 x 10/100/1000Base-T (RJ-45)
2. Additional Port(s): ability to expand capabilities with 4 optional uplink modules with GE or 10GE ports
3. Console Port(s): RJ-45
4. Rack mountable
5. DRAM: 512 MB
6. Flash: 128 MB
7. Dual redundant power supplies and fans
8. Switch Fabric Capacity: 160 Gbps
9. Layer 3 Forwarding rate: 101.2 Mbps
10. VLANs: 1005
11. LAN Standards: IEEE 802.1d Spanning Tree Bridge, IEEE 802.1AE MACsec, IEEE 802.3 CSMA/CD or Ethernet, IEEE 802.3u 100 Mbps (Fast Ethernet), IEEE 802.3ab 1000 Mbps (Gigabit Ethernet), IEEE 802.3ad Link aggregation, IEEE 802.3z Gigabit Ethernet over fiber standard (1000BaseX), IEEE 802.1w Rapid Spanning Tree Protocol (RSTP), IEEE 802.3x Flow Control, IEEE 802.1Q (VLANs), IEEE 802.1p (Priority)
12. IP BASE: Baseline Enterprise Services
13. Management Protocols: SNMPv1, SNMPv2c & SNMPv3, RMON I & RMON II, Telnet
14. Protocols: IGMPv2, RADIUS, SSH, TCP, UDP, DHCP, PIM
15. Routing Protocols: OSPF, RIP Version 1, RIP Version 2, BGPv4, IGRP, EIGRP, DVMRP, Static Routing
16. Ethernet Switch must support StackWise Plus technology, must be capable of remote management with Cisco Network Management Software, and shall be fully managed by CiscoView and CiscoWorks

METHOD OF MEASUREMENT:

Item "48-PORT CORE NETWORK SWITCH" will be measured by "EACH" unit actually installed in accordance with the Contract Documents and/or as directed by the Engineer.

BASIS OF PAYMENT:

The accepted quantities of Item "48-PORT CORE NETWORK SWITCH" will be paid for at its respective contract unit price per "Each" as listed in the Proposal. The price so stated shall constitute full and complete compensation for all hardware, components, software, installation and testing, as well as all labor, additional materials, tools and equipment, and all

other incidentals (including cabling) required to complete the work as described in these Special Provisions and elsewhere in the Contract Documents, complete in place and accepted by the Engineer.

48-PORT NETWORK SWITCH

1. 1000 Mbps Port(s): 48 x 10/100/1000Base-T (RJ-45)
2. Additional Port(s): 2 (SFP+) Enhanced Small Form-Factor Pluggable Slots
3. Console Port(s): RJ-45
4. Rack mountable
5. Dual redundant power supplies and fans
6. DRAM: 128 MB
7. Flash: 64 MB
8. Switch Fabric Capacity: 176 Gbps
9. Layer 3 Forwarding rate: 101.2 Mbps
10. VLANs: 255
11. LAN Standards: IEEE 802.1d Spanning Tree Bridge, IEEE 802.3 CSMA/CD or Ethernet, IEEE 802.3u 100 Mbps (Fast Ethernet), IEEE 802.3ab 1000 Mbps (Gigabit Ethernet), IEEE 802.3ad Link aggregation, IEEE 802.3z Gigabit Ethernet over fiber standard (1000BaseX), IEEE 802.1w Rapid Spanning Tree Protocol (RSTP), IEEE 802.3x Flow Control, IEEE 802.1Q (VLANs), IEEE 802.1p (Priority)
12. Management Protocols: SNMPv1, SNMPv2c & SNMPv3, RMON I & RMON II, Telnet
13. Protocols: IGMPv2, RADIUS, SSH, TCP, UDP, DHCP, PIM
14. Routing Protocols: OSPF, RIP Version 1, RIP Version 2, BGPv4, IGRP, EIGRP, DVMRP, Static Routing
15. Ethernet Switch must be capable of remote management with Cisco Network Management Software and shall be fully managed by CiscoView and CiscoWorks

METHOD OF MEASUREMENT:

Item "48-PORT NETWORK SWITCH" will be measured by "EACH" unit actually installed in accordance with the Contract Documents and/or as directed by the Engineer.

BASIS OF PAYMENT:

The accepted quantities of Item "48-PORT NETWORK SWITCH" will be paid for at its respective contract unit price per "Each" as listed in the Proposal. The price so stated shall constitute full and complete compensation for all hardware, components, software, installation and testing, as well as all labor, additional materials, tools and equipment, and all other incidentals (including cabling) required to complete the work as described in these Special Provisions and elsewhere in the Contract Documents, complete in place and accepted by the Engineer.

**REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS**

**REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS**

- I. General
- II. Nondiscrimination
- III. Nonsegregated Facilities
- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects
- IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Compliance with Governmentwide Suspension and Debarment Requirements
- XI. Certification Regarding Use of Contract Funds for Lobbying

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

II. NONDISCRIMINATION

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding \$10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

1. Equal Employment Opportunity: Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under

this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.

b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. EEO Officer: The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are

applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. Reasonable Accommodation for Applicants / Employees with Disabilities: The contractor must be familiar

with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment: The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

10. Assurance Required by 49 CFR 26.13(b):

a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.

b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.

11. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor

will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding \$2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. Minimum wages

a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions

of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b.(1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is utilized in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or

will notify the contracting officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program. Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding

The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-

Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b.(1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency..

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and trainees

a. Apprentices (programs of the USDOL).

Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly

rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

b. Trainees (programs of the USDOL).

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

d. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

6. Subcontracts. The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

7. Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility.

a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The following clauses apply to any Federal-aid construction contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.

3. Withholding for unpaid wages and liquidated damages. The FHWA or the contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.

4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term "perform work with its own organization" refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:

- (1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;
- (2) the prime contractor remains responsible for the quality of the work of the leased employees;
- (3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and
- (4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is

evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.

2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost \$25,000 or more – as defined in 2 CFR Parts 180 and 1200.

1. Instructions for Certification – First Tier Participants:

a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this

covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;

(2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

2. Instructions for Certification - Lower Tier Participants:

(Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost \$25,000 or more - 2 CFR Parts 180 and 1200)

a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which

this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the

department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.
2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000 (49 CFR 20).

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:
 - a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
 - b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-L.L.L., "Disclosure Form to Report Lobbying," in accordance with its instructions.
2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.
3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

**ATTACHMENT A - EMPLOYMENT AND MATERIALS
PREFERENCE FOR APPALACHIAN DEVELOPMENT
HIGHWAY SYSTEM OR APPALACHIAN LOCAL ACCESS
ROAD CONTRACTS**

This provision is applicable to all Federal-aid projects funded under the Appalachian Regional Development Act of 1965.

1. During the performance of this contract, the contractor undertaking to do work which is, or reasonably may be, done as on-site work, shall give preference to qualified persons who regularly reside in the labor area as designated by the DOL wherein the contract work is situated, or the subregion, or the Appalachian counties of the State wherein the contract work is situated, except:

a. To the extent that qualified persons regularly residing in the area are not available.

b. For the reasonable needs of the contractor to employ supervisory or specially experienced personnel necessary to assure an efficient execution of the contract work.

c. For the obligation of the contractor to offer employment to present or former employees as the result of a lawful collective bargaining contract, provided that the number of nonresident persons employed under this subparagraph (1c) shall not exceed 20 percent of the total number of employees employed by the contractor on the contract work, except as provided in subparagraph (4) below.

2. The contractor shall place a job order with the State Employment Service indicating (a) the classifications of the laborers, mechanics and other employees required to perform the contract work, (b) the number of employees required in each classification, (c) the date on which the participant estimates such employees will be required, and (d) any other pertinent information required by the State Employment Service to complete the job order form. The job order may be placed with the State Employment Service in writing or by telephone. If during the course of the contract work, the information submitted by the contractor in the original job order is substantially modified, the participant shall promptly notify the State Employment Service.

3. The contractor shall give full consideration to all qualified job applicants referred to him by the State Employment Service. The contractor is not required to grant employment to any job applicants who, in his opinion, are not qualified to perform the classification of work required.

4. If, within one week following the placing of a job order by the contractor with the State Employment Service, the State Employment Service is unable to refer any qualified job applicants to the contractor, or less than the number requested, the State Employment Service will forward a certificate to the contractor indicating the unavailability of applicants. Such certificate shall be made a part of the contractor's permanent project records. Upon receipt of this certificate, the contractor may employ persons who do not normally reside in the labor area to fill positions covered by the certificate, notwithstanding the provisions of subparagraph (1c) above.

5. The provisions of 23 CFR 633.207(e) allow the contracting agency to provide a contractual preference for the use of mineral resource materials native to the Appalachian region.

6. The contractor shall include the provisions of Sections 1 through 4 of this Attachment A in every subcontract for work which is, or reasonably may be, done as on-site work.

APPENDIX A
TITLE VI ASSURANCE

Rhode Island Department of Transportation
Title VI Assurance

Appendix A

During the performance of this Contract, the contractor, for itself, its assignees and successors in interest (the Contractor) agrees as follows:

- (1) **Compliance with Regulations:** The Contractor shall comply with the regulations relative to nondiscrimination in federally-assisted programs of the Rhode Island Department of Transportation (the Department), 49 C.F.R. Part 21, as they may be amended from time to time (the Regulations), and which are herein incorporated by reference and made a part of this Contract.
- (2) **Nondiscrimination:** The Contractor, with regard to the work performed by it during the Contract, shall not discriminate on the grounds of race, color, sex, national origin, age, or disability in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The Contractor shall not participate either directly or indirectly in the discrimination prohibited by section 21.5 of the Regulations, including employment practices when the Contract covers a program set forth in Appendix B of the Regulations.
- (3) **Solicitations for Subcontractors, Including Procurements of Materials and Equipment:** In all solicitations either by competitive bidding or negotiation made by the Contractor for work to be performed under a subcontract, including procurements of materials or leases of equipment, each potential subcontractor or supplier shall be notified by the Contractor of the Contractor's obligations under this Contract and the Regulations relative to nondiscrimination on the grounds of race, color, sex, national origin, age, or disability.
- (4) **Information and Reports:** The Contractor shall provide all information and reports required by the Regulations or directives issued pursuant thereto, and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Department or the Federal Highway Administration to be pertinent to ascertain compliance with such Regulations, orders and instructions. Where any information required of the Contractor is in the exclusive possession of another who fails or refuses to furnish this information, the Contractor shall so certify to the Department, or the Federal Highway Administration, as appropriate, and shall set forth what efforts it has made to obtain the information.
- (5) **Sanctions for Noncompliance:** In the event of the Contractor's noncompliance with the nondiscrimination provisions of this Contract, the Department shall impose such contract sanctions as it or the Federal Highway Administration may determine to be appropriate, including, but not limited to:
 - (a) withholding of payments to the Contractor under the Contract until the Contractor complies, and/or
 - (b) cancellation, termination or suspension of the Contract, in whole or in part.

Rhode Island Department of Transportation
Title VI Assurance

Appendix A

- (6) **Incorporation of Provisions:** The Contractor shall include the provisions of paragraphs (1) through (6) in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations or directives issued pursuant thereto.

The Contractor shall take such action with respect to any subcontract or procurement as the Department or the Federal Highway Administration may direct as a means of enforcing such provisions, including sanctions for non-compliance; provided, however, that in the event the Contractor becomes involved in or is threatened with litigation with a subcontractor or supplier as a result of such direction, the Contractor may request the Department to enter into such litigation to protect the interests of the Department and, in addition, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

APPENDIX
CERTIFICATIONS

Dated: 6/27/2011

CERTIFICATION FOR TITLE VI ASSURANCE

I, Mustapha Gharrae Vice President a duly authorized representative of
(Name) (Title)
Shanix Technology, Inc. do hereby certify that the organization affirmatively agrees to the provisions
(Company)

set forth below:

1. The Certificate.

For all contracts subject to Title VI of the Civil Rights Act of 1964, 42 U.S.C. part 2000d - 2000d4 (the Act) and 49 C.F.R. Part 21, Nondiscrimination in Federally-Assisted Programs of the Department of Transportation - Effectuation of Title VI of the Civil Rights Act of 1964 (the Regulations), prospective bidders shall be required to complete a Certification affirming compliance with the Act and the Regulations.

2. Certification.

By submission of a Proposal, each bidder and each person signing a Proposal subject to the Act and the Regulations certifies that the bidder shall affirmatively agree as follows:

(a) Compliance with Regulations:

The bidder shall comply with the regulations relative to nondiscrimination in federally-assisted programs of the Department, 49 C.F.R. Part 21, as they may be amended from time to time.

(b) Nondiscrimination:

The bidder shall not discriminate on the grounds of race, color, sex, national origin, age, or disability in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The bidder shall not participate either directly or indirectly in the discrimination prohibited by section 21.5 of the Regulations, including employment practices when the Contract covers a program set forth in Appendix B of the Regulations.

(c) Solicitations for Subcontractors, Including Procurements of Materials and Equipment:

In all solicitations either by competitive bidding or negotiation made by the bidder for work to be performed under a subcontract, including procurements of materials or leases of equipment, each potential subcontractor or supplier shall be notified by the bidder of its obligations relative to nondiscrimination on the grounds of race, color, sex, national origin, age, or disability.

(d) Information and Reports:

The bidder shall provide all information and reports required by the Regulations or directives issued pursuant thereto, and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Department or the Federal Highway Administration to be pertinent to ascertain compliance with such Regulations, orders and instructions. Where any information required of the bidder is in the exclusive possession of another who fails or refuses to furnish this information, the bidder shall so certify to the Department, or the Federal Highway Administration, as appropriate, and shall set forth what efforts it has made to obtain the information.

(e) Sanctions for Noncompliance:

In the event of the bidder's noncompliance with the nondiscrimination provisions, the Department shall impose such contract sanctions as it or the Federal Highway Administration may determine to be appropriate, including, but not limited to:

- (1) withholding of payments under the Contract until the bidder complies, and/or
- (2) cancellation, termination or suspension of the Contract, in whole or in part.

(f) Incorporation of Provisions:

The bidder shall include the provisions of paragraphs (a) through (f) in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations or directives issued pursuant thereto.

The bidder shall take such action with respect to any subcontract or procurement as the Department or the Federal Highway Administration may direct as a means of enforcing such provisions, including sanctions for noncompliance; provided, however, that in the event the bidder becomes involved in or is threatened with litigation with a subcontractor or supplier as a result of such direction, the bidder may request the Department to enter into such litigation to protect the interests of the Department and, in addition, the bidder may request the United States to enter into such litigation to protect the interests of the United States.

49 CFR Part 29 - Appendix A

**CERTIFICATION REGARDING DEBARMENT, SUSPENSION, AND OTHER
RESPONSIBILITY MATTERS--PRIMARY COVERED TRANSACTIONS**

Instructions For Certification

1. By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.
2. The inability of a person to provide the certification required below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such person from participation in this transaction.
3. The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.
4. The prospective primary participant shall provide immediate written notice to the department or agency to which this proposal is submitted if at any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
5. The terms covered transaction, debarred, suspended, ineligible, lower tier covered transaction, participant, person, primary covered transaction, principal, proposal, and voluntarily excluded, as used in this clause, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549. You may contact the department or agency to which this proposal is being submitted for assistance in obtaining a copy of those regulations.
6. The prospective primary participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is proposed for debarment under 48 CFR part 9, subpart 9.4, debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

7. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion- Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
8. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not proposed for debarment under 48 CFR part 9, subpart 9.4, debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the List of Parties Excluded from Federal Procurement and Nonprocurement Programs.
9. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
10. Except for transactions authorized under paragraph 6 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is proposed for debarment under 48 CFR part 9, subpart 9.4, suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

**CERTIFICATION REGARDING DEBARMENT, SUSPENSION, AND OTHER
RESPONSIBILITY MATTERS--PRIMARY COVERED TRANSACTIONS**

- (1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:
- (a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded by any Federal department or agency;
 - (b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
 - (c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification;
 - (d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.
- (2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.



Signature/Authorized Certifying Official

Mustapha Gharace, Vice President
Typed Name and Title

Sharix Technology, Inc.
Applicant/Organization

September 3, 2014
Date Signed

49 CFR Part 29 - Appendix B

**CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND
VOLUNTARY EXCLUSION--LOWER TIER COVERED TRANSACTIONS**

Instructions For Certification

1. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.
2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
3. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or had become erroneous by reason of changed circumstances.
4. The terms covered transaction, debarred, suspended, ineligible, lower tier covered transaction, participant, person, primary covered transaction, principal, proposal, and voluntarily excluded, as used in this clause, have the meaning set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.
5. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is proposed for debarment under 48 CFR part 9, subpart 9.4, debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
6. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not proposed for debarment under 48 CFR part 9, subpart 9.4, debarred, suspended, ineligible, or voluntarily excluded from covered transactions, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the List of Parties Excluded from Federal Procurement and Nonprocurement Programs.
8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
9. Except for transactions authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is proposed for debarment under 48 CFR part 9, subpart 9.4, suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

**CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AN
VOLUNTARY EXCLUSION--LOWER TIER COVERED TRANSACTIONS**

- (1) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.
- (2) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.


Signature/Authorized Certifying Official

Mustapha Gharrae, Vice President
Typed Name and Title

Shanix Technology, Inc.
Applicant/Organization

September 3, 2014
Date Signed

BID CONDITIONS

**NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL OPPORTUNITY
(Executive Order 11246)**

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications set forth herein.
2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate work force in each trade on all construction work in the covered area, are as follows:

Timetables	Goals for Minority Participation for Each Trade	Goals for Female Participation in Each Trade
	3.0% R.I. Except Newport County	6.9%
	3.1% Newport County	6.9%

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or Federally assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and nonfederally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs through the Area Director, OFCCP, 169 Weybosset Street, Providence, Rhode Island 02903, within 10 working days of award of any construction subcontract in excess of \$10,000.00 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the Subcontractor; employer identification number; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the contract is to be performed.
4. As used in this Notice, and in the contract resulting from this Solicitation, the "covered area" is the State of Rhode Island.

**STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY
CONSTRUCTION CONTRACT SPECIFICATIONS
(Executive Order 11246)**

1. As used in these specifications:
 - (a) "Covered area" means the geographical area described in the solicitation from which this contract resulted.
 - (b) "Director" means Director, Office of Federal Contract Compliance Programs United States Department of Labor, or any person to whom the Director delegates authority.
 - (c) "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.
 - (d) "Minority" includes:
 - (i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
 - (ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);
 - (iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
 - (iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).
2. Whenever the Contractor, or any Subcontractor at any tier subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000.00 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.
3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in a approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.
4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7a through p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered Construction Contractors performing construction work in geographical areas where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical

area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.
6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability to employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.
7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:
 - (a) Ensure and maintain a working environment free of harassment, intimidation and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all on site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
 - (b) Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organization responses.
 - (c) Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the Contractor may have taken.
 - (d) Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
 - (e) Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.
 - (f) Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards

accessible to all employees at each location where construction work is performed.

- (g) Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on site supervisory personnel such as Superintendents, Supervisors, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.
 - (h) Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.
 - (i) Direct its recruitment efforts, both oral and written, to minority female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection procedures.
 - (j) Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.
 - (k) Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
 - (l) Conduct, at least annually, an inventory and evaluation of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
 - (m) Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.
 - (n) Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
 - (o) Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.
 - (p) Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.
8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a through p). The efforts of a contractor associations, joint contractor union, contractor-community, or other similar group of which the Contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7a through p of these Specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female work force participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of

actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and nonminority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though a Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).
10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.
11. The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.
12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.
13. The Contractor, in fulfilling its obligations under these specifications shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.
14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation, if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, Contractors shall not be required to maintain separate records.
15. Nothing herein provided shall be construed as a limitation upon application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program.).
 - (a) A Form 257, Monthly Employment Utilization Report, is to be completed by both Contractor and Subcontractors, and signed by the designated EEO Officer or an authorized representative of the prime or subcontractor. The reports are to be submitted by the 5th of each month during the term of the contract. The Contractor shall submit an aggregate Form 257 showing its entire work force, minority work force, and female work force (in work hours), on all construction work (Federal and non-federally assisted) in the covered area. The Contractor shall collect and submit reports for each Subcontractor's aggregate work force, providing the same information as above.
 - (b) The Contractor shall submit a Form PR-1391, Federal-Aid Highway Construction Contractors' Annual EEO Report, to be completed by the Contractor and each Subcontractor for every month of July, during which work was performed and submitted to the State. A separate report is to be completed for each Contractor and subcontractor holding contracts or subcontracts exceeding \$10,000.00, except where specified. The employment data entered should reflect the work force on board during all or any part of

the last payroll period preceding the end of the month of July.

NOTE: Include the R.I. Contract Number in the upper right hand corner of the form.

- (c) The Contractor shall submit a Form EEO-10, Federal-Aid Highway Construction Contractors' Semiannual Training Report, to be completed by the Contractor semiannually for each individual employed on this contract (including any subcontractors under it who have provided training during the reporting period under the training special provision). This report is to be submitted by the 20th of the month following the reporting period (July 20 and January 20). The original of this report is to be furnished to the trainee, and two (2) copies submitted to the State.

These reports are required by the Public Laws of Rhode Island (1960), Chapters 85, 96, & 88; 23 U.S.C., 140(a); 23 CFR, Part 23; and Executive Order 11246.

Revised: 4/12/2002

**ANTI-COLLUSION CERTIFICATE FOR CONTRACT AND FORCE ACCOUNT
[Unsworn Declaration]**

Title 23, United States Code, Section 112(c), requires, as a condition precedent to approval by the Director of Public Roads of the contract for this work, that there be filed an unsworn declaration executed by, on behalf of, the person, firm, association, or corporation submitting the bid certifying that such person, firm, association, or corporation has not either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action, in restraint of free competitive bidding in connection with the submitted bid. This unsworn statement shall be in the form of a declaration executed under penalty of perjury under the laws of the United States.

To the: **STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
DEPARTMENT OF TRANSPORTATION, DIVISION OF PUBLIC WORKS**

State of RI

County of Providence

I, Mustapha Gharaee, Vice President, under penalty under the laws of the United States, do depose and say:

On behalf of Shanix Technology, of Cranston, RI that said Contractor has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with Rhode Island Contract Number, Federal-Aid Project Number, County of, Town-City, Road-Bridge.



State of Rhode Island Department of Administration
Division of Purchases

REVISED
November 20, 2013

NOTICE TO VENDORS

Each bid proposal for a *public works project* must include a "public copy" to be available for public inspection upon the opening of bids. **Bid proposals that do not include a copy for public inspection will be deemed nonresponsive.**

The public copy must be submitted in .pdf (portable document file) format on a *read-only* CD-R media disc. The disc must include *all of the documents* submitted in response to the solicitation concatenated or merged into one file. The file must be named in the following manner:

BidNumber_DateofBid_VendorName_VendorID.pdf

The Bidder Certification Cover Form contains all of the information for the file name. The date of bid must appear as mm-dd-yyyy. The vendor name must appear as one word, with no spaces or punctuation. Underscores must separate the fields.

Example: 7543210_11-08-2013_OceanStateCompanyInc_9867.pdf

The public copy disc must be separately enclosed in a protective cover clearly marked "Public Copy" and include the following information (all available from the Bidder Certification Cover Form): (1) title of solicitation; (2) name of bidder and RIVIP vendor ID number; (3) bid number; and (4) date of bid.

The public copy may redact any trade secrets or commercial or financial information which is of a privileged or confidential nature pursuant to the "Access to Public Records Act," R. I. Gen. Laws §§ 38-2-1 *et seq.*

For further information on how to comply with this statutory requirement, see R. I. Gen. Laws §§ 37-2-18(b) and (j). Also see Procurement Regulation 5.11 accessible at www.purchasing.ri.gov



State of Rhode Island
Division of Purchases

Public Works
Bid Preparation Checklist

Date: 8/13/2014

Bid#: 7548935

Title: ON-CALL CAMERA AND VIDE EQUIPMENT/INSTALLATIONS

This checklist is provided to assist the bidder in preparing a bid proposal for submission. It is not a substitute for a thorough review of the Instruction to Bidders nor a comprehensive list of all bid proposal requirements. Each bidder is responsible to review the Instructions to Bidders and to comply with all requirements of the Solicitation.

Bid Proposal Package:

- RIVIP Bidder Certification Cover Form (completed) signed in ink ✓
- Bid Form ✓
 - All applicable blank spaces on the Bid Form have been completed ✓
 - All Addenda have been acknowledged
 - Bid price printed legibly in ink (in both words and figures that match where specified)
 - Erasures or corrections have been initialed by person signing the Bid Form
 - Bid Form is signed in ink
- Bid Surety
 - Bid bond or certified check (for DOT projects, bid bond only)
 - Bid surety is five percent of the bid total (or such other specified amount)
 - Bid Bond is signed by the bidder and surety
 - Power of Attorney is attached to the Bid Bond showing the name of person who signed the surety bond
- Public Copy of bid proposal in pdf format on a read-only CD-R media disk ✓
- General Contractor Apprenticeship Certification Form "2013-14" (for projects \$1,000,000 and greater) required at time of bid proposal submission

Note: General Contractor Apprenticeship Re-Certification and Certification Form "2013-16" and Subcontractor Apprenticeship Certification Form "2013-15" are not required at time of bid proposal submission deadline.

- Applicable professional licenses (as specified in the Solicitation) ✓
- Rhode Island Contractor Registration Board No.
- All bid proposal documents in a sealed envelope with the specific Solicitation #, Solicitation title, and the bid proposal submission deadline marked in the upper left hand corner of the envelope ✓
- Each bid proposal submitted in a separate sealed envelope ✓
- Completed Form W-9 ✓
- Other _____

Lisa Hill

401-574-8118

Lisa.hill@purchasing.ri.gov

State of Rhode Island and Providence Plantations Contract Offer
RIVIP BIDDER CERTIFICATION COVER FORM

SECTION 1 - VENDOR INFORMATION

Bid/RFPNumber: 7548935A1
Bid/RFP Title: ON-CALL CAMERA & VIDEO EQUIPMENT INSTALLATION - DOT - ADDENDUM 1 (1 PG)

Opening Date & Time: 9/3/2014 11:00 AM

RIVIP Vendor ID #: 2450

Vendor Name: Shanix, Inc.

Address: 40 Worthington Road
Cranston , RI 02920-7940
USA

Telephone: (401) 941-4222

Fax: (401) 941-4333

E-Mail: mustapha@shanix.com

Contact Person: Mustapha Gharaee

Title: Vice President

R.I. Foreign Corp #:

NOTICE TO VENDORS

Each bid proposal for a *public works project* must include a "public copy" to be available for public inspection upon the opening of bids. **Bid proposals that do not include a copy for public inspection will be deemed nonresponsive.** For further information on how to comply with this statutory requirement, see R. I. Gen. Laws §§ 37-2-18(b) and (j). Also see Procurement Regulation 5.11, and in addition, for highway and bridge projects, also see Procurement Regulation 5.13, accessible at www.purchasing.ri.gov.

NOTE: AWARD OF CONTRACTS AND PURCHASE ORDERS SHALL BE SUBJECT, AT THE DISCRETION OF THE PURCHASING AGENT, TO THE OFFEROR COMPLETING AN ON-LINE RIVIP REGISTRATION at www.purchasing.ri.gov. It is THE RESPONSIBILITY OF THE VENDOR to make on-line corrections/updates using the Vendor maintenance program on the RI Division of Purchases Web Site.

SECTION 2 – REQUIREMENTS

ALL OFFERS ARE SUBJECT TO THE REQUIREMENTS, PROVISIONS AND PROCEDURES CONTAINED IN THIS CERTIFICATION FORM. Offerors are expected to READ, SIGN and COMPLY WITH all requirements. Failure to do so may be grounds for disqualification of the offer contained herein.

Section 2.1 - RULES FOR SUBMITTING OFFERS

2.1A. This CERTIFICATION FORM MUST BE ATTACHED IN ITS ENTIRETY TO THE FRONT OF THE OFFER and shall be considered an integral part of each offer made by a vendor to enter into a contract with the State of Rhode Island, Division of Purchases. As such, submittal of the entire Bidder Certification Cover Form, signed by a duly authorized representative of the offeror attesting that he/she (1) has read and agrees to comply with the requirements set forth herein and (2) to the accuracy of the information provided and the offer extended, is a mandatory part of any contract award.

To assure that offers are considered on time, each offer must be submitted with the specific Bid/RFP/LOI number (provided above) and the date and time of opening marked in the upper left hand corner of envelope. Each bid/offer must be submitted in separate sealed envelopes.

A complete, signed (in ink) offer package must be delivered to the Division of Purchases (via any mail or messenger service) by the time and date specified for the opening of responses in a sealed envelope.

Bids must be submitted on the RI bid solicitation forms provided, indicating brand and part numbers of items offered, as appropriate. Bidders must submit detailed cuts and specs on items offered as equivalent to brands requested WITH THE OFFER. Bidders must be able to submit samples if requested. Mail To: Division of Purchases, One Capitol Hill, Second Floor, Providence, RI 02908-5855.

Documents misdirected to other State locations or which are not present in the Division of Purchases at the time of opening for whatever cause will be deemed to be late and will not be considered. For the purposes of this requirement, the official time and date shall be that of the time clock in the Division of Purchases. Postmarks shall not be considered proof of timely submission.

2.1B. RIVIP SOLICITATIONS. To assure maximum access opportunities for users, public bid/RFP solicitations shall be posted on the RIVIP for a minimum of seven days and no amendments shall be made within the last five days before the date an offer is due. Except when access to the Web Site has been severely curtailed and it is determined by the State Purchasing Agent that special circumstances preclude extending a solicitation due date, requests to mail or fax hard copies of solicitations will not be honored. When the result of an Internet solicitation is unsuccessful, the State of Rhode Island will cancel the original solicitation and resolicit the original offer directly from vendors.

2.2. PRICING. Offers are irrevocable for sixty (60) days from the opening date (or such other extended period set forth in the solicitation) and may not be withdrawn, except with the express permission of the State Purchasing Agent. All pricing will be considered to be firm and fixed unless otherwise indicated. The State of Rhode Island is exempt from Federal excise taxes and State Sales and Use Taxes. Such taxes shall not be included in the bid price. PRICES QUOTED ARE FOB DESTINATION.

2.3. DELIVERY and PRODUCT QUALITY. All offers must define delivery dates for all items; if no delivery date is specified, it is assumed that immediate delivery from stock will be made. The contractor will be responsible for delivery of materials in first class condition. Rejected materials will be at vendor's expense.

2.4. PREVAILING WAGE, OSHA SAFETY TRAINING, and APPRENTICESHIP REQUIREMENTS.

Bidders must comply with the provisions of the Rhode Island labor laws, including R. I. Gen. Laws §§ 37-13-1 *et seq.* and occupational safety laws, including R. I. Gen. Laws §§ 28-20-1 *et seq.* These laws mandate for public works construction projects the payment of prevailing wage rates, the implementation and maintenance of occupational safety standards, and for projects with a minimum value of \$1 Million, the employment of apprentices. The successful Bidder must submit certifications of compliance with these laws from each of its subcontractors prior to their commencement of any work. Prevailing wage rates, apprenticeship requirements, and other workforce and safety regulations are accessible at www.dlt.ri.gov.

2.5. PUBLIC RECORDS. Offerors are advised that all materials submitted to the State for consideration in response to this solicitation will be considered without exception to be Public Records pursuant to Title 38 Chapter 2 of the Rhode Island General Laws, and will be released for inspection immediately upon request once an award has been made. Offerors are encouraged to attend public bid/RFP openings to obtain information; however, bid/RFP response summaries may be reviewed after award(s) have been made by using the RIVIP at any time or appearing in person at the Division of Purchases Mondays through Fridays between 8:30 a.m. and 3:30 p.m. Telephone requests for results will not be honored. Written requests for results will only be honored if the information is not available on the RIVIP.

SECTION 3 - AWARD DETERMINATION

Award will be made to the responsive and responsible offeror quoting the lowest net price in accordance with specifications, for any individual item(s), for major groupings of items, or for all items listed, at the State's sole option.

3.1. BID SURETY. Where bid surety is required, bidder must furnish a bid bond or certified check for 5% of the bid total with the bid, or for such other amount as may be specified. Bids submitted without a required bid surety will not be considered.

3.2. SPECIFICATIONS. Unless specified "no substitute," product offerings equivalent in quality and performance will be considered (at the sole option of the State) on the condition that the offer is accompanied by detailed product specifications. Offers which fail to include alternate specifications may be deemed nonresponsive.

SECTION 4 – CONTRACT PROVISIONS

4.1. VENDOR AUTHORIZATION TO PROCEED.

4.1A. When a purchase order, change order, contract/agreement or contract/agreement amendment is issued by the RI Division of Purchases, no claim for payment for services rendered or goods delivered contrary to or in excess of the contract terms and scope shall be considered valid unless the vendor has obtained a written change order or contract amendment issued by the Division of Purchases PRIOR TO delivery.

4.1B. Any offer, whether in response to a solicitation for proposals or bids, or made without a solicitation, which is accepted in the form of an order OR Pricing Agreement made in writing by the Purchasing Agent, or a state official with purchasing authority delegated by the Purchasing Agent, shall be considered a binding contract.

4.2. REGULATIONS, GENERAL TERMS AND CONDITIONS GOVERNING STATE CONTRACTS. This solicitation and any contract or purchase order arising from it are issued in accordance with the specific requirements described herein, and the State's Purchasing Laws and Regulations and other applicable State Laws. The Regulations, General Terms and Conditions are incorporated into all state contracts. These regulations and basic information on How To Do Business with the State of Rhode Island are posted on the Rhode Island Vendor Information Program Website (www.purchasing.ri.gov).

4.2A. ARRA SUPPLEMENTAL TERMS AND CONDITIONS. Contracts and sub-awards funded in whole or in part by the American Recovery and Reinvestment Act of 2009. Pub.L.No. 111-5 and any amendments thereto, such contracts and sub-awards, shall be subject to the Supplemental Terms and Conditions For Contracts and Sub-awards Funded in Whole or in Part by the American Recovery and Reinvestment Act of 2009. Pub.L.No. 111-5 and any amendments thereto located on the Division of Purchases website at www.purchasing.ri.gov.

4.3. EQUAL EMPLOYMENT OPPORTUNITY. Compliance certificate and agreement procedures will apply to all awards for supplies or services valued at \$10,000 and more. Minority Business Enterprise policies and procedures, including subcontracting opportunities as described in Title 37 Chapter 14.1, of the Rhode Island General Laws, also apply.

4.4. PERFORMANCE BONDS. Where indicated, successful bidder must furnish a 100% performance bond and labor and payment bond for contracts subject to Title 37 Chapters 12 and 13 of the Rhode Island General Laws. All bonds must be furnished by a surety company authorized to conduct business in the State of Rhode Island. Performance bonds must be submitted within 21 calendar days of the issuance of a tentative notice of award.

4.5. DEFAULT and NON-COMPLIANCE. Default and/or non-compliance with the RIVIP requirements and any other aspects of the award may result in withholding of payment(s), contract termination, debarment, suspension, or any other remedy necessary that is in the best interest of the state.

4.6. COMPLIANCE. Vendor must comply with all applicable federal, state and local laws, regulations and ordinances.

4.7. SPRINKLER IMPAIRMENT AND HOT WORK. The Contractor agrees to comply with the practices of the State's insurance carrier for sprinkler impairment and hot work. Prior to performing any work, the Contractor shall obtain the necessary information for compliance from the Risk Management Office at the Department of Administration or the agency for which work will be performed.

SECTION 5 – CERTIFICATIONS AND DISCLOSURES **ALL CONTRACT AWARDS ARE SUBJECT TO THE FOLLOWING DISCLOSURES & CERTIFICATIONS**

Offerors must respond to every disclosure statement.

A person authorized to enter into contracts must sign the offer and attest to the accuracy of all statements.

Indicate Yes (Y) or No (N):

- N 1. State whether your company, or any owner, stockholder, officer, director, member, partner, or principal thereof, or any subsidiary or affiliated company, has been subject to suspension or debarment by any federal, state, or municipal government agency, or the subject of criminal prosecution, or convicted of a criminal offense within the previous five (5) years. If so, then provide details below.
- N 2. State whether your company, or any owner, stockholder, officer, director, member, partner, or principal thereof, or any subsidiary or affiliated company, has had any contracts with a federal, state or municipal government agency terminated for any reason within the previous five (5) years. If so, then provide details below.
- N 3. State whether your company or any owner, stockholder, officer, director, member, partner, or principal thereof, or any subsidiary or affiliated company, has been fined more than \$5000 for violation(s) of Rhode Island environmental laws by the Rhode Island Department of Environmental Management within the previous five (5) years. If so, then provide details below.
- Y 4. I/we certify that I/we will immediately disclose, in writing, to the Chief Purchasing Officer any potential conflict of interest, which may occur during the course of the engagement authorized pursuant to this contract.
- Y 5. I/we acknowledge that, in accordance with Chapter 37-2-54(c) of the Rhode Island General Laws "no purchase or contract shall be binding on the state or any agency thereof unless approved by the Department [of Administration] or made under general regulations which the Chief Purchasing Officer may prescribe", including change orders and other types of contracts and under State Purchasing Regulation 8.2.1.1.2, "any alleged oral agreement or arrangements made by a bidder or contractor with any agency or an employee of the Office of Purchases may be disregarded and shall not be binding on the state".
- Y 6. I/we certify that I/we or my/our firm possesses all licenses required by Federal and State laws and regulations as they pertain to the requirements of the solicitation and offer made herein and shall maintain such required license(s) during the entire course of the contract resulting from the offer contained herein and should my/our license lapse or be suspended, I/we shall immediately inform the Rhode Island State Purchasing Agent in writing of such circumstance.
- Y 7. I/we certify that I/we will maintain required insurance during the entire course of the contract resulting from the offer contained herein and should my/our insurance lapse or be suspended, I/we shall immediately inform the Rhode Island State Purchasing Agent in writing of such circumstance.
- Y 8. I/we certify that I/we understand that falsification of any information herein or failure to notify the Rhode Island State Purchasing Agent as certified herein may be grounds for suspension, debarment and/or prosecution for fraud.
- Y 9. I/we acknowledge that the provisions and procedures set forth in this form apply to any contract arising from this offer.
- Y 10. I/we acknowledge that I/we understand the State's Purchasing Laws (37-2 of the General Laws of Rhode Island) and Purchasing Regulations and General Terms and Conditions available at the Rhode Island Division of Purchases Website (www.purchasing.ri.gov) apply as the governing conditions for any contract or purchase order I/we may receive from the State of Rhode Island, including the offer contained herein.
- Y 11. I/we certify that the bidder: (i) is not identified on the General Treasurer's list, created pursuant to R.I. Gen. Laws § 37-2.5-3, as a person or entity engaging in investment activities in Iran described in § 37-2.5-2(b); and (ii) is not engaging in any such investment activities in Iran.
- Y 12. I/we certify that the above vendor information is correct and complete.



State of Rhode Island
Department of Administration / Division of Purchases
One Capitol Hill, Providence, Rhode Island 02908-5855
Tel: (401) 574-8100 Fax: (401) 574-8387

ADDENDUM #1

RFP #7548935

**TITLE: ON-CALL CAMERA & VIDEO EQUIPMENT
INSTALLATION - DOT**

OPENING DATE AND TIME: 9/3/14- 11:00 AM

The following information was inadvertently left off Public Bid 7548938:

THERE WILL BE A NON-MANDATORY PRE-BID
AUGUST 19, 2014 AT 9:00 AM
2 CAPITAL HILL /TMC
PROVIDENCE, RI

DUE TO LENGTH OF BID AND TIME CONSTRAINTS, THE STATE WILL ONLY
ACKNOWLEDGE RECEIPT AND READ THE NAMES OF VENDORS SUBMITTING
PROPOSALS. NO EXAMINATION OF DOCUMENTS OR PRESENTATION OF
INFORMATION CONTAINED IN PROPOSALS WILL BE MADE AVAILABLE AT THE
BID OPENING; HOWEVER, INSTRUCTIONS TO OBTAIN THE TABULATION OR
SUMMARY OF BID RESPONSES WILL BE MADE AVAILABLE AT THE RI DIVISION
OF PURCHASES WEBSITE AT WWW.PURCHASING.RI.GOV

LISA HILL
CHIEF BUYER

State of Rhode Island and Providence Plantations Contract Offer
RIVIP BIDDER CERTIFICATION COVER FORM

SECTION 1 - VENDOR INFORMATION

Bid/RFPNumber: 7548935A2
Bid/RFP Title: ON-CALL CAMERA AND VIDEO EQUIPMENT/INSTALLATION - ADDENDUM 2 (3 PGS)

Opening Date & Time: 9/3/2014 11:00 AM

RIVIP Vendor ID #: 2450
Vendor Name: Shanix, Inc.
Address: 40 Worthington Road
Cranston , RI 02920-7940
USA

Telephone: (401) 941-4222
Fax: (401) 941-4333
E-Mail: mustapha@shanix.com
Contact Person: Mustapha Gharaee
Title: Vice President
R.I. Foreign Corp #:

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2.1A. This CERTIFICATION FORM MUST BE ATTACHED IN ITS ENTIRETY TO THE FRONT OF THE OFFER and shall be considered an integral part of each offer made by a vendor to enter into a contract with the State of Rhode Island, Division of Purchases. As such, submittal of the entire Bidder Certification Cover Form, signed by a duly authorized representative of the offeror attesting that he/she (1) has read and agrees to comply with the requirements set forth herein and (2) to the accuracy of the information provided and the offer extended, is a mandatory part of any contract award.

To assure that offers are considered on time, each offer must be submitted with the specific Bid/RFP/LOI number (provided above) and the date and time of opening marked in the upper left hand corner of envelope. Each bid/offer must be submitted in separate sealed envelopes.

A complete, signed (in ink) offer package must be delivered to the Division of Purchases (via any mail or messenger service) by the time and date specified for the opening of responses in a sealed envelope.

Bids must be submitted on the RI bid solicitation forms provided, indicating brand and part numbers of items offered, as appropriate. Bidders must submit detailed cuts and specs on items offered as equivalent to brands requested WITH THE OFFER. Bidders must be able to submit samples if requested. Mail To: Division of Purchases, One Capitol Hill, Second Floor, Providence, RI 02908-5855.

Documents misdirected to other State locations or which are not present in the Division of Purchases at the time of opening for whatever cause will be deemed to be late and will not be considered. For the purposes of this requirement, the official time and date shall be that of the time clock in the Division of Purchases. Postmarks shall not be considered proof of timely submission.

2.1B. RIVIP SOLICITATIONS. To assure maximum access opportunities for users, public bid/RFP solicitations shall be posted on the RIVIP for a minimum of seven days and no amendments shall be made within the last five days before the date an offer is due. Except when access to the Web Site has been severely curtailed and it is determined by the State Purchasing Agent that special circumstances preclude extending a solicitation due date, requests to mail or fax hard copies of solicitations will not be honored. When the result of an Internet solicitation is unsuccessful, the State of Rhode Island will cancel the original solicitation and resolicit the original offer directly from vendors.

2.2. PRICING. Offers are irrevocable for sixty (60) days from the opening date (or such other extended period set forth in the solicitation) and may not be withdrawn, except with the express permission of the State Purchasing Agent. All pricing will be considered to be firm and fixed unless otherwise indicated. The State of Rhode Island is exempt from Federal excise taxes and State Sales and Use Taxes. Such taxes shall not be included in the bid price. PRICES QUOTED ARE FOB DESTINATION.

2.3. DELIVERY and PRODUCT QUALITY. All offers must define delivery dates for all items; if no delivery date is specified, it is assumed that immediate delivery from stock will be made. The contractor will be responsible for delivery of materials in first class condition. Rejected materials will be at vendor's expense.

2.4. PREVAILING WAGE, OSHA SAFETY TRAINING, and APPRENTICESHIP REQUIREMENTS.

Bidders must comply with the provisions of the Rhode Island labor laws, including R. I. Gen. Laws §§ 37-13-1 *et seq.* and occupational safety laws, including R. I. Gen. Laws §§ 28-20-1 *et seq.* These laws mandate for public works construction projects the payment of prevailing wage rates, the implementation and maintenance of occupational safety standards, and for projects with a minimum value of \$1 Million, the employment of apprentices. The successful Bidder must submit certifications of compliance with these laws from each of its subcontractors prior to their commencement of any work. Prevailing wage rates, apprenticeship requirements, and other workforce and safety regulations are accessible at www.dlt.ri.gov.

2.5. PUBLIC RECORDS. Offerors are advised that all materials submitted to the State for consideration in response to this solicitation will be considered without exception to be Public Records pursuant to Title 38 Chapter 2 of the Rhode Island General Laws, and will be released for inspection immediately upon request once an award has been made. Offerors are encouraged to attend public bid/RFP openings to obtain information; however, bid/RFP response summaries may be reviewed after award(s) have been made by using the RIVIP at any time or appearing in person at the Division of Purchases Mondays through Fridays between 8:30 a.m. and 3:30 p.m. Telephone requests for results will not be honored. Written requests for results will only be honored if the information is not available on the RIVIP.

SECTION 3 - AWARD DETERMINATION

Award will be made to the responsive and responsible offeror quoting the lowest net price in accordance with specifications, for any individual item(s), for major groupings of items, or for all items listed, at the State's sole option.

3.1. BID SURETY. Where bid surety is required, bidder must furnish a bid bond or certified check for 5% of the bid total with the bid, or for such other amount as may be specified. Bids submitted without a required bid surety will not be considered.

3.2. SPECIFICATIONS. Unless specified "no substitute," product offerings equivalent in quality and performance will be considered (at the sole option of the State) on the condition that the offer is accompanied by detailed product specifications. Offers which fail to include alternate specifications may be deemed nonresponsive.

SECTION 4 – CONTRACT PROVISIONS

4.1. VENDOR AUTHORIZATION TO PROCEED.

4.1A. When a purchase order, change order, contract/agreement or contract/agreement amendment is issued by the RI Division of Purchases, no claim for payment for services rendered or goods delivered contrary to or in excess of the contract terms and scope shall be considered valid unless the vendor has obtained a written change order or contract amendment issued by the Division of Purchases PRIOR TO delivery.

4.1B. Any offer, whether in response to a solicitation for proposals or bids, or made without a solicitation, which is accepted in the form of an order OR Pricing Agreement made in writing by the Purchasing Agent, or a state official with purchasing authority delegated by the Purchasing Agent, shall be considered a binding contract.

4.2. REGULATIONS, GENERAL TERMS AND CONDITIONS GOVERNING STATE CONTRACTS. This solicitation and any contract or purchase order arising from it are issued in accordance with the specific requirements described herein, and the State's Purchasing Laws and Regulations and other applicable State Laws. The Regulations, General Terms and Conditions are incorporated into all state contracts. These regulations and basic information on How To Do Business with the State of Rhode Island are posted on the Rhode Island Vendor Information Program Website (www.purchasing.ri.gov).

4.2A. ARRA SUPPLEMENTAL TERMS AND CONDITIONS. Contracts and sub-awards funded in whole or in part by the American Recovery and Reinvestment Act of 2009. Pub.L.No. 111-5 and any amendments thereto, such contracts and sub-awards, shall be subject to the Supplemental Terms and Conditions For Contracts and Sub-awards Funded in Whole or in Part by the American Recovery and Reinvestment Act of 2009. Pub.L.No. 111-5 and any amendments thereto located on the Division of Purchases website at www.purchasing.ri.gov.

4.3. EQUAL EMPLOYMENT OPPORTUNITY. Compliance certificate and agreement procedures will apply to all awards for supplies or services valued at \$10,000 and more. Minority Business Enterprise policies and procedures, including subcontracting opportunities as described in Title 37 Chapter 14.1, of the Rhode Island General Laws, also apply.

4.4. PERFORMANCE BONDS. Where indicated, successful bidder must furnish a 100% performance bond and labor and payment bond for contracts subject to Title 37 Chapters 12 and 13 of the Rhode Island General Laws. All bonds must be furnished by a surety company authorized to conduct business in the State of Rhode Island. Performance bonds must be submitted within 21 calendar days of the issuance of a tentative notice of award.

4.5. DEFAULT and NON-COMPLIANCE. Default and/or non-compliance with the RIVIP requirements and any other aspects of the award may result in withholding of payment(s), contract termination, debarment, suspension, or any other remedy necessary that is in the best interest of the state.

4.6. COMPLIANCE. Vendor must comply with all applicable federal, state and local laws, regulations and ordinances.

4.7. SPRINKLER IMPAIRMENT AND HOT WORK. The Contractor agrees to comply with the practices of the State's insurance carrier for sprinkler impairment and hot work. Prior to performing any work, the Contractor shall obtain the necessary information for compliance from the Risk Management Office at the Department of Administration or the agency for which work will be performed.

SECTION 5 – CERTIFICATIONS AND DISCLOSURES
ALL CONTRACT AWARDS ARE SUBJECT TO THE FOLLOWING DISCLOSURES & CERTIFICATIONS
Offerors must respond to every disclosure statement.

A person authorized to enter into contracts must sign the offer and attest to the accuracy of all statements.

Indicate Yes (Y) or No (N):

- N 1. State whether your company, or any owner, stockholder, officer, director, member, partner, or principal thereof, or any subsidiary or affiliated company, has been subject to suspension or debarment by any federal, state, or municipal government agency, or the subject of criminal prosecution, or convicted of a criminal offense within the previous five (5) years. If so, then provide details below.
- N 2. State whether your company, or any owner, stockholder, officer, director, member, partner, or principal thereof, or any subsidiary or affiliated company, has had any contracts with a federal, state or municipal government agency terminated for any reason within the previous five (5) years. If so, then provide details below.
- N 3. State whether your company or any owner, stockholder, officer, director, member, partner, or principal thereof, or any subsidiary or affiliated company, has been fined more than \$5000 for violation(s) of Rhode Island environmental laws by the Rhode Island Department of Environmental Management within the previous five (5) years. If so, then provide details below.
- Y 4. I/we certify that I/we will immediately disclose, in writing, to the Chief Purchasing Officer any potential conflict of interest, which may occur during the course of the engagement authorized pursuant to this contract.
- Y 5. I/we acknowledge that, in accordance with Chapter 37-2-54(c) of the Rhode Island General Laws "no purchase or contract shall be binding on the state or any agency thereof unless approved by the Department [of Administration] or made under general regulations which the Chief Purchasing Officer may prescribe", including change orders and other types of contracts and under State Purchasing Regulation 8.2.1.1.2, "any alleged oral agreement or arrangements made by a bidder or contractor with any agency or an employee of the Office of Purchases may be disregarded and shall not be binding on the state".
- Y 6. I/we certify that I/we or my/our firm possesses all licenses required by Federal and State laws and regulations as they pertain to the requirements of the solicitation and offer made herein and shall maintain such required license(s) during the entire course of the contract resulting from the offer contained herein and should my/our license lapse or be suspended, I/we shall immediately inform the Rhode Island State Purchasing Agent in writing of such circumstance.
- Y 7. I/we certify that I/we will maintain required insurance during the entire course of the contract resulting from the offer contained herein and should my/our insurance lapse or be suspended, I/we shall immediately inform the Rhode Island State Purchasing Agent in writing of such circumstance.
- Y 8. I/we certify that I/we understand that falsification of any information herein or failure to notify the Rhode Island State Purchasing Agent as certified herein may be grounds for suspension, debarment and/or prosecution for fraud.
- Y 9. I/we acknowledge that the provisions and procedures set forth in this form apply to any contract arising from this offer.
- Y 10. I/we acknowledge that I/we understand the State's Purchasing Laws (37-2 of the General Laws of Rhode Island) and Purchasing Regulations and General Terms and Conditions available at the Rhode Island Division of Purchases Website (www.purchasing.ri.gov) apply as the governing conditions for any contract or purchase order I/we may receive from the State of Rhode Island, including the offer contained herein.
- Y 11. I/we certify that the bidder: (i) is not identified on the General Treasurer's list, created pursuant to R.I. Gen. Laws § 37-2.5-3, as a person or entity engaging in investment activities in Iran described in § 37-2.5-2(b); and (ii) is not engaging in any such investment activities in Iran.
- Y 12. I/we certify that the above vendor information is correct and complete.



State of Rhode Island
Department of Administration / Division of Purchases
One Capitol Hill, Providence, Rhode Island 02908-5855
Tel: (401) 574-8100 Fax: (401) 574-8387

ADDENDUM #2

RFP # 7548935

TITLE: ON-CALL CAMERA AND VIDEO EQUIPMENT/INSTALLATION

SUBMISSION DEADLINE: 9/3/14 – 11:00 A.M.

Prospective bidders and all concerned are hereby advised of the attached changes/modifications for the above referenced RFQ and are hereby requested to change their copies accordingly.

- PRE-BID CONFERENCE Q&A

Synopsis of questions/comments discussed at the Pre-bid Conference held on August 19, 2014 at the RIDOT Transportation Management Center.

- ATTENDANCE SHEET

Copy of Attendance Sign-in sheets from the Pre-bid Conference held on August 19, 2014 is attached.

Clarification #1 – Miscellaneous Items

Section 11 of the General Provisions – Contract Specific (Miscellaneous Materials and Services) refers to a “Miscellaneous Materials and Services bid item.” This line has since been removed from the list of bid items. However, the Purchase Order for this project will contain an “allowance” item in the amount of \$75,000 which will serve the same function and be used with the approval of the TMC Manager.

Clarification #2 – Camera Mounting Hardware

As stated in Section 8 of the General Provisions – Contract Specific, the Contractor shall “Provide mounting hardware appropriate to the mounting location and camera device...” and shall include this cost in any “Furnish and Install” bid camera items. (“Furnish Only” items need not include these costs.) At the TMC Manager’s discretion, the

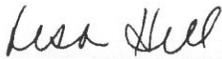
Miscellaneous/Allowance line item may be used to purchase additional mounting equipment that is not specified in Section 8.

Clarification #3 – Typos in conduit line Items 16, 17, 18, and 19

Due to a document conversion error, line Items 16, 17, 18, and 19 contain a question mark (“?”) in the Bid Item Description. These are supposed to be inch (“”) designations. For example, line Item 16 should read, “...FURNISH AND INSTALL: 2 INCH GALVANIZED RIGID STEEL CONDUIT...”

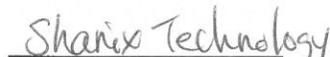
Clarification #4 – Reiteration of existing Video Management System requirements

As stated in Section 8 of the General Provisions – Contract Specific, the TMC uses Aimetis’s Symphony product to manage all camera video, including providing it to the TMC’s various video sharing partners, such as the RI State Police. The TMC is not interested in replacing the system under this contract, but requires an authorized agent to purchase components and provide software support for Aimetis systems.



Lisa Hill
Chief Buyer

Bidders must include a signed copy of this addendum with their proposal submission as acknowledgement.



Company Name (print)



Signature of Authorized Representative

"NON-MANDATORY" PRE-BID CONFERENCE SIGN IN SHEET

BID NUMBER: **7548935**
 BID TITLE: **ON CALL CAMERA VIDEO EQUIPMENT**
 PRESIDENTIAL TIME: **19 AUGUST 2014 09:00**
 BIDDER: **RIDOT - TMC**

Purchasing Representative
 Purchasing Staff Title
 President Time

COMPANY NAME	COMPANY REPRESENTATIVE	ADDRESS	CONTACT EMAIL	CONTACT PHONE NUMBER	CONTACT FAX NUMBER	PROPOSAL SUBMITTED FOR PURCHASING USE ONLY
1 RIDOT	Evertt Samachos	2 Capital Hill rd 114	esamachos@dot.rhodeis.gov	222-5826	401-441-4333	
2 RIDOT	Phillip V. Dencare	2 Capital Hill	phillip.dencare@dot.rhodeis.gov	222-5826	401-441-4333	
3 RIDOT	Jammy Rodriguez	106 Leguater Dr Newell, RI 02881	jammyrod@dot.rhodeis.gov	401-327-1650		
4 Signet	Jason Blanc		jason.blanc@signet.com	781-871-5888		
5 SHANLEY INC	MUSTAPHA CHARRIS	44 WESTWIND RD CRANSTON, RI 02906	mustapha.charris@shanley.com	401-952-1850		
6 RIDOT/TMC	M. KE WINTER	2000 1st Hill	michael.winter@dot.rhodeis.gov	401-272-5832		
7 Jacobs Engineering	Jack Hodgkinson	2000 1st Hill	jack.hodgkinson@jacobs.com	401-272-5832		
8 Jacobs Eng	Tom Excavator	1st Hill	tom.excavator@jacobs.com	401-272-5832		
9 Jacobs Eng	Wayne Owens	1st Hill	wayne.owens@jacobs.com	401-477-9555		
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State of Rhode Island and Providence Plantations Contract Offer
RIVIP BIDDER CERTIFICATION COVER FORM

SECTION 1 - VENDOR INFORMATION

Bid/RFPNumber: 7548935A3
Bid/RFP Title: ON-CALL CAMERA AND VIDEO EQUIPMENT/INSTALLATIONS - DOT - ADDENDUM 3

Opening Date & Time: 9/3/2014 11:00 AM

RIVIP Vendor ID #: 2450
Vendor Name: Shanix, Inc.
Address: 40 Worthington Road
Cranston , RI 02920-7940
USA

Telephone: (401) 941-4222
Fax: (401) 941-4333
E-Mail: mustapha@shanix.com
Contact Person: Mustapha Gharaee
Title: Vice President
R.I. Foreign Corp #:

NOTICE TO VENDORS

Each bid proposal for a *public works project* must include a "public copy" to be available for public inspection upon the opening of bids. **Bid proposals that do not include a copy for public inspection will be deemed nonresponsive.** For further information on how to comply with this statutory requirement, see R. I. Gen. Laws §§ 37-2-18(b) and (j). Also see Procurement Regulation 5.11, and in addition, for highway and bridge projects, also see Procurement Regulation 5.13, accessible at www.purchasing.ri.gov.

NOTE: AWARD OF CONTRACTS AND PURCHASE ORDERS SHALL BE SUBJECT, AT THE DISCRETION OF THE PURCHASING AGENT, TO THE OFFEROR COMPLETING AN ON-LINE RIVIP REGISTRATION at www.purchasing.ri.gov. It is THE RESPONSIBILITY OF THE VENDOR to make on-line corrections/updates using the Vendor maintenance program on the RI Division of Purchases Web Site.

SECTION 2 – REQUIREMENTS

ALL OFFERS ARE SUBJECT TO THE REQUIREMENTS, PROVISIONS AND PROCEDURES CONTAINED IN THIS CERTIFICATION FORM. Offerors are expected to READ, SIGN and COMPLY WITH all requirements. Failure to do so may be grounds for disqualification of the offer contained herein.

Section 2.1 - RULES FOR SUBMITTING OFFERS

2.1A. This CERTIFICATION FORM MUST BE ATTACHED IN ITS ENTIRETY TO THE FRONT OF THE OFFER and shall be considered an integral part of each offer made by a vendor to enter into a contract with the State of Rhode Island, Division of Purchases. As such, submittal of the entire Bidder Certification Cover Form, signed by a duly authorized representative of the offeror attesting that he/she (1) has read and agrees to comply with the requirements set forth herein and (2) to the accuracy of the information provided and the offer extended, is a mandatory part of any contract award.

To assure that offers are considered on time, each offer must be submitted with the specific Bid/RFP/LOI number (provided above) and the date and time of opening marked in the upper left hand corner of envelope. Each bid/offer must be submitted in separate sealed envelopes.

A complete, signed (in ink) offer package must be delivered to the Division of Purchases (via any mail or messenger service) by the time and date specified for the opening of responses in a sealed envelope.

Bids must be submitted on the RI bid solicitation forms provided, indicating brand and part numbers of items offered, as appropriate. Bidders must submit detailed cuts and specs on items offered as equivalent to brands requested WITH THE OFFER. Bidders must be able to submit samples if requested. Mail To: Division of Purchases, One Capitol Hill, Second Floor, Providence, RI 02908-5855.

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Bidders must comply with the provisions of the Rhode Island labor laws, including R. I. Gen. Laws §§ 37-13-1 *et seq.* and occupational safety laws, including R. I. Gen. Laws §§ 28-20-1 *et seq.* These laws mandate for public works construction projects the payment of prevailing wage rates, the implementation and maintenance of occupational safety standards, and for projects with a minimum value of \$1 Million, the employment of apprentices. The successful Bidder must submit certifications of compliance with these laws from each of its subcontractors prior to their commencement of any work. Prevailing wage rates, apprenticeship requirements, and other workforce and safety regulations are accessible at www.dlt.ri.gov.

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Award will be made to the responsive and responsible offeror quoting the lowest net price in accordance with specifications, for any individual item(s), for major groupings of items, or for all items listed, at the State's sole option.

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4.1B. Any offer, whether in response to a solicitation for proposals or bids, or made without a solicitation, which is accepted in the form of an order OR Pricing Agreement made in writing by the Purchasing Agent, or a state official with purchasing authority delegated by the Purchasing Agent, shall be considered a binding contract.

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ALL CONTRACT AWARDS ARE SUBJECT TO THE FOLLOWING DISCLOSURES & CERTIFICATIONS

Offerors must respond to every disclosure statement.

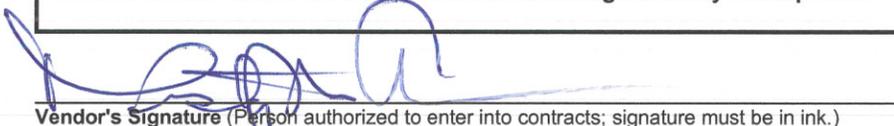
A person authorized to enter into contracts must sign the offer and attest to the accuracy of all statements.

Indicate Yes (Y) or No (N):

- N 1. State whether your company, or any owner, stockholder, officer, director, member, partner, or principal thereof, or any subsidiary or affiliated company, has been subject to suspension or debarment by any federal, state, or municipal government agency, or the subject of criminal prosecution, or convicted of a criminal offense within the previous five (5) years. If so, then provide details below.
- N 2. State whether your company, or any owner, stockholder, officer, director, member, partner, or principal thereof, or any subsidiary or affiliated company, has had any contracts with a federal, state or municipal government agency terminated for any reason within the previous five (5) years. If so, then provide details below.
- N 3. State whether your company or any owner, stockholder, officer, director, member, partner, or principal thereof, or any subsidiary or affiliated company, has been fined more than \$5000 for violation(s) of Rhode Island environmental laws by the Rhode Island Department of Environmental Management within the previous five (5) years. If so, then provide details below.
- Y 4. I/we certify that I/we will immediately disclose, in writing, to the Chief Purchasing Officer any potential conflict of interest, which may occur during the course of the engagement authorized pursuant to this contract.
- Y 5. I/we acknowledge that, in accordance with Chapter 37-2-54(c) of the Rhode Island General Laws "no purchase or contract shall be binding on the state or any agency thereof unless approved by the Department [of Administration] or made under general regulations which the Chief Purchasing Officer may prescribe", including change orders and other types of contracts and under State Purchasing Regulation 8.2.1.1.2, "any alleged oral agreement or arrangements made by a bidder or contractor with any agency or an employee of the Office of Purchases may be disregarded and shall not be binding on the state".
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- Y 7. I/we certify that I/we will maintain required insurance during the entire course of the contract resulting from the offer contained herein and should my/our insurance lapse or be suspended, I/we shall immediately inform the Rhode Island State Purchasing Agent in writing of such circumstance.
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- Y 9. I/we acknowledge that the provisions and procedures set forth in this form apply to any contract arising from this offer.
- Y 10. I/we acknowledge that I/we understand the State's Purchasing Laws (37-2 of the General Laws of Rhode Island) and Purchasing Regulations and General Terms and Conditions available at the Rhode Island Division of Purchases Website (www.purchasing.ri.gov) apply as the governing conditions for any contract or purchase order I/we may receive from the State of Rhode Island, including the offer contained herein.
- Y 11. I/we certify that the bidder: (i) is not identified on the General Treasurer's list, created pursuant to R.I. Gen. Laws § 37-2.5-3, as a person or entity engaging in investment activities in Iran described in § 37-2.5-2(b); and (ii) is not engaging in any such investment activities in Iran.
- Y 12. I/we certify that the above vendor information is correct and complete.

IF YOU HAVE ANSWERED "YES" TO QUESTIONS #1-3 OR IF YOU ARE UNABLE TO CERTIFY YES TO ITEMS #4-12 OF THE FOREGOING, PROVIDE DETAILS/EXPLANATION BELOW AND/OR IN AN ATTACHED STATEMENT. INCOMPLETE CERTIFICATION FORMS SHALL BE GROUNDS FOR DISQUALIFICATION OF OFFER.

Signature below commits vendor to the attached offer and certifies (1) that the offer has taken into account all solicitation amendments, (2) that the above statements and information are accurate and that vendor understands and has complied with the requirements set forth herein. When delivering offers in person to One Capitol Hill, vendors are advised to allow at least one hour additional time for clearance through security checkpoints.


Vendor's Signature (Person authorized to enter into contracts; signature must be in ink.)

Date 9/3/14

Mustapha Gharacee, VP
Name and Title of company official signing offer Print



State of Rhode Island
Department of Administration / Division of Purchases
One Capitol Hill, Providence, Rhode Island 02908-5855
Tel: (401) 574-8100 Fax: (401) 574-8387

ADDENDUM #3

RFP # 7548935

TITLE: ON-CALL CAMERA AND VIDEO EQUIPMENT/INSTALLATIONS - DOT

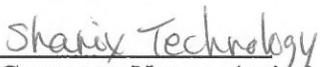
SUBMISSION DEADLINE: 9/3/14 – 11:00 A.M.

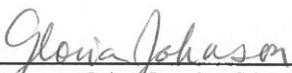
Prospective bidders and all concerned are hereby advised of the attached changes/modifications for the above referenced RFQ and are hereby requested to change their copies accordingly.

RESPONSES TO QUESTIONS RECEIVED ARE ATTACHED.


Lisa Hill
Chief Buyer

Bidders must include a signed copy of this addendum with their proposal submission as acknowledgement.


Company Name (print)


Signature of Authorized Representative

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

SOLICITATION # 7548935 (ADDENDUM 3)
ON-CALL CAMERA AND VIDEO EQUIPMENT/INSTALLATIONS - DOT

Question 1. The specifications state to provide the manufacture 'Aimetis' for the Video Management software and doesn't state alternate or equal manufacture will be allowed. In order to allow a more competitive bid process, will alternate manufactures of the VMS be acceptable? If so, can the consultant provide the names of such alternate manufactures?

No, alternate manufacturers are not acceptable. Line Items 24 and 25 specifically refer to purchasing additional Aimetis camera licenses and Aimetis 1-year support agreements for our existing Aimetis Symphony system. An alternate manufacturer would not be able to provide this.

As stated in Section 8 of the General Provisions – Contract Specific, the TMC already uses Aimetis's Symphony product to manage all camera video, including providing it to the TMC's various video sharing partners, such as the RI State Police. Purchasing a new software package is outside the scope of this contract. The Video Management software has already been purchased under a previous contract and is already integrated into various systems and sharing agreements. Under this contract, the TMC requires an authorized agent to purchase additional components and provide software support for Aimetis systems.

Question 2. If the answer to number one is yes;

- a) How many total cameras are on the existing system?**
- b) Please provide the manufacture and model numbers of the existing IP cameras and corresponding quantities.**
- c) Please provide the manufacture and model numbers of the existing IP encoders and corresponding quantities.**
- d) How many concurrent client connections are being used?**
- e) Is there any integration to third party systems? If so, please provide the level of integration and manufacture/model of the third party system(s).**
- f) Are video analytics currently being performed? If so, please provide a brief description of what type of analytics.**

See answer to Question 1.

3. The specifications state to provide the manufactures 'Cisco' and 'Netgear' for network switches and doesn't state alternate or equal manufacture will be allowed. In order to allow a more competitive bid process and provided that the alternate switch meets the

technical characteristics of what was specified, will alternate manufactures of the network switches be acceptable?

Cisco network switches are required by the Rhode Island State Division of Information Technology (DoIT) for compatibility with existing high-end network equipment. Specifically, Line Items 11, 12, and 13 must be manufactured by Cisco, as they need to be managed alongside other State-owned network resources which are managed outside of the TMC.

Line Item 14 is for a small, unmanaged switch, and therefore Netgear is not a required manufacturer for this item. Alternate manufacturers of equipment with the same functionality may be submitted for approval as an "approved equivalent."

State of Rhode Island and Providence Plantations Contract Offer
RIVIP BIDDER CERTIFICATION COVER FORM

SECTION 1 - VENDOR INFORMATION

Bid/RFPNumber: 7548935A4
Bid/RFP Title: ON-CALL CAMERA AND VIDEO EQUIPMENT/INSTALLATION - DOT - ADDENDUM 4 (2 PGS)
Opening Date & Time: 9/3/2014 11:00 AM
RIVIP Vendor ID #: 2450
Vendor Name: Shanix, Inc.
Address: 40 Worthington Road
Cranston , RI 02920-7940
USA
Telephone: (401) 941-4222
Fax: (401) 941-4333
E-Mail: mustapha@shanix.com
Contact Person: Mustapha Gharaee
Title: Vice President
R.I. Foreign Corp #:

NOTICE TO VENDORS

Each bid proposal for a *public works project* must include a "public copy" to be available for public inspection upon the opening of bids. **Bid proposals that do not include a copy for public inspection will be deemed nonresponsive.** For further information on how to comply with this statutory requirement, see R. I. Gen. Laws §§ 37-2-18(b) and (j). Also see Procurement Regulation 5.11, and in addition, for highway and bridge projects, also see Procurement Regulation 5.13, accessible at www.purchasing.ri.gov.

NOTE: AWARD OF CONTRACTS AND PURCHASE ORDERS SHALL BE SUBJECT, AT THE DISCRETION OF THE PURCHASING AGENT, TO THE OFFEROR COMPLETING AN ON-LINE RIVIP REGISTRATION at www.purchasing.ri.gov. It is THE RESPONSIBILITY OF THE VENDOR to make on-line corrections/updates using the Vendor maintenance program on the RI Division of Purchases Web Site.

SECTION 2 – REQUIREMENTS

ALL OFFERS ARE SUBJECT TO THE REQUIREMENTS, PROVISIONS AND PROCEDURES CONTAINED IN THIS CERTIFICATION FORM. Offerors are expected to READ, SIGN and COMPLY WITH all requirements. Failure to do so may be grounds for disqualification of the offer contained herein.

Section 2.1 - RULES FOR SUBMITTING OFFERS

2.1A. This CERTIFICATION FORM MUST BE ATTACHED IN ITS ENTIRETY TO THE FRONT OF THE OFFER and shall be considered an integral part of each offer made by a vendor to enter into a contract with the State of Rhode Island, Division of Purchases. As such, submittal of the entire Bidder Certification Cover Form, signed by a duly authorized representative of the offeror attesting that he/she (1) has read and agrees to comply with the requirements set forth herein and (2) to the accuracy of the information provided and the offer extended, is a mandatory part of any contract award.

To assure that offers are considered on time, each offer must be submitted with the specific Bid/RFP/LOI number (provided above) and the date and time of opening marked in the upper left hand corner of envelope. Each bid/offer must be submitted in separate sealed envelopes.

A complete, signed (in ink) offer package must be delivered to the Division of Purchases (via any mail or messenger service) by the time and date specified for the opening of responses in a sealed envelope.

Bids must be submitted on the RI bid solicitation forms provided, indicating brand and part numbers of items offered, as appropriate. Bidders must submit detailed cuts and specs on items offered as equivalent to brands requested WITH THE OFFER. Bidders must be able to submit samples if requested. Mail To: Division of Purchases, One Capitol Hill, Second Floor, Providence, RI 02908-5855.

Documents misdirected to other State locations or which are not present in the Division of Purchases at the time of opening for whatever cause will be deemed to be late and will not be considered. For the purposes of this requirement, the official time and date shall be that of the time clock in the Division of Purchases. Postmarks shall not be considered proof of timely submission.

2.1B. RIVIP SOLICITATIONS. To assure maximum access opportunities for users, public bid/RFP solicitations shall be posted on the RIVIP for a minimum of seven days and no amendments shall be made within the last five days before the date an offer is due. Except when access to the Web Site has been severely curtailed and it is determined by the State Purchasing Agent that special circumstances preclude extending a solicitation due date, requests to mail or fax hard copies of solicitations will not be honored. When the result of an Internet solicitation is unsuccessful, the State of Rhode Island will cancel the original solicitation and resolicit the original offer directly from vendors.

2.2. PRICING. Offers are irrevocable for sixty (60) days from the opening date (or such other extended period set forth in the solicitation) and may not be withdrawn, except with the express permission of the State Purchasing Agent. All pricing will be considered to be firm and fixed unless otherwise indicated. The State of Rhode Island is exempt from Federal excise taxes and State Sales and Use Taxes. Such taxes shall not be included in the bid price. PRICES QUOTED ARE FOB DESTINATION.

2.3. DELIVERY and PRODUCT QUALITY. All offers must define delivery dates for all items; if no delivery date is specified, it is assumed that immediate delivery from stock will be made. The contractor will be responsible for delivery of materials in first class condition. Rejected materials will be at vendor's expense.

2.4. PREVAILING WAGE, OSHA SAFETY TRAINING, and APPRENTICESHIP REQUIREMENTS.

Bidders must comply with the provisions of the Rhode Island labor laws, including R. I. Gen. Laws §§ 37-13-1 *et seq.* and occupational safety laws, including R. I. Gen. Laws §§ 28-20-1 *et seq.* These laws mandate for public works construction projects the payment of prevailing wage rates, the implementation and maintenance of occupational safety standards, and for projects with a minimum value of \$1 Million, the employment of apprentices. The successful Bidder must submit certifications of compliance with these laws from each of its subcontractors prior to their commencement of any work. Prevailing wage rates, apprenticeship requirements, and other workforce and safety regulations are accessible at www.dlt.ri.gov.

2.5. PUBLIC RECORDS. Offerors are advised that all materials submitted to the State for consideration in response to this solicitation will be considered without exception to be Public Records pursuant to Title 38 Chapter 2 of the Rhode Island General Laws, and will be released for inspection immediately upon request once an award has been made. Offerors are encouraged to attend public bid/RFP openings to obtain information; however, bid/RFP response summaries may be reviewed after award(s) have been made by using the RIVIP at any time or appearing in person at the Division of Purchases Mondays through Fridays between 8:30 a.m. and 3:30 p.m. Telephone requests for results will not be honored. Written requests for results will only be honored if the information is not available on the RIVIP.

SECTION 3 - AWARD DETERMINATION

Award will be made to the responsive and responsible offeror quoting the lowest net price in accordance with specifications, for any individual item(s), for major groupings of items, or for all items listed, at the State's sole option.

3.1. BID SURETY. Where bid surety is required, bidder must furnish a bid bond or certified check for 5% of the bid total with the bid, or for such other amount as may be specified. Bids submitted without a required bid surety will not be considered.

3.2. SPECIFICATIONS. Unless specified "no substitute," product offerings equivalent in quality and performance will be considered (at the sole option of the State) on the condition that the offer is accompanied by detailed product specifications. Offers which fail to include alternate specifications may be deemed nonresponsive.

SECTION 4 – CONTRACT PROVISIONS

4.1. VENDOR AUTHORIZATION TO PROCEED.

4.1A. When a purchase order, change order, contract/agreement or contract/agreement amendment is issued by the RI Division of Purchases, no claim for payment for services rendered or goods delivered contrary to or in excess of the contract terms and scope shall be considered valid unless the vendor has obtained a written change order or contract amendment issued by the Division of Purchases PRIOR TO delivery.

4.1B. Any offer, whether in response to a solicitation for proposals or bids, or made without a solicitation, which is accepted in the form of an order OR Pricing Agreement made in writing by the Purchasing Agent, or a state official with purchasing authority delegated by the Purchasing Agent, shall be considered a binding contract.

4.2. REGULATIONS, GENERAL TERMS AND CONDITIONS GOVERNING STATE CONTRACTS. This solicitation and any contract or purchase order arising from it are issued in accordance with the specific requirements described herein, and the State's Purchasing Laws and Regulations and other applicable State Laws. The Regulations, General Terms and Conditions are incorporated into all state contracts. These regulations and basic information on How To Do Business with the State of Rhode Island are posted on the Rhode Island Vendor Information Program Website (www.purchasing.ri.gov).

4.2A. ARRA SUPPLEMENTAL TERMS AND CONDITIONS. Contracts and sub-awards funded in whole or in part by the American Recovery and Reinvestment Act of 2009. Pub.L.No. 111-5 and any amendments thereto, such contracts and sub-awards, shall be subject to the Supplemental Terms and Conditions For Contracts and Sub-awards Funded in Whole or in Part by the American Recovery and Reinvestment Act of 2009. Pub.L.No. 111-5 and any amendments thereto located on the Division of Purchases website at www.purchasing.ri.gov.

4.3. EQUAL EMPLOYMENT OPPORTUNITY. Compliance certificate and agreement procedures will apply to all awards for supplies or services valued at \$10,000 and more. Minority Business Enterprise policies and procedures, including subcontracting opportunities as described in Title 37 Chapter 14.1, of the Rhode Island General Laws, also apply.

4.4. PERFORMANCE BONDS. Where indicated, successful bidder must furnish a 100% performance bond and labor and payment bond for contracts subject to Title 37 Chapters 12 and 13 of the Rhode Island General Laws. All bonds must be furnished by a surety company authorized to conduct business in the State of Rhode Island. Performance bonds must be submitted within 21 calendar days of the issuance of a tentative notice of award.

4.5. DEFAULT and NON-COMPLIANCE. Default and/or non-compliance with the RIVIP requirements and any other aspects of the award may result in withholding of payment(s), contract termination, debarment, suspension, or any other remedy necessary that is in the best interest of the state.

4.6. COMPLIANCE. Vendor must comply with all applicable federal, state and local laws, regulations and ordinances.

4.7. SPRINKLER IMPAIRMENT AND HOT WORK. The Contractor agrees to comply with the practices of the State's insurance carrier for sprinkler impairment and hot work. Prior to performing any work, the Contractor shall obtain the necessary information for compliance from the Risk Management Office at the Department of Administration or the agency for which work will be performed.

SECTION 5 – CERTIFICATIONS AND DISCLOSURES
ALL CONTRACT AWARDS ARE SUBJECT TO THE FOLLOWING DISCLOSURES & CERTIFICATIONS
Offerors must respond to every disclosure statement.

A person authorized to enter into contracts must sign the offer and attest to the accuracy of all statements.

Indicate Yes (Y) or No (N):

- N 1. State whether your company, or any owner, stockholder, officer, director, member, partner, or principal thereof, or any subsidiary or affiliated company, has been subject to suspension or debarment by any federal, state, or municipal government agency, or the subject of criminal prosecution, or convicted of a criminal offense within the previous five (5) years. If so, then provide details below.
- N 2. State whether your company, or any owner, stockholder, officer, director, member, partner, or principal thereof, or any subsidiary or affiliated company, has had any contracts with a federal, state or municipal government agency terminated for any reason within the previous five (5) years. If so, then provide details below.
- N 3. State whether your company or any owner, stockholder, officer, director, member, partner, or principal thereof, or any subsidiary or affiliated company, has been fined more than \$5000 for violation(s) of Rhode Island environmental laws by the Rhode Island Department of Environmental Management within the previous five (5) years. If so, then provide details below.
- Y 4. I/we certify that I/we will immediately disclose, in writing, to the Chief Purchasing Officer any potential conflict of interest, which may occur during the course of the engagement authorized pursuant to this contract.
- Y 5. I/we acknowledge that, in accordance with Chapter 37-2-54(c) of the Rhode Island General Laws "no purchase or contract shall be binding on the state or any agency thereof unless approved by the Department [of Administration] or made under general regulations which the Chief Purchasing Officer may prescribe", including change orders and other types of contracts and under State Purchasing Regulation 8.2.1.1.2, "any alleged oral agreement or arrangements made by a bidder or contractor with any agency or an employee of the Office of Purchases may be disregarded and shall not be binding on the state".
- Y 6. I/we certify that I/we or my/our firm possesses all licenses required by Federal and State laws and regulations as they pertain to the requirements of the solicitation and offer made herein and shall maintain such required license(s) during the entire course of the contract resulting from the offer contained herein and should my/our license lapse or be suspended, I/we shall immediately inform the Rhode Island State Purchasing Agent in writing of such circumstance.
- Y 7. I/we certify that I/we will maintain required insurance during the entire course of the contract resulting from the offer contained herein and should my/our insurance lapse or be suspended, I/we shall immediately inform the Rhode Island State Purchasing Agent in writing of such circumstance.
- Y 8. I/we certify that I/we understand that falsification of any information herein or failure to notify the Rhode Island State Purchasing Agent as certified herein may be grounds for suspension, debarment and/or prosecution for fraud.
- Y 9. I/we acknowledge that the provisions and procedures set forth in this form apply to any contract arising from this offer.
- Y 10. I/we acknowledge that I/we understand the State's Purchasing Laws (37-2 of the General Laws of Rhode Island) and Purchasing Regulations and General Terms and Conditions available at the Rhode Island Division of Purchases Website (www.purchasing.ri.gov) apply as the governing conditions for any contract or purchase order I/we may receive from the State of Rhode Island, including the offer contained herein.
- Y 11. I/we certify that the bidder: (i) is not identified on the General Treasurer's list, created pursuant to R.I. Gen. Laws § 37-2.5-3, as a person or entity engaging in investment activities in Iran described in § 37-2.5-2(b); and (ii) is not engaging in any such investment activities in Iran.
- Y 12. I/we certify that the above vendor information is correct and complete.



State of Rhode Island
Department of Administration / Division of Purchases
One Capitol Hill, Providence, Rhode Island 02908-5855
Tel: (401) 574-8100 Fax: (401) 574-8387

ADDENDUM #4

RFP # 7548935

TITLE: ON-CALL CAMERA AND VIDEO EQUIPMENT/INSTALLATIONS - DOT

SUBMISSION DEADLINE: 9/3/14 – 11:00 A.M.

Prospective bidders and all concerned are hereby advised of the attached changes/modifications for the above referenced RFQ and are hereby requested to change their copies accordingly.

RESPONSE TO QUESTION RECEIVED IS AS FOLLOWS:

Question: There is no specifications or model #s for the items I have highlighted in the attached parts list. Can you please provide model numbers for the highlighted items.

Clarification #1 – Requested Part Numbers

Line	Description	Qty	Unit	Model/Part #
20	10/1/14-9/30/16 Filter for Planar Video Wall Module	24	EA	Purolator #DMK80 (5.5 in x 9.5 in x 1 in)
21	10/1/14-9/30/16 Halogen Bulb for Planar Video Wall Module	24	EA	Planar #151-1065-01 (V6R Lamp Changer Module 150w)
22	10/1/14-9/30/16 Ballast for Planar Video Wall Module	8	EA	Planar #750-1845-00

The TMC has eight 50-inch Clarity Margay II video cubes and requires these spare parts for them. We have used the above replacement part numbers, but any equivalent parts approved by the manufacturer (Planar) are acceptable.

Line	Description	Qty	Unit	Model/Part #
27	10/1/14-9/30/16 Crestron DM Cabling	500	LF	#DM-CBL-8G-P-SP500
28	10/1/14-9/30/16 Crestron Programmer	40	HR	Not Applicable
30	10/1/14-9/30/16 Crestron Matrix Expansion Card	1	EA	#DMCO-55

The TMC has a 32x32 Crestron Audio Video Matrix Switcher and requires these items and services. We have used the above model numbers, but any equivalent models approved by the manufacturer (Crestron) are acceptable. The Crestron Programmer line item is for technician hours, and so does not have a model or part number.

 Lisa Hill
 Chief Buyer

Bidders must include a signed copy of this addendum with their proposal submission as acknowledgement.

Sharix Technology
 Company Name (print)

Gloria Johnson
 Signature of Authorized Representative

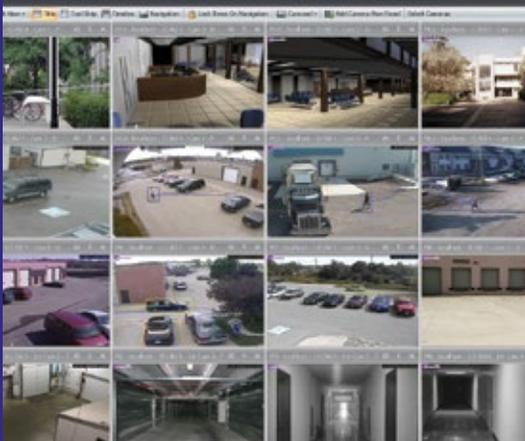
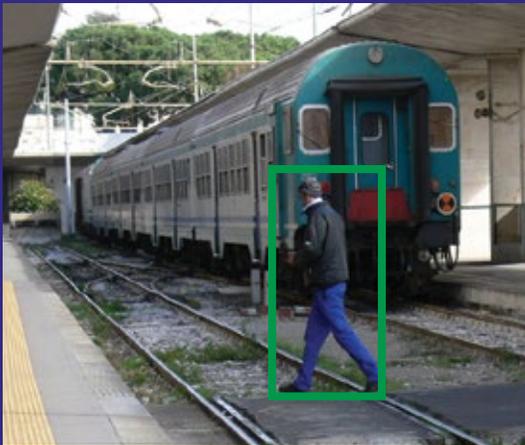


Intelligent Video Surveillance Software
Video Management. Video Analytics. *In Harmony.*

Future-Proof Surveillance

Migrate from analog CCTV to Intelligent IP video surveillance with a single software platform - Aimetis Symphony™.

- Integrate analog and IP cameras
- Scalable IP video management
- Open platform for system integration
- Alarm management
- Video analytics



Aimetis Symphony™

Video Management. Video Analytics. In Harmony.

Aimetis Symphony™ is award-winning intelligent video surveillance software that offers a single, innovative, open IP video platform for video management, video analytics, system integration and alarm management.

Open IP Video Management

Aimetis Symphony™ installs on standard IT hardware, supports both analog and IP cameras from hundreds of camera manufacturers, provides a feature-rich, easy-to-use interface, and incorporates IT friendly features to make administration simple.

- Install on standard IT hardware
- Supports hundreds of cameras and encoder models
- Supports MPEG4, MJPEG, H.264
- Intelligent user-friendly interface
- Unhindered scalability
- IT friendly

Proven Video Analytics

Aimetis VE Series video analytic algorithms are seamlessly incorporated into Aimetis Symphony™, analyzing video data in real-time and providing organizations with intelligent information at their fingertips. The analytic applications in Aimetis Symphony™ include:

- Video Motion Detection
- Motion Tracking
- Object Classification
- Left/Removed Item Detection
- People Counting
- Dwell Time/Loitering
- Wrong Direction
- Auto PTZ tracking

System Integration & Alarm Management

Aimetis Symphony™ has a full Application Programming Interface (API) that makes integration with third-party systems, such as access control, easy. What's more is that Aimetis Symphony™ makes it simple to configure rules, and create automatic actions, such as lock doors, sound alarm, or turn-on lights, in the event of an emergency.

- Rich API for third party integration
- OPC Interface
- Simple rule configuration
- Automatic actions

Simple Migration Path

Analog CCTV to Intelligent IP Video Surveillance

With three licenses to choose from, Aimetis Symphony™ has a solution for every stage on the migration path from analog CCTV to intelligent IP video surveillance.

Aimetis Symphony™ Standard - IP Video Recording

Aimetis Symphony™ Standard is the ideal choice for organizations making a transition from analog CCTV or DVR technology to IP video. The Standard license is installed on commercial-off-the-shelf hardware, supports an unlimited number of cameras and features robust video recording features, such as; remote live view, video playback, record on motion and PTZ control.

Aimetis Symphony™ Professional - Integrated Alarm Management

Aimetis Symphony™ Professional combines the robust video recording features of the Standard license with enterprise wide system scalability, third party system integration, and alarm management capabilities creating a centralized system for security administration and response.

Aimetis Symphony™ Enterprise - Intelligent Video Surveillance

Aimetis Symphony™ Enterprise incorporates all the capabilities of Standard and Professional and adds several Aimetis VE Series™ Video Analytics algorithms, changing the use of video from a passive recording device to a proactive, enterprise intelligence gathering tool.

Key Features

Unhindered Scalability

Aimetis Symphony™ provides IT professionals with the tools for simplified, centralized deployment across multiple buildings and campuses.

- High camera density per server
- Server farm support
- Server virtualization
- Microsoft Active Directory

Intelligent User Interface

Security professionals are provided with intelligent information at their fingertips, allowing for comprehensive investigation and real-time response.

- Dynamic, deep-linked site map
- Alarm notification and response log
- Event-driven, interactive timeline

- Customizable display
- Multiple PTZ control options
- Multi-language support
- PC Client, PDA Client, Web Client

Unparalleled Investigation and Reporting Tools

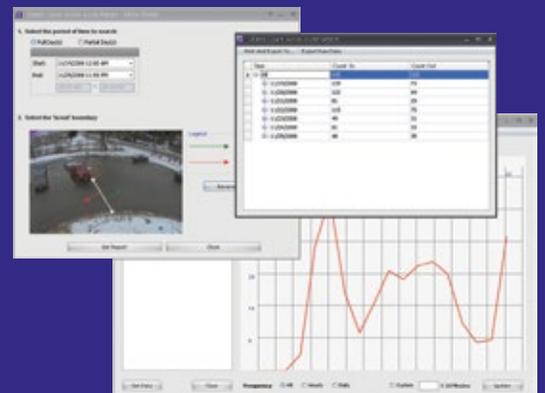
With seamlessly integrated analytics, Aimetis Symphony™ turns passive video data into proactive security and business intelligence.

- Event-driven video search
- Business intelligence reports
 - People/Vehicle Counts
 - Object Density/Occupancy
 - Traffic Flow
 - Alarm Counts/Time/Rule
 - Loitering/Dwell Time

The Industry's Simplest Licensing Model

One Camera. One License. Period.

- Three license versions to choose from
- Add licenses one at a time
- Mix and Match licenses on a single server
- Simple license version upgrade
- Unrestricted camera replacement
- License not tied to MAC address of camera



Surveillance Capabilities You Need . . . With IT Features You Want

Aimetis Symphony™ software provides advanced video surveillance capabilities with robust and scalable IT infrastructure to meet the needs of both security and technical professionals.

Aimetis Symphony™ Version 6.12

	Server License: Target Application:	STANDARD "Recording"	PROFESSIONAL "Management"	ENTERPRISE "Intelligent Management"
Server Features	Supported operating system	Windows XP, Vista, 7, 8, Server 2003, Server 2008 (32 or 64 bit versions supported)		
	Number of cameras per server**	Unlimited	Unlimited	Unlimited
	Number of Concurrent Client Connections**	Unlimited	Unlimited	Unlimited
	Multi-server (Server Farm)		Unlimited	Unlimited
	Automatic Server Failover		■	■
	Server Virtualization***	■	■	■
	2-way Audio	■	■	■
	Unicast, Multicast & Multistream support	■	■	■
	Network Video support**** (MJPEG / MPEG-4 / H.264)	■	■	■
	Record on Motion (Video motion detection from camera)	■	■	■
	Device Packs	■	■	■
	Mobile Bridge Server	■	■	■
	Record locally or to network storage	■	■	■
	Customizable User Access Levels	■	■	■
	Web and Mobile Clients	■	■	■
Video Wall		■	■	
Alerting	Android & Apple smartphones or tablets	■	■	■
	I/O Devices	■	■	■
	E-mail Notification	■	■	■
	FTP	■	■	■
	TCP	■	■	■
Analytics Applications (Powered by Aimetis VE Series™)	Camera loss detection (e.g. cord cut)	■	■	■
	Camera obstructed/moved (scene change detection)	■	■	■
	Basic Video Motion Detection (VMD)	■	■	■
	Motion tracking / object classification (3D model)			■
	Virtual fence / Wrong direction			■
	Multiple area alarms			■
	Left item / removed item detection			■
	People counting			■
	Loitering			■
	Automatic License Plate Recognition			■
	Auto-PTZ tracking			■
Client	Customizable User Interface	■	■	■
	Graphical Timeline	■	■	■
	Hierarchical Site Map Navigation	■	■	■
	Integrated Remote Support Module	■	■	■
	Advanced Video Analytic Search	By motion	By motion	By Aimetis VE Series™ algorithm
	Intelligent Reporting	By motion	By motion	By Aimetis VE Series™ algorithm
License	Mix/Match Different Licenses on Same Server	■	■	■
	Interchangeable Licenses between Cameras	■	■	■
	License Fee per Camera	■	■	■
	License Fee per Server	None	None	None
	License Fee per Client	None	None	None

* Actual limitations only constrained by PC hardware, no license limitation invoked. Visit Aimetis Xnet for hardware benchmarks.

** 500 concurrent connections tested.

*** VMware and Microsoft Virtual Server.

**** Please check www.aimetis.com for updated supported device list

Intelligent Video Surveillance for Security and Business Intelligence

Security & Beyond

With advanced video search tools, and a comprehensive selection of on-demand reports, organizations use Aimetis Symphony™ for business intelligence in addition to security surveillance, helping them to plan business requirements, improve operations and increase ROI.

Aimetis Symphony helps organizations to:

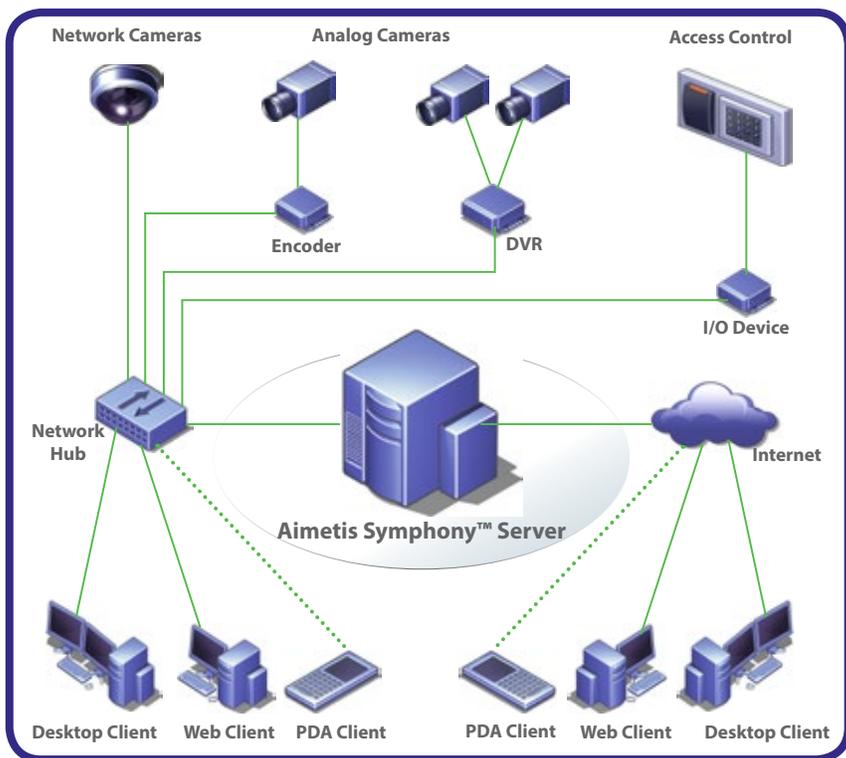
- Improve public safety
- Reduce shrinkage
- Increase revenues
- Decrease insurance and liability
- Optimize operations

Industry Applications

Aimetis Symphony™ is solving real world problems in many industries around the world, including:

- Education
- Entertainment & Hospitality
- Government
- Healthcare & Life Science
- Industrial
- Retail
- Transportation

Aimetis Symphony™ Solution Architecture



Proven Solutions for Real World Problems

“Aimetis Symphony™ was the best intelligent video platform we could find. Nothing else could touch it.”

Steve Patterson, Manager IT Operations
City of Oshawa

“Aimetis software provides us with peace of mind, knowing that we have a powerful, yet easy-to-use video system that leaves us best prepared to prevent and respond to any threat to the safety and security of our facilities, students, teachers and staff.”

Peter Thompson, Manager, IT
Princeton Regional Schools

“Aimetis Symphony™ gives us 24 hour security, helps us improve customer service and provides us with revenue generating opportunities.”

Christer Erikson, CEO
ICA Alundhallen

“Aimetis Symphony is a critical component of airport security and operations. It assures the smooth flow of operations, helps to prevent and solve crimes and provides emergency crews with the information they need in special situations.”

Michael Zaddach, Manager IT Service
Munich Airport



ABOUT AIMETIS

Aimetis Corp. is a software company offering integrated intelligent video surveillance solutions for security and business intelligence applications. The company is a global leader in intelligent video technology and is propelling the adoption of video analytics as an integral component of video management solutions. Aimetis products are based on innovative, open technologies that provide customers with a single platform for migrating from analog video to intelligent IP video solutions.

Aimetis Corp. is a Canadian-based company with distribution partners in more than 60 countries. More information is available on our website at www.aimetis.com.

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www.aimetis.com

Aimetis Symphony 6.13

6.13 Release Notes

Published 8/27/2014 3:22 PM EST

Disclaimers and Legal Information

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Document History

Date	Description
August 27, 2014	Release 6.13.1.2
August 20, 2014	Release 6.13.1.1
August 1, 2014	Release 6.13.1
June 25, 2014	Release 6.13.0.3
June 19, 2014	Release 6.13.0.2
June 13, 2014	Release 6.13.0.1
May 27, 2014	Release 6.13

Release 6.13.1.2

Fixed

Fixed	
AIR-23388	Following a Symphony upgrade, able to access historical video captured prior to the upgrade

Release 6.13.1.1

Fixed

Fixed	
AIR-23393	Client no longer locked for up to 30 seconds when exporting video from server with older software version

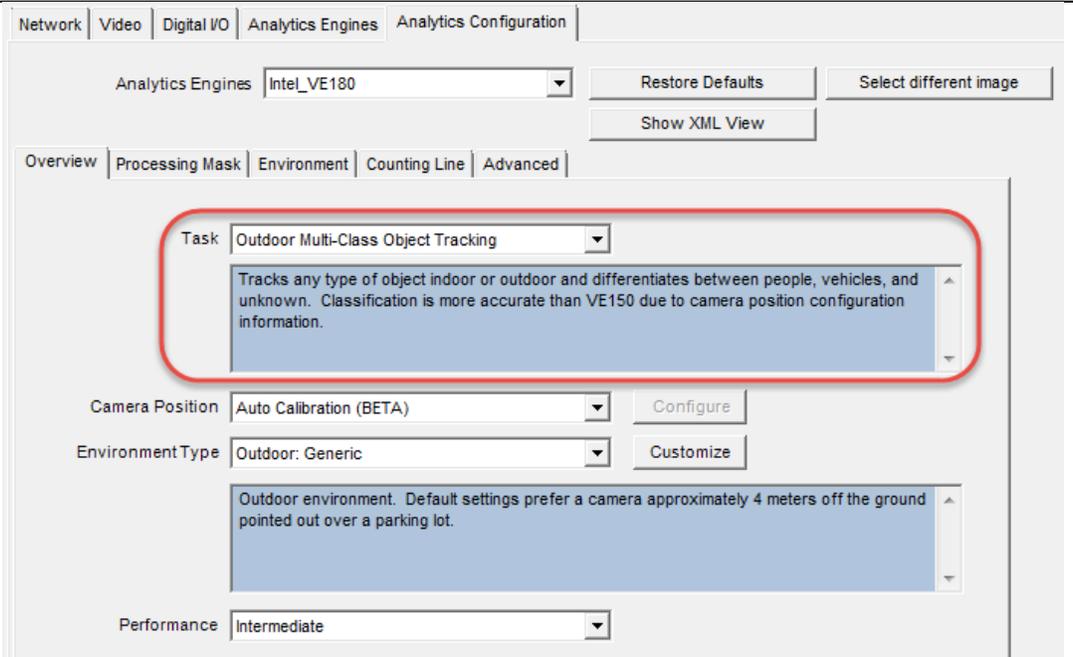
Release 6.13.1

Includes previously privately released 6.13.0.1, 6.13.0.2, and 6.13.0.3 patch updates.

New

New	
VIS-86	VE180 Outdoor Multi-Class Object Tracking implemented and features the following improvements: <ul style="list-style-type: none">• increased robustness to environmental conditions• better suppression of shadows• updated object overlap penalty to prevent tracking boxes within masked out regions• reduction of CPU usage

New



Network | Video | Digital IO | Analytics Engines | Analytics Configuration

Analytics Engines: Intel_VE180 [Restore Defaults] [Select different image]
[Show XML View]

Overview | Processing Mask | Environment | Counting Line | Advanced

Task: Outdoor Multi-Class Object Tracking
Tracks any type of object indoor or outdoor and differentiates between people, vehicles, and unknown. Classification is more accurate than VE150 due to camera position configuration information.

Camera Position: Auto Calibration (BETA) [Configure]

Environment Type: Outdoor: Generic [Customize]
Outdoor environment. Default settings prefer a camera approximately 4 meters off the ground pointed out over a parking lot.

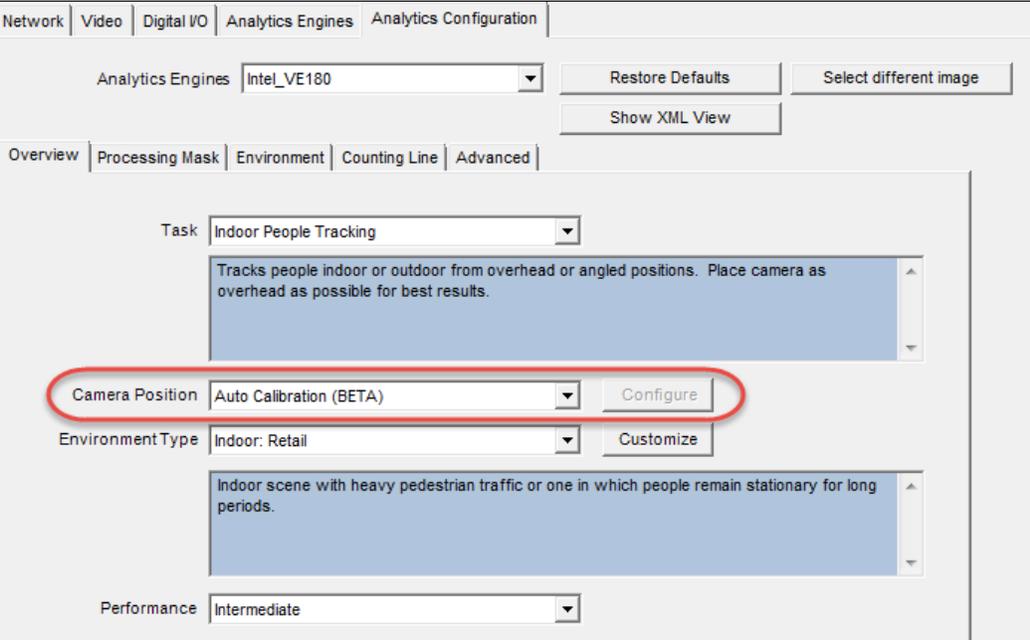
Performance: Intermediate

AIR-19295 Automatic calibration support added for perspective cameras (overhead or angled view)

AIR-20624 Automatic calibration added to VE180 analytics configuration for supported devices.

Automatic calibration determines the optimal camera configuration for scenes containing people. You can switch to manual calibration at any time, and the system retains the last best estimation of camera position detected.

Auto Calibration option available in **Server Configuration > Devices > Analytics Configuration > Overview > Camera Position**

New	
	
AIR-22945	<p>Clear alarms configures how Symphony Client clears alarms in the alarm log every 24 hours at midnight.</p> <p>On each server, edit <code>%appdata%\<ProductFolder>\acc.ini</code> and change the following parameter as needed:</p> <p>[Main] ClearAlarms = All</p> <p>Values include:</p> <ul style="list-style-type: none"> • All (default) – all alarm logs are cleared • None – alarm logs are not cleared • Marked – only alarm logs marked as acknowledged • Viewed – only alarm logs marked as viewed are cleared <p>Note: Alarms generated less than 24 hours in the past are never deleted regardless of how the Client is configured.</p>

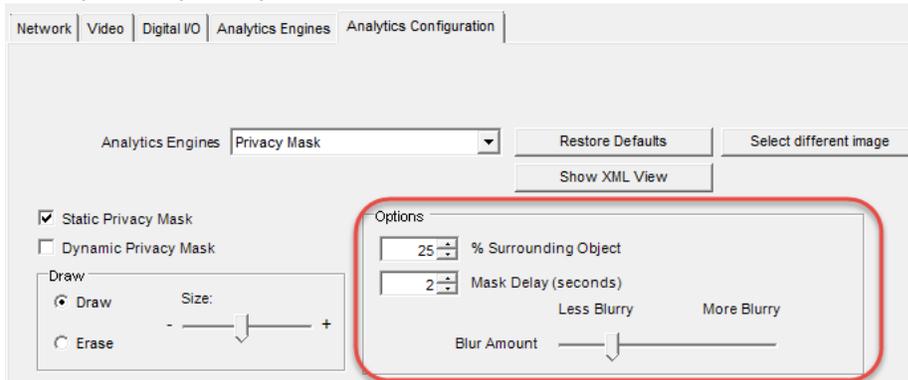
Improvement

Improvement	
AIR-20083	Support added for Windows 8.1 Enterprise Edition, 64-bit Operating System
AIR-22334	Arecont: Auto Discovery support added via Server Configuration > Discover Devices feature
AIR-22846	VE180 indoor tracking shadow suppression improvements implemented
AIR-22749	Privacy mask improvements implemented: <ul style="list-style-type: none"> • % Surrounding Object – the percentage of the area the privacy blur is applied

Improvement

to beyond the tracking box. Applies only to dynamic privacy masks.

- **Mask Delay (seconds)** – the number of seconds to remember the position of tracked objects and continue blurring their previous position. Applies only to dynamic privacy masks.
- **Blur Amount** – the amount of blur applied to the area. Applies to both static and dynamic privacy masks.



AIR-22901	VE180 Indoor People Tracking analytic configured for Overhead camera position by default
AIR-22993 AIR-23083	Client Notification bar correctly indicates which individual servers in a multiple server farm are down
AIR-22944	PTZ camera response time improvements implemented
AIR-23026	In Server Configuration > Storage , enabling the Limit the number of days video is stored option visibly disables the Default max storage days option in the interface
AIR-23031	New alarms implemented: <ul style="list-style-type: none"> • If the connection with the video system has been lost because the server is disabled or shuts down or the network connection is lost • When the video server has reconnected and is operational and/or the network connection is re-established • If the list of cameras (and PTZ presets) changes and the video server may need to update its cache (such as when camera is added, deleted, or renamed, or if a PTZ camera's presets are added, deleted, or renamed)
AIR-23041	PT091: Calculates object speed based on tracked foreground points, when available. If there are tracked keypoints in the region that don't correspond to background motion, the PT091 analytic uses that motion data to estimate the motion of the foreground object.

Fixed

Fixed	
AIR-18360	No longer displaying erroneous message after generating bug report log package
AIR-18762	IQeye: Live video and historical video playback working correctly
AIR-19038	Camera storage path modifications persist correctly and discarded changes are not saved
AIR-20895	Gallagher Access Control alarm popups working correctly
AIR-21424	When connected to more than one server, interface responsive after switching cameras
AIR-21736	Device decorations, including camera name and ID, display in the center of the live screen view
AIR-22036	Siemens SPC device alarms being received successfully
AIR-22276	Axiom RBH access control rule action correctly forcing associated cameras to record
AIR-22374	WebClient installations no longer displaying erroneous CAB errors
AIR-22426	Visible objects that do not overlap masked-in portions of the area by 10% or more are no longer being tracked
AIR-22433	You are prompted to select a tracking algorithm when enabling the VE101 analytic for a device
AIR-22436	Exporting thumbnails via Alarm Log working correctly
AIR-22441	Multiple login deny user permission working correctly
AIR-22456	Privacy masks are applied for rule and analytic configuration as well as video search results for users without the appropriate permission
AIR-22687	Map link placement improvements implemented
AIR-22689	Client responsiveness improvements implemented during device model refresh
AIR-22690	Static privacy mask control setting retained correctly
AIR-22692	Device connections including adding and removing cameras working correctly following a server IP address change
AIR-22723	Server/Client connectivity improvements implemented
AIR-22745	LPR: No longer generating bitmap of every image that generates an exception. Error images now written to the standard date-and-camera directory within the _images directory in the data folder.
AIR-22758	Historical video playback working correctly
AIR-22777	When playing historical video, purple circle indicates the correct Timeline position
AIR-22778	Email on alarm functionality now correctly including attachments
AIR-22811	When the camera is set to not record, and there is no historical video available when the user attempts to select an image for algorithm configuration, the system attempts to get an image from tracker instead of displaying a “no footage found” message
AIR-22827	Alarm popups working correctly across multi-server farms
AIR-22831	When a device is set to record on motion detected by PC but no analytics engine is selected, you are prompted to select a different recording mode for the device

Fixed	
AIR-22834	Privacy masks working correctly using the mobile client
AIR-22837	PTZ control panel functions working correctly
AIR-22847	Fisheye Dewarping: PTZ buttons working correctly in wall mount mode
AIR-22855	PTZ autotracking timeline indicator improvements implemented when the device is not configured to raise an alarm
AIR-22858	HTTP authentication added for auxiliary PTZ commands
AIR-22882	LPR: Multiple cameras simultaneously running LPR no longer displaying the error "License Plate Recognition – Hardware lock error" on the live view panels
AIR-22887	Client is no longer erroneously applying Privacy Masks when the server is older than 6.13
AIR-22888	<p>Analytics configuration is no longer freezing on load. Analytics configuration is no longer available initially when a device is added.</p> <p>You must successfully add a device, close the Server Configuration dialog, and reopen the dialog to access the Analytics Configuration tab options.</p>
AIR-22890	Video export email notification working correctly
AIR-22905	Line counting conversion working correctly without errors for non-English Operating System installations
AIR-22919	Video decoration font improvements implemented
AIR-23002	Phoenix hardware device inputs and outputs being detected correctly
AIR-23040	Server Configuration > Devices List > Server field supports server hostnames and IP addresses
AIR-23057	Alarm Log: Video panel working correctly in Advanced Mode when an alarm is selected
AIR-23071	Report distribution via email working correctly
AIR-23016	
AIR-23101	When creating a rule for the VE180 analytic, all three (3) classes of objects are selected by default, including: People, Vehicles, and Unknown
AIR-23122	Client now logs when the requested analysis FPS (frames per second) value is greater than the capture FPS

Release 6.13.0.3

(Not generally released)

Fixed

Fixed	
AIR-22884	Mobile Bridge requests for JPEG images no longer resulting in occasional decompression errors

Release 6.13.0.2

(Not generally released)

Fixed

Fixed	
AIR-22779	Vivotek: Edge storage video downloads working correctly following connectivity interruptions
AIR-22862	Axis: LPR detection and privacy mask stability improvements implemented for edge storage footage downloads
AIR-22897	Active Directory integration working correctly when upgrading while Setup Wizard is in offline mode
AIR-22900	Accessing the Web Client and a live camera video working correctly Note: Encoded Passwords that include equal signs (=) must be escaped as %3D. See AIR-21421 for parameter details.

Release 6.13.0.1

(Not generally released)

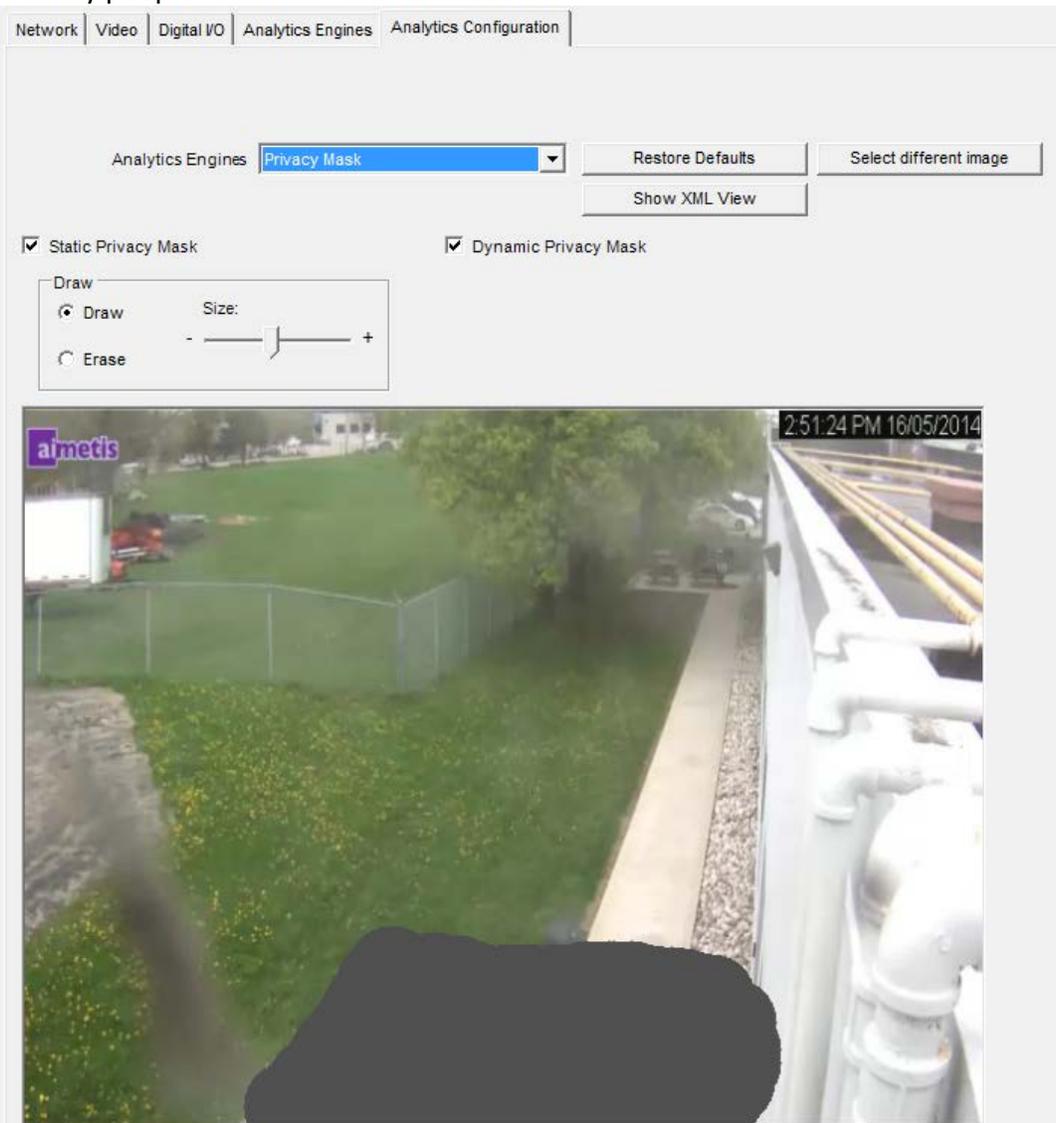
Fixed

Fixed	
AIR-22779	Vivotek: Edge storage video downloads working correctly following connectivity interruptions
AIR-22819	Vivotek: Automatic playback stream switching working correctly

Release 6.13

Includes previously privately released 6.12.4.x patch updates as of May 26, 2014.

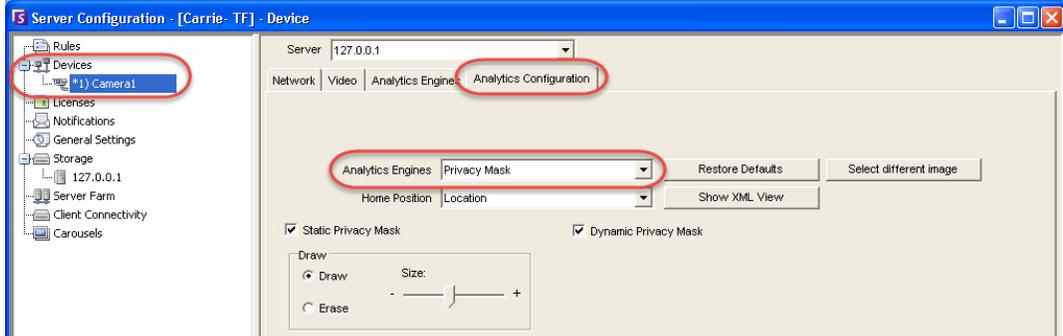
New

New	
AIR-20889	<p>Dynamic and Static Privacy Masks</p> <p>In Symphony analytics configuration, you can define dynamic and static privacy blur masks per device for cases where privacy is a concern. Privacy masks can be configured for all motion tracking video analytics in Symphony.</p> <p>When privacy masks are defined, operators can validate alarms but cannot identify people in live or historical video.</p> 

New

Configure Privacy Masks

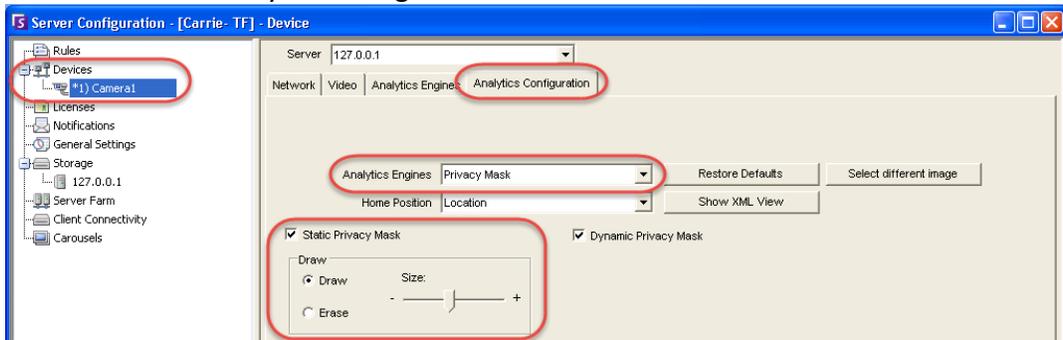
1. In the Symphony Client, within the **Server Configuration** dialog (**Server > Configuration**), select a device whose analytic you want to configure with a privacy mask.
2. Select the **Analytics Configuration** tab.
3. Select **Privacy Mask** from the **Analytics Engines** drop-down list.



Define a Static Privacy Mask

Static privacy masks blur the area of a drawn region for static areas such as entrance ways.

1. Enable the **Static Privacy Mask** checkbox.
2. Using the displayed image from the video, define the area in gray (the privacy mask) where objects in that defined area should be blurred.
 - Select the **Erase** option to erase the grey privacy mask.
 - Select the **Draw** option to draw the grey privacy mask.
 - The **Size** slider adjusts the pen thickness.
3. Click **OK** to save your changes.

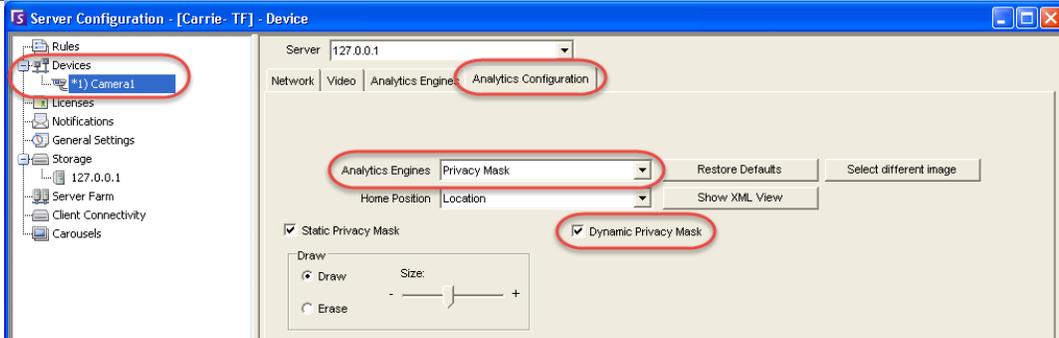


Define a Dynamic Privacy Mask

Dynamic privacy masks dynamically blur motion tracking boxes for moving objects such as people walking.

1. Enable the **Dynamic Privacy Mask** checkbox.
2. Click **OK** to save your changes.

New



Privacy masks are transmitted with decorations in live and historical video streams with every key frame (or every eighth frame for MJPG). They are also saved to disk.

Note: Privacy masks are permission-driven. Users denied the View Private Video permission will always see the privacy mask applied. System administrators granted the permission will never see applied privacy masks.

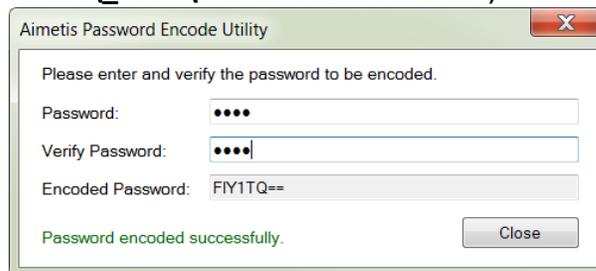
AIR-21421

Access the Web Client with username, password, and a live video of a specific camera ID using URL variables as follows:

[http://\[SERVERNAME\]:50000/Default.aspx?U=jsmith&P=FIY1TQ==&C=7&R=1](http://[SERVERNAME]:50000/Default.aspx?U=jsmith&P=FIY1TQ==&C=7&R=1)

where:

- **[SERVERNAME]** is the Microsoft® Windows® Hostname or the IP address of the Aimetis Symphony Server
- **U=** is the **User Name**
- **P=** is the **Encoded Password** (Generate the encoded password using the **Aimetis Password Encode Utility** located in **C:\Aimetis Symphony Install folder_tools\PasswordEncoder.exe**)



- **C=** is the **Camera ID** to load
- **R=** prevents the server from load balancing the request by redirecting the request to another server. Not intended for production deployments.

Note: Ensure that each variable is separated by the ampersand symbol (&).

New	
AIR-22263	Auxiliary command support added for applicable PTZ cameras and video server devices See https://www.aimetis.com/Xnet/KB/KBArticleView.aspx?ID=10293

Improvements

Improvements	
AIR-18765	LPR – Can set how long to keep a license plate visible after a car has left the scene in seconds using a new Plate Display Time field
AIR-20786	South American LPR module support improved
AIR-21158	PTZ Lock Timeout is ignored for PTZ calibration
AIR-21369	Export Video right-click option added to the Timeline and available when a Start Time and End Time is marked.
AIR-21415	Arab LPR module support improved
AIR-21459	Rule status correctly toggled via ADAM module
AIR-21539	Refactored PTZ movement control logic and camera command systems for improved stability and performance
AIR-21544	SDK WebServiceConsole GUID argument support added
AIR-21738	SNMP calculates footage size when redundant storage used
AIR-21778	InfoService logs now include the location of %APPDATA% for system processes
AIR-21831	LPR plate size on-screen draw options added and Analysis Heuristical Sensitivity option removed
AIR-21874	Retrieving edge storage JPEG and historical video for multi-channel AXIS video encoders working correctly
AIR-21935	Mexico LPR module support improved
AIR-21936	Latin LPR module support improved
AIR-21937	Taiwan LPR module support improved
AIR-21938	USA/Canada LPR module support improved
AIR-22005	PT091: Zooming can be suppressed during auto tracking
AIR-22011	Moroccan LPR module support improved
AIR-22187	PT091 improvements implemented to support PTZ autotracking performance with thermal cameras
AIR-22190, AIR-22197	The Auto track object and Follow object to other cameras auto-tracking commands have been removed from the live video feed right-click menu
AIR-22245	Embedded CHM help link replaced with centralized webhelp link
AIR-22324	LPR: Opacity of the plate rectangles set to 75% to ensure plate characters are visible
AIR-22333	VE180 shadow suppression improvements implemented
AIR-22406	LPR: Default minimum and maximum value adjustments applied for the first instance of Slant and Slope
AIR-22675	Microsoft® Windows Server® 2012 R2 support added

Fixed

Fixed	
AIR-15738	Camera audio plays via second stream correctly for live video, exports, and historical video playback
AIR-19058	ALPR working successfully in cases where motion detection chaining is disabled
AIR-19186	PTZ panoramic mask generation working correctly
AIR-20748	Occasional LPR crashes resolved
AIR-20861	Alarm emails no longer missing attachments on systems configured for a non-North American date/time format
AIR-21007	Client no longer logging application errors during videowall panel switching
AIR-21108	Users can access historical data successfully
AIR-21122	Images are cleaned at the correct time
AIR-21155	Rule actions working correctly with Access Control devices in Symphony
AIR-21157	Unlicensed systems display an error message when importing cameras using a CSV file: Camera {0} could not be added. Please ensure all servers are up and adequately licensed.
AIR-21233	AXIS cameras recovering successfully following disconnections
AIR-21234	Adding a second server to a server farm updates licenses correctly
AIR-21307	Switch view on alarm working correctly
AIR-21308	Web Client: Displaying Profile Switch messages correctly
AIR-21309	The View Blank Camera option working correctly when viewing JPEGs
AIR-21312	Symphony no longer exhibiting issues when camera setup does not match the actual camera configuration
AIR-21313	SDK VideoWallClient sample supports video wall hostnames and IP addresses
AIR-21330	Advantech Adam-6060 digital IO: Erroneous message no longer displays when trying to disconnect
AIR-21342	VE180 Outdoor Mode no longer erroneously showing unknown objects when unknown object detection is disabled; classification checkbox options for the outdoors interface have also been removed
AIR-21394	When supported cameras are configured for Corridor Mode, changing the frame rate for the camera correctly adjusts on reconnect
AIR-21414	Adding a server to an existing server farm working correctly
AIR-21422, AIR-21456	PTZ camera unlock and home commands are working correctly
AIR-21473	Discover Devices ONVIF discovery working correctly
AIR-21530	Footage maintained correctly to prevent recording gaps
AIR-21617	Multiple email addresses separated by commas are working correctly in the Advanced Search panel
AIR-21636	Following storage restoration, correct time values recorded
AIR-21640	Axiom RBH Access Control working correctly
AIR-21646	If an unavailable storage path is detected, the system does not try to write to the unavailable disk

Fixed	
AIR-21719	Import Cameras Template XLS file > Valid Entries tab headers are formatted consistently
AIR-21744	PTZ Calibration camera right-click option hidden for non-Enterprise licenses
AIR-21812	Server merge successful when source farm contains more than eight (8) maps
AIR-21822	Alarm times correct and in sync with alarm images
AIR-21861	Switch User correctly updating stored credentials when the Client is configured to prompt users for credentials at startup
AIR-21876	Redundant storage works better in configurations with slower media
AIR-21897	Live video camera panel views working correctly
AIR-21900	License Configuration verification step no longer failing in Setup Wizard due to Xnet connection timeout
AIR-21962	Large scale solution improvements implemented
AIR-22007	PT091: Alarm no longer erroneously detected throughout FLIR PTZ camera autotracking
AIR-22024	PTZ lock decoration no longer erroneously showing "ptz locked [] P[0]" when the camera is not locked
AIR-22026	Switching PTZ locations no longer results in an alarm click jumping to an incorrect point in the timeline
AIR-22088	VE180 Restore Default working correctly
AIR-22100	Johnson Controls P2000: Alarms working correctly in a multiple server farm environment
AIR-22185	Searching for alarms working correctly
AIR-22192	Erroneous empty Show Details button no longer available following a Client error
AIR-22194	Clear alarms at midnight working correctly
AIR-22199	CoreVision configuration parser correctly supports multiple masks by validating mask name during mask load
AIR-22204	Video export End Time accuracy improved
AIR-22216	Resizing a window with dewarped JPEG resizes correctly
AIR-22217	Removing PTZ home locations working correctly when the VE180 analytics engine enabled
AIR-22226	Server able to access historical video from a network drive
AIR-22234	Servers no longer erroneously removed from the Server List as already registered
AIR-22237	Current Timeline position (purple circle) no longer moving erroneously following JPEG retrieval from edge storage
AIR-22239	VE130 search for alarms only no longer results in "No footage Found " error
AIR-22242	Unlicensed Axis camera application error no longer being erroneously logged
AIR-22359	Axis: Device discovery working correctly via ONVIF
AIR-22360	Setup Wizard delay increase to prevent slow internet connections to Xnet timeouts
AIR-22370	Remote system backups working correctly when the server farm is on a separate network from the client

Fixed	
AIR-22461	Axis fisheye camera floating multi-view switches from fisheye to dewarp view correctly
AIR-22548	Web Client: Erroneous “Graph is not connected” message no longer displays after clicking Live View button
AIR-22549	Alarms inserted through SDK correctly displayed on Symphony Web Client Alarm Log
AIR-22552	Manual Configuration Editor interface OK button enabled when a cell value is updated
AIR-22557	VE180: When creating a new rule, interface refresh issues resolved when clicking Refresh Image button on the Event tab

Cisco Catalyst 2960-S and 2960 Series Switches with LAN Base Software

Product Overview

The Cisco® Catalyst® 2960-S and 2960 Series Switches are the leading Layer 2 edge, providing improved ease of use, highly secure business operations, improved sustainability, and a borderless network experience. The Catalyst 2960-S Series Switches include new FlexStack switch stacking capability with 1 and 10 Gigabit connectivity, and Power over Ethernet Plus (PoE+) with the Cisco Catalyst 2960 Series Switches offering Fast Ethernet access connectivity and PoE capabilities. The Cisco Catalyst 2960-S and 2960 Series are fixed-configuration access switches designed for enterprise, midmarket, and branch office networks to provide lower total cost of ownership. The Cisco Catalyst 2960-S is shown in Figure 1, and the Cisco Catalyst 2960 Series Switches are shown in Figure 2.

What's new for the Cisco Catalyst 2960-S Series Switches with LAN Base Software:

- 10 and 1 Gigabit Ethernet uplink flexibility with Small Form-Factor Pluggable Plus (SFP+), providing business continuity and fast transition to 10 Gigabit Ethernet
- 24 or 48 ports of Gigabit Ethernet desktop connectivity
- Cisco FlexStack stacking module with 20 Gbps of throughput, allowing ease of operation with single configuration and simplified switch upgrade
- PoE+ with up to 30W per port that allows you to support the latest PoE+ capable devices
- Power supply options, with 740W or 370W fixed power supplies for PoE+ switches are available
- USB storage for file backup, distribution, and simplified operations
- A wide range of software features to provide ease of operation, highly secure business operations, sustainability, and a borderless network experience
- Limited lifetime hardware warranty, including next-business-day replacement with 90-day service and support

The Cisco Catalyst 2960 Series Switches with LAN Base Software offer the following:

- Dual-purpose uplinks for Gigabit Ethernet uplink flexibility, allowing use of either a copper or fiber uplink; each dual-purpose uplink port has one 10/100/1000 Ethernet port and one SFP-based Gigabit Ethernet port, with one port active at a time
- 24 or 48 ports of Fast Ethernet desktop connectivity
- PoE configurations with up to 15.4W per port
- A wide range of software features to provide ease of operation, highly secure business operations, sustainability, and a borderless networking experience
- Limited lifetime hardware warranty

Figure 1. Cisco Catalyst 2960-S Series Switches



Figure 2. Cisco Catalyst 2960 Series Switches



Switch Configurations

Table 1 shows the configuration information for the Catalyst 2960-S Series Switches with LAN Base Software, and Table 2 shows the configuration information for the Catalyst 2960 Series Switches with LAN Base Software.

Table 1. Configurations of Cisco Catalyst 2960-S Series Switches with LAN Base Software

Cisco Catalyst 2960-S Switch Model	Description	Uplinks	Available PoE Power
10 Gigabit Uplinks with 10/100/1000 Ethernet Connectivity			
Cisco Catalyst 2960S-48FPD-L	48 Ethernet 10/100/1000 PoE+ ports	2 Ten Gigabit Ethernet SFP+ or 2 One Gigabit Ethernet SFP ports	740W
Cisco Catalyst 2960S-48LPD-L	48 Ethernet 10/100/1000 PoE+ ports	2 Ten Gigabit Ethernet SFP+ or 2 One Gigabit Ethernet SFP ports	370W
Cisco Catalyst 2960S-24PD-L	24 Ethernet 10/100/1000 PoE+ ports	2 Ten Gigabit Ethernet SFP+ or 2 One Gigabit Ethernet SFP ports	370W
Cisco Catalyst 2960S-48TD-L	48 Ethernet 10/100/1000 ports	2 Ten Gigabit Ethernet SFP+ or 2 One Gigabit Ethernet SFP ports	-
Cisco Catalyst 2960S-24TD-L	24 Ethernet 10/100/1000 ports	2 Ten Gigabit Ethernet SFP+ or 2 One Gigabit Ethernet SFP ports	-
1 Gigabit Uplinks with 10/100/100 Ethernet Connectivity			
Cisco Catalyst 2960S-48FPS-L	48 Ethernet 10/100/1000 PoE+ ports	4 One Gigabit Ethernet SFP ports	740W
Cisco Catalyst 2960S-48LPS-L	48 Ethernet 10/100/1000 PoE+ ports	4 One Gigabit Ethernet SFP ports	370W
Cisco Catalyst 2960S-24PS-L	24 Ethernet 10/100/1000 PoE+ ports	4 One Gigabit Ethernet SFP ports	370W
Cisco Catalyst 2960S-48TS-L	48 Ethernet 10/100/1000 ports	4 One Gigabit Ethernet SFP ports	-
Cisco Catalyst 2960S-24TS-L	24 Ethernet 10/100/1000 ports	4 One Gigabit Ethernet SFP ports	-
Cisco Catalyst 2960S-STACK	Hot-swappable FlexStack stacking module	-	-
All models available with optional Cisco FlexStack stacking module. No DC power supplies are available.			

Table 2. Configurations of Cisco Catalyst 2960 Series Switches with LAN Base Software

Cisco Catalyst 2960 Switch Model	Description	Uplinks	Available PoE Power
1 Gigabit Uplinks with 10/100 Ethernet Connectivity			
Cisco Catalyst 2960-48PST-L	48 Ethernet 10/100 PoE ports	2 One Gigabit Ethernet SFP ports and 2 fixed Ethernet 10/100/1000 ports	370W
Cisco Catalyst 2960-24PC-L	24 Ethernet 10/100 PoE ports	2 dual-purpose ports (10/100/1000 or SFP)	370W
Cisco Catalyst 2960-24LT-L	24 Ethernet 10/100 ports	2 Ethernet 10/100/1000 ports	123W
Cisco Catalyst 2960-24TC-L	24 Ethernet 10/100 ports	2 dual-purpose ports	-
Cisco Catalyst 2960-48TC-L	48 Ethernet 10/100 ports	2 dual-purpose ports (10/100/1000 or SFP)	-
Cisco Catalyst 2960-24TT-L	24 Ethernet 10/100 ports	2 Ethernet 10/100/1000 ports	-
Cisco Catalyst 2960-48TT-L	48 Ethernet 10/100 ports	2 Ethernet 10/100/1000 ports	-
1 Gigabit Uplinks with 10/100/1000 Ethernet Connectivity			
Cisco Catalyst 2960G-24TC-L	24 Ethernet 10/100/1000 ports, 4 of which are dual-purpose (10/100/1000 or SFP)	4 dual-purpose ports (10/100/1000 or SFP)	
Cisco Catalyst 2960G-48TC-L	48 Ethernet 10/100/1000 ports, 4 of which are dual-purpose (10/100/1000 or SFP)	4 dual-purpose ports (10/100/1000 or SFP)	
Compact Switches			
Cisco Catalyst 2960-8TC-L	8 Ethernet 10/100 ports; compact size with no fan	1 dual-purpose port (10/100/1000 or SFP)	
Cisco Catalyst 2960PD-8TT-L	8 Ethernet 10/100 ports; compact size with no fan	1 10/100/1000 PoE input port	
Cisco Catalyst 2960G-8TC-L	7 Ethernet 10/100/1000 ports; compact size with no fan	1 dual-purpose port (10/100/1000 or SFP)	

Cisco FlexStack Stacking

Cisco FlexStack stacking with a hot-swappable module and IOS software provides true stacking, all switches in a stack act as a single switch unit. The Cisco FlexStack provides a unified data plane, unified configuration, and single IP address management for a group of switches. The advantages of true stacking are lower total cost of ownership through simplified management and higher availability. Cisco FlexStack supports cross-stack features including Etherchannel, SPAN and FlexLink technology. A stack module can be added to any Catalyst 2960-S switch with LAN Base software to quickly upgrade the switch to make it stack capable, and the switch added to the stack will upgrade to the correct Cisco IOS® Software version and transparently become a stack member. Figure 3 shows the FlexStack stacking module for the Catalyst 2960-S.

Figure 3. Cisco FlexStack Module and Switches



Power over Ethernet Plus PoE+

In addition to PoE 802.3af, the Cisco Catalyst 2960-S Series Switches support PoE+ (IEEE 802.3at standard), which provides up to 30W of power per port. The Cisco Catalyst 2960-S and 2960 Series Switches can provide a lower total cost of ownership for deployments that incorporate Cisco IP phones, Cisco Aironet® wireless LAN (WLAN) access points, or any IEEE 802.3af-compliant end device. PoE removes the need for wall power to each PoE-enabled device and eliminates the cost for additional electrical cabling and circuits that would otherwise be necessary in IP phone and WLAN deployments. Table 3 shows the power supply combinations required for different PoE needs.

Table 3. Switch PoE and PoE+ Power Capacity

Switch Model	Maximum Number of PoE+ (IEEE 802.3at) Ports*	Maximum Number of PoE (IEEE 802.3af) Ports	Available PoE Power
10 Gigabit Uplinks with 10/100/1000 Ethernet Connectivity			
Cisco Catalyst 2960S-48FPD-L	24 ports up to 30W	48 ports up to 15.4W	740W
Cisco Catalyst 2960S-48LPD-L	12 ports up to 30W	24 ports up to 15.4W 48 ports up to 7.7W	370W
Cisco Catalyst 2960S-24PD-L	12 ports up to 30W	24 ports up to 15.4W	370W
1 Gigabit Uplinks with 10/100/1000 Ethernet Connectivity			
Cisco Catalyst 2960S-48FPS-L	24 ports up to 30W	48 ports up to 15.4W	740W
Cisco Catalyst 2960S-48LPS-L	12 ports up to 30W	24 ports up to 15.4W 48 ports up to 7.7W	370W
Cisco Catalyst 2960S-24PS-L	12 ports up to 30W	24 ports up to 15.4W	370W
Cisco Catalyst 2960-48PST-L	N/A	24 ports up to 15.4W	370W
Cisco Catalyst 2960-24PC-L	N/A	24 ports up to 15.4W	370W
Cisco Catalyst 2960-24LT-L	N/A	8 ports up to 15.4W	123W

* Intelligent power management allows flexible power allocation across all ports.

Cisco Catalyst 2960-S and 2960 Series Switches Enable Cisco Borderless Network

Borderless Networks, a Cisco architecture, deliver the new workspace experience, connecting anyone, anywhere, using any device, to any resource securely, reliably, and transparently. Cisco's Borderless Networks architecture addresses primary IT and business challenges to help create a truly borderless experience by bringing interactions closer to the employee and customer.

Borderless experience is only possible with intelligent network elements designed and architected to meet the needs of a global workspace. Cisco Network Access is a primary component of this architecture, enabling various borderless network services such as mobility, security, sustainability, EnergyWise and ease of operations for increased productivity and operational efficiency. When network access is intelligent, it knows the identity of the user, as well as where the user is on the network. It knows what is connecting to the network, to automatically provision the network for QoS and delivery. It becomes services-aware to optimize user experience. Only with intelligent access network, your enterprise can go borderless securely and transparently. Your business can save energy, simplify operations with better business efficiency, and have an optimized total cost of ownership.

Cisco Network Access for Borderless solution focuses on the following primary areas:

- Sustainability
- EnergyWise
- Ease of operations
- Borderless security
- Borderless experience

Sustainability

Cisco Catalyst switching solutions enable greener practices through measurable power efficiency, integrated services, and continuous innovations such as Cisco EnergyWise, an enterprise wide solution that monitors and conserves energy with customized policies. Together, Cisco EnergyWise technology and Cisco Catalyst switches reduce greenhouse gas (GhG) emissions and increase energy cost savings and sustainable business behavior. Sustainability features in the Cisco Catalyst 2960-S and 2960 Series Switches include the following features sets:

- Cisco EnergyWise technology
- Efficient switch operation
- Intelligent power management

Cisco EnergyWise Technology

Cisco EnergyWise is an innovative architecture, added to fixed configuration switches, promoting companywide sustainability by reducing energy consumption across an entire corporate infrastructure and affecting more than 50 percent of global greenhouse gas emissions created by worldwide building infrastructure, a much greater effect than the 2 percent generated by the IT industry. Cisco EnergyWise enables companies to measure the power consumption of network infrastructure and network-attached devices and manage power consumption with specific policies, reducing power consumption to realize increased cost savings, potentially affecting any powered device.

EnergyWise encompasses a highly intelligent network-based approach to communicate messages that measure and control energy between network devices and endpoints. The network discovers Cisco EnergyWise-manageable devices, monitors their power consumption, and takes action based on business rules to reduce power consumption. EnergyWise uses a unique domain-naming system to query and summarize information from large sets of devices, making it simpler than traditional network management capabilities. Cisco EnergyWise's management interfaces allow facilities and network management applications to communicate with endpoints and each other using the network as a unifying fabric. The management interface uses standard SNMP or TCP to integrate Cisco and third-party management systems.

Efficient Switch Operation

Cisco Catalyst 2960-S and 2960 Series Switches, designed and engineered by Cisco, provide optimum power savings, low power operations for industry best-in-class power management, and power consumption capabilities. The Catalyst 2960-S ports are capable of reduced power modes so that ports not in use can move into a lower power utilization state.

Intelligent Power over Ethernet Management

The Cisco Catalyst 2960-S PoE models support the latest PoE+ devices including Cisco IP phones and Cisco Aironet WLAN access points providing up to 30W of power per port, as well as any IEEE 802.3af-compliant end device.

- **Per port power consumption** command allows customers to specify maximum power setting on an individual port
- **Per port PoE power sensing** measures actual power being drawn, enabling more intelligent control of powered devices
- **Cisco Discovery Protocol Version 2** allows switches to negotiate a more granular power setting when connecting to a Cisco powered device such as IP phones or access points than what is provided by IEEE classification
- **The PoE MIB** provides proactive visibility into power usage and allows customers to set different power-level thresholds

Ease of Operations

The Cisco Catalyst 2960-S and 2960 Series Switches help reduce the operating costs through:

- Cisco Catalyst Smart Operations
- Easy to use deployment and control features
- Advanced, intelligent network management tools

Cisco Catalyst Smart Operations

Cisco Catalyst Smart Operations is a comprehensive set of capabilities that simplify LAN deployment, configuration, and troubleshooting. Cisco Catalyst Smart Operations enable zero touch installation and replacement of switches, fast upgrade, as well as ease of troubleshooting with reduced operational cost.

Cisco Catalyst Smart Operations is a set of features that includes Smart Install, Auto Smartports, Smart Configuration, and Smart Troubleshooting to enhance operational excellence:

- **Cisco Smart Install** is a transparent plug-and-play technology to configure the Cisco IOS Software image and switch configuration without user intervention. Smart Install utilizes dynamic IP address allocation and the assistance of other switches to facilitate installation providing transparent network plug and play.
- **Cisco Auto Smartports** provide automatic configuration as devices connect to the switch port, allowing auto detection and plug and play of the device onto the network.
- **Cisco Smart Configuration** provides a single point of management for a group of switches and in addition adds the ability archive and backup configuration files to a file server or switch allowing seamless zero touch switch replacement.
- **Cisco Smart Troubleshooting** is an extensive array of debug diagnostic commands and system health checks within the switch, including Generic Online Diagnostics (GOLD) and Onboard Failure Logging (OBFL).

Easy to Use Deployment and Control Features

- **Automatic QoS (AutoQoS)** simplifies QoS configuration in voice over IP (VoIP) networks by issuing interface and global switch commands to detect Cisco IP phones, classify traffic, and help enable egress queue configuration.
- **Stacking Master configuration management** and Cisco FlexStack stacking helps ensure that all switches are automatically upgraded when the master switch receives a new software version. Automatic software version checking and updating help ensure that all stack members have the same software version.
- **Dynamic Host Configuration Protocol (DHCP)** autoconfiguration of multiple switches through a boot server eases switch deployment.
- **Auto-negotiation** on all ports automatically selects half- or full-duplex transmission mode to optimize bandwidth.
- **Dynamic Trunking Protocol (DTP)** facilitates dynamic trunk configuration across all switch ports.
- **Port Aggregation Protocol (PAgP)** automates the creation of Cisco Fast EtherChannel[®] groups or Gigabit EtherChannel groups to link to another switch, router, or server.
- **Link Aggregation Control Protocol (LACP)** allows the creation of Ethernet channeling with devices that conform to IEEE 802.3ad. This feature is similar to Cisco EtherChannel technology and PAgP.
- **Automatic media-dependent interface crossover (MDIX)** automatically adjusts transmit and receive pairs if an incorrect cable type (crossover or straight-through) is installed.
- **Unidirectional Link Detection Protocol (UDLD)** and Aggressive UDLD allow unidirectional links caused by incorrect fiber-optic wiring or port faults to be detected and disabled on fiber-optic interfaces.
- **Switching Database Manager (SDM)** templates for access, routing, and VLAN deployment allow the administrator to easily maximize memory allocation to the desired features based on deployment-specific requirements.
- **Local Proxy Address Resolution Protocol (ARP)** works in conjunction with Private VLAN Edge to minimize broadcasts and maximize available bandwidth.
- **Internet Group Management Protocol (IGMP)** Snooping for IPv4 and IPv6 MLD v1 and v2 Snooping provide fast client joins and leaves of multicast streams and limit bandwidth-intensive video traffic to only the requestors.
- **Multicast VLAN Registration (MVR)** continuously sends multicast streams in a multicast VLAN while isolating the streams from subscriber VLANs for bandwidth and security reasons.
- **Per-port broadcast, multicast, and unicast storm control** prevents faulty end stations from degrading overall systems performance.
- **Voice VLAN** simplifies telephony installations by keeping voice traffic on a separate VLAN for easier administration and troubleshooting.
- **Cisco VLAN Trunking Protocol (VTP)** supports dynamic VLANs and dynamic trunk configuration across all switches.
- **Remote Switch Port Analyzer (RSPAN)** allows administrators to remotely monitor ports in a Layer 2 switch network from any other switch in the same network.
- For enhanced traffic management, monitoring, and analysis, the Embedded **Remote Monitoring (RMON)** software agent supports four RMON groups (history, statistics, alarms, and events).

- **Layer 2 traceroute** eases troubleshooting by identifying the physical path that a packet takes from source to destination.
- **Trivial File Transfer Protocol (TFTP)** reduces the cost of administering software upgrades by downloading from a centralized location.
- **Network Timing Protocol (NTP)** provides an accurate and consistent timestamp to all intranet switches.

Advanced, Intelligent Network Management Tools

The Cisco Catalyst 2960-S and 2960 Series Switches offer both a superior CLI for detailed configuration and Cisco Network Assistant software, a PC-based tool for quick configuration based on preset templates. In addition, CiscoWorks LAN Management Solution (LMS) supports the Cisco Catalyst 2960-S and 2960 Series Switches for networkwide management.

Cisco Network Assistant

A PC-based network management application designed for small and medium-sized business (SMB) networks with up to 250 users, Cisco Network Assistant offers centralized network management and configuration capabilities. Cisco Network Assistant uses Cisco Smartports technology to simplify both initial deployment and ongoing maintenance. This application also features an intuitive GUI where users can easily apply common services across Cisco switches, routers, and access points, such as:

- Configuration management
- Troubleshooting advice
- Inventory reports
- Event notification
- Network security settings
- Password synchronization
- Drag-and-drop Cisco IOS Software upgrades
- Secure wireless

For detailed information about Cisco Network Assistant, visit <http://www.cisco.com/go/cna>.

CiscoWorks LAN Management Solution

CiscoWorks LAN Management Solution (LMS) is a comprehensive network lifecycle management solution. It provides an extensive library of easy-to-use features to automate the initial and day-to-day management of your Cisco network infrastructure. CiscoWorks LMS uniquely uses Cisco hardware and software platform knowledge and operational experience into a powerful set of workflow-driven configuration, monitoring, troubleshooting, reporting, and administrative tools. Including:

- Support for new Cisco hardware platforms the day they ship
- Support for new technologies and services from initial deployment to day-to-day administration and management, such as EnergyWise, Identity, Cisco Auto Smartports, Cisco Smart Install, and much more
- Configuration management tools built from Cisco experience and Cisco Validated Design recommendations
- Monitoring and troubleshooting capabilities that incorporates Cisco hardware best practices and diagnostics features
- Automation in managing hardware inventories, security vulnerabilities (PSIRTS) and platform end-of-life and support cycles

For detailed information about CiscoWorks LMS, go to <http://www.cisco.com/en/US/products/sw/cscowork/ps2425/index.html>.

Borderless Security

The Cisco Catalyst 2960-S and 2960 Series Switches provide superior Layer 2 threat defense capabilities for mitigating man-in-the-middle attacks (such as MAC, IP, and ARP spoofing). TrustSec, a primary element of Borderless Security Architecture, helps enterprise customers secure their networks, data and resources with policy-based access control, identity and role-aware networking, pervasive integrity, and confidentiality. The borderless security is enabled by the following feature sets in the Cisco Catalyst 2960-S and 2960 Series Switches:

- Threat defense
- Cisco TrustSec
- Other advanced security features

Threat Defense

Cisco Integrated Security Features is an industry-leading solution available on Cisco Catalyst Switches that proactively protects your critical network infrastructure. Delivering powerful, easy-to-use tools to effectively prevent the most common and potentially damaging Layer 2 security threats, Cisco Integrated Security Features provides robust security throughout the network. Cisco Integrated Security Features include Port Security, DHCP Snooping, Dynamic ARP Inspection, and IP Source guard.

- **Port Security** secures the access to an access or trunk port based on MAC address. It limits the number of learned MAC addresses to deny MAC address flooding.
- **DHCP Snooping** prevents malicious users from spoofing a DHCP server and sending out bogus addresses. This feature is used by other primary security features to prevent a number of other attacks such as ARP poisoning.
- **Dynamic ARP Inspection (DAI)** helps ensure user integrity by preventing malicious users from exploiting the insecure nature of the ARP protocol.
- **IP source guard** prevents a malicious user from spoofing or taking over another user's IP address by creating a binding table between the client's IP and MAC address, port, and VLAN.

Cisco TrustSec

TrustSec secures access to the network, enforces security policies, and delivers standard based security solutions such as 802.1X enabling secure collaboration and policy compliance. TrustSec capabilities reflect Cisco thought leadership, innovations, and commitment to customer success. These new capabilities include:

- **Flexible authentication** that supports multiple authentication mechanisms including 802.1X, MAC Authentication Bypass and web authentication using a single, consistent configuration.
- **Open mode** that creates a user friendly environment for 802.1X operations.
- **Integration of device profiling technology and guest access** handling with Cisco switching to significantly improve security while reducing deployment and operational challenges.
- **RADIUS Change of Authorization and downloadable calls** for comprehensive policy management capabilities.

- **802.1X Supplicant with Network Edge Access Transport (NEAT)** enables extended secure access where compact switches in the conference rooms have the same level of security as switches inside the locked wiring closet.

Other Advanced Security Features

Other Advanced Security features include but are not limited to:

- **Private VLAN Edge** provides security and isolation between switch ports, which helps ensure that users cannot snoop on other users' traffic.
- **Multidomain Authentication** allows an IP phone and a PC to authenticate on the same switch port while placing them on appropriate voice and data VLAN.
- **Port-based ACLs** for Layer 2 interfaces allow security policies to be applied on individual switch ports.
- **Secure Shell (SSH) Protocol, Kerberos, and Simple Network Management Protocol Version 3 (SNMPv3)** provide network security by encrypting administrator traffic during Telnet and SNMP sessions. SSH Protocol, Kerberos, and the cryptographic version of SNMPv3 require a special cryptographic software image because of U.S. export restrictions.
- Bidirectional data support on the **Switched Port Analyzer (SPAN)** port allows Cisco Intrusion Detection System (IDS) to take action when an intruder is detected.
- **TACACS+ and RADIUS authentication** facilitates centralized control of the switch and restricts unauthorized users from altering the configuration.
- **MAC Address Notification** allows administrators to be notified of users added to or removed from the network.
- **Multilevel security on console access** prevents unauthorized users from altering the switch configuration.
- **Bridge protocol data unit (BPDU) Guard** shuts down Spanning Tree PortFast-enabled interfaces when BPDUs are received to avoid accidental topology loops.
- **Spanning Tree Root Guard (STRG)** prevents edge devices not in the network administrator's control from becoming Spanning Tree Protocol root nodes.
- **IGMP filtering** provides multicast authentication by filtering out nonsubscribers and limits the number of concurrent multicast streams available per port.
- **Dynamic VLAN assignment** is supported through implementation of VLAN Membership Policy Server client capability to provide flexibility in assigning ports to VLANs. Dynamic VLAN facilitates the fast assignment of IP addresses.

Borderless Experience

Borderless network enables enterprise mobility and business-grade video services. Industry's first unified network (wired and wireless) location services enable tracking of mobile assets and the users of those assets for both wired and wireless devices. The true borderless experience is enabled by the following feature sets in the Cisco Catalyst 2960-S and 2960 Series Switches:

- High availability and layer 2 networking
- QoS
- Location awareness and mobility

High Availability and Layer 2 Networking

The Cisco Catalyst 2960-S Series Switches provides Cisco FlexStack stacking and both the Cisco 2960-S and 2960 Series switches provide layer 2 networking to enable resiliency and availability.

Other high-availability features include but are not limited to:

- **Cross-Stack EtherChannel** provides the ability to configure Cisco EtherChannel technology across different members of the Cisco FlexStack for high resiliency.
- **Flexlink** provides link redundancy with convergence time less than 100 ms.
- **IEEE 802.1s/w Rapid Spanning Tree Protocol (RSTP) and Multiple Spanning Tree Protocol (MSTP)** provide rapid spanning-tree convergence independent of spanning-tree timers and also offer the benefit of Layer 2 load balancing and distributed processing. Stacked units behave as a single spanning-tree node.
- **Per-VLAN Rapid Spanning Tree (PVRST+)** allows rapid spanning-tree reconvergence on a per-VLAN spanning-tree basis, without requiring the implementation of spanning-tree instances.
- **Switch-port autorecovery (Errdisable)** automatically attempts to reactivate a link that is disabled because of a network error.

Enhanced Quality of Service

The Cisco 2960-S and 2960 Series Switches offers intelligent services that keep everything flowing smoothly. Industry-leading mechanisms for marking, classification, and scheduling deliver superior performance for data, voice, and video traffic, all at wire speed.

Following are some of the QoS features supported in the Cisco 2960-S and 2960 Series Switches:

- **Cross-stack QoS** allows QoS to be configured across the entire Cisco 2960-S Flexstack.
- **802.1p class of service (CoS)** and differentiated services code point (DSCP) field classification are provided, using marking and reclassification on a per-packet basis by source and destination IP address, MAC address, or Layer 4 TCP/UDP port number.
- **Cisco control-plane and data-plane QoS ACLs** on all ports help ensure proper marking on a per-packet basis.
- **Four egress queues per port** help enable differentiated management of different traffic types across the stack.
- **Shaped Round Robin (SRR)** scheduling helps ensure differential prioritization of packet flows by intelligently servicing the ingress queues and egress queues.
- **Weighted Tail Drop (WTD)** provides congestion avoidance at the ingress and egress queues before a disruption occurs.
- **Strict priority queuing** helps ensure that the highest-priority packets are serviced ahead of all other traffic.
- **Trusted Boundary** provides the ability to trust the QoS priority settings if an IP phone is present and to disable the trust setting if the IP phone is removed, thereby preventing a malicious user.
- **Rate limiting** is provided based on source and destination IP address, source and destination MAC address, Layer 4 TCP/UDP information, or any combination of these fields, using QoS ACLs (IP ACLs or MAC ACLs), class maps, and policy maps.
- **Up to 64 aggregate or individual policers** are available per Fast Ethernet or GbE port.

Location Awareness and Mobility

In order to provide delivery of a best-in-class network experience to end users, it's critical for network access to be location aware. A wide variety of devices can appear on the network, both wired (switches, routers, IP phones, PCs, access points, controllers, video digital media players, and so on) and wireless (mobile devices, wireless tags, rogues, and so on). In many industries, locating assets is primarily a manual process and is time consuming and error prone. The inability to locate assets in real time and to help ensure their availability when and where they are needed limits reaction time and efficiency.

Location services answer business-critical questions about both mobile assets and the users of those assets regardless of whether those assets are connecting using wired or wireless, and hence directly improve their organization's profitability. Network Location Services also improve security and accelerate client troubleshooting by locating an asset, user, or device on the network.

- **Network visibility and control** provide centralized visibility into wired and wireless devices on the network and their location.
- **Location-assisted client troubleshooting** enables tracking of wired or wireless clients for quick problem resolution.
- **Asset tracking and improved security** provide centralized inventory of wired and wireless devices and asset management for improved business processes.
- **Location based policy** allows greater control and visibility. With EnergyWise, power policies can be set up (to reduce the power or shut down the power from a port) based on the location.
- **Cisco Emergency Responder (CER)** enhances emergency calling from Cisco Unified CallManager. It helps assure that Cisco Unified CallManager sends emergency calls to the appropriate Public Safety Answering Point (PSAP) for the caller's location.

Tables 4, 6, 7, and 8 provide hardware features, power specifications, management and standards support, and safety and compliance information for the Cisco Catalyst 2960-S and 2960 Series Switches with LAN Base Software.

Table 4. Cisco Catalyst 2960-S and 2960 Series Switches with LAN Base Software switch performance and scalability information

Performance and Scalability Numbers for All Switch Models		
	Catalyst 2960-S	Catalyst 2960
Forwarding bandwidth	88 Gbps	16 Gbps 32 Gbps (2960G)
Switching bandwidth*	176 Gbps	32Gbps 32 Gbps (2960G)
Flash memory	64 MB	32 MB
Memory DRAM	128 MB	64 MB
Max VLANs	255	255
VLAN IDs	4000	4000
Maximum transmission unit (MTU)	9198 bytes	Up to 9000 bytes
Jumbo frames	9216 bytes	9018 bytes (2960G only)

Performance and Scalability Numbers for All Switch Models			
Forwarding Rate: 64-Byte Packet Cisco Catalyst 2960-S			
Cisco Catalyst 2960S-48FPD-L	101.2 mpps		
Cisco Catalyst 2960S-48LPD-L	101.2 mpps		
Cisco Catalyst 2960S-24PD-L	65.5 mpps		
Cisco Catalyst 2960S-48TD-L	101.2 mpps		
Cisco Catalyst 2960S-24TD-L	65.5 mpps		
Cisco Catalyst 2960S-48FPS-L	77.4 mpps		
Cisco Catalyst 2960S-48LPS-L	77.4 mpps		
Cisco Catalyst 2960S-24PS-L	41.7 mpps		
Cisco Catalyst 2960S-48TS-L	77.4 mpps		
Cisco Catalyst 2960S-24TS-L	41.7 mpps		
Forwarding Rate: 64-Byte Packet Cisco Catalyst 2960			
Cisco Catalyst 2960PD-8TT-L	2.7 mpps		
Cisco Catalyst 2960-8TC-L	2.7 mpps		
Cisco Catalyst 2960-24TT-L	6.5 mpps		
Cisco Catalyst 2960-24TC-L	6.5 mpps		
Cisco Catalyst 2960-24LT-L	6.5 mpps		
Cisco Catalyst 2960-24PC-L	6.5 mpps		
Cisco Catalyst 2960-48TT-L	10.1 mpps		
Cisco Catalyst 2960-48TC-L	10.1 mpps		
Cisco Catalyst 2960-48PST-L	13.3 mpps		
Cisco Catalyst 2960G-8TC-L	11.9 mpps		
Cisco Catalyst 2960G-24TC-L	35.7 mpps		
Cisco Catalyst 2960G-48TC-L	39.0 mpps		
Resource: Cisco Catalyst 2960-S and 2960	Default	QoS	Dual
Unicast MAC addresses	8000	8000	8000
IPv4 IGMP groups	255	255	255
IPv4 MAC QoS access control entries (ACEs)	128	384	0
IPv4 MAC security ACEs	384	128	256

* Switching bandwidth is full-duplex capacity.

Table 5. Dimensions, weight, acoustic, MTBF and environmental range

Dimensions (H x W x D)		
Cisco Catalyst 2960-S	Inches	Centimeters
Cisco Catalyst 2960S-48FPD-L	1.75 x 17.5 x 15.2	4.5 x 44.5 x 38.6
Cisco Catalyst 2960S-48LPD-L		
Cisco Catalyst 2960S-24PD-L		
Cisco Catalyst 2960S-48TD-L	1.75 x 17.5 x 11.8	4.5 x 44.5 x 30
Cisco Catalyst 2960S-24TD-L		
Cisco Catalyst 2960S-48FPS-L	1.75 x 17.5 x 15.2	4.5 x 44.5 x 38.6
Cisco Catalyst 2960S-48LPS-L		
Cisco Catalyst 2960S-24PS-L		

Cisco Catalyst 2960S-48TS-L	1.75 x 17.5 x 11.8	4.5 x 44.5 x 30		
Cisco Catalyst 2960S-24TS-L				
Cisco Catalyst 2960	Inches	Centimeters		
Cisco Catalyst 2960PD-8TT-L	1.73 x 10.6 x 6.2	4.4 x 27 x 15.7		
Cisco Catalyst 2960-8TC-L	1.73 x 10.6 x 6.4	4.4 x 27 x 16.3		
Cisco Catalyst 2960-24TT-L	1.73 x 17.7 x 9.52	4.4 x 45 x 23.6		
Cisco Catalyst 2960-24TC-L				
Cisco Catalyst 2960-24LT-L				
Cisco Catalyst 2960-24PC-L	1.73 x 17.7 x 13	4.4 x 45 x 33.2		
Cisco Catalyst 2960-48TT-L				
Cisco Catalyst 2960-48TC-L				
Cisco Catalyst 2960-48PST-L	1.73 x 17.7 x 13.07	4.4 x 45 x 23.6		
Cisco Catalyst 2960G-8TC-L	1.73 x 10.6 x 8.1	4.4 x 27 x 20.5		
Cisco Catalyst 2960G-24TC-L				
Cisco Catalyst 2960G-48TC-L	1.73 x 17.7 x 12.9	4.4 x 45 x 32.8		
Weight				
Cisco Catalyst 2960-S	Pounds	Kilograms		
Cisco Catalyst 2960S-48FPD-L	13	5.9		
Cisco Catalyst 2960S-48LPD-L	12.5	5.7		
Cisco Catalyst 2960S-24PD-L	12.5	5.7		
Cisco Catalyst 2960S-48TD-L	9.5	4.3		
Cisco Catalyst 2960S-24TD-L	9.5	4.3		
Cisco Catalyst 2960S-48FPS-L	13	5.9		
Cisco Catalyst 2960S-48LPS-L	12.5	5.7		
Cisco Catalyst 2960S-24PS-L	12.5	5.7		
Cisco Catalyst 2960S-48TS-L	10.5	4.8		
Cisco Catalyst 2960S-24TS-L	10	4.5		
Cisco Catalyst 2960	Pounds	Kilograms		
Cisco Catalyst 2960PD-8TT-L	3	1.4		
Cisco Catalyst 2960-8TC-L	3	1.4		
Cisco Catalyst 2960-24TT-L	8	3.6		
Cisco Catalyst 2960-24TC-L	8	3.6		
Cisco Catalyst 2960-24LT-L	10	4.5		
Cisco Catalyst 2960-24PC-L	12	5.4		
Cisco Catalyst 2960-48TT-L	8	3.6		
Cisco Catalyst 2960-48TC-L	8	3.6		
Cisco Catalyst 2960-48PST-L	12	5.4		
Cisco Catalyst 2960G-8TC-L	3	1.4		
Cisco Catalyst 2960G-24TC-L	10	4.5		
Cisco Catalyst 2960G-48TC-L	12	5.4		
Environmental Ranges				
	Cisco Catalyst 2960-S		Cisco Catalyst 2960	
	Fahrenheit	Centigrade	Fahrenheit	Centigrade
Operating temperature up to 5000 ft (1500 m)	0° to 113°F	-5° to 45°C	23° to 113°F	-5° to 45°C
Operating temperature up to 10,000 ft (3000 m)	23° to 104°F	-5° to 40°C	23° to 104°F	-5° to 40°C

Short-term exception at sea level [†]	23° to 31°F	-5° to 55°C	23° to 31°F	-5° to 55°C
Short-term exception up to 5000 feet (1500 m) [†]	23° to 122°F	-5° to 50°C	23° to 122°F	-5° to 50°C
Short-term exception up to 10,000 feet (3000 m) [†]	23° to 113°F	-5° to 45°C	23° to 113°F	-5° to 45°C
Short-term exception up to 13,000 feet (4000 m) [†]	23° to 104°F	-5° to +40°C	23° to 104°F	-5° to 40°C
Storage temperature up to 15,000 feet (4573 m)	-13° to 158°F	-25° to 70°C	-13° to 158°F	-25° to 70°C
	Feet	Meters		
Operating altitude	Up to 10,000	Up to 3000	Up to 10,000	Up to 3000
Storage altitude	Up to 13,000	Up to 4000	Up to 13,000	Up to 4000
Operating relative humidity	10% to 95% noncondensing		10% to 95% noncondensing	
Storage relative humidity	10% to 95% noncondensing		10% to 95% noncondensing	
Acoustic Noise				
Measured per ISO 7779 and declared per ISO 9296.				
Bystander positions operating mode at 25°C ambient.				
	Sound Pressure		Sound Power	
Model	LpA (Typical)	LpAD (Maximum)	LwA (Typical)	LwAD (Maximum)
Cisco Catalyst 2960S-48FPD-L	42 dB	45 dB	5.2 B	5.5 B
Cisco Catalyst 2960S-48LPD-L				
Cisco Catalyst 2960S-24PD-L				
Cisco Catalyst 2960S-48TD-L	44 dB	47 dB	5.4 B	5.7 B
Cisco Catalyst 2960S-24TD-L				
Cisco Catalyst 2960S-48FPS-L	42 dB	45 dB	5.2 B	5.5 B
Cisco Catalyst 2960S-48LPS-L				
Cisco Catalyst 2960S-24PS-L				
Cisco Catalyst 2960S-48TS-L	44 dB	47 dB	5.4 B	5.7 B
Cisco Catalyst 2960S-24TS-L				
Mean time between failures (MTBF)				
Cisco Catalyst 2960-S			Cisco Catalyst 2960	
Model	MTBF in hours		Model	MTBF in hours
Cisco Catalyst 2960S-48FPD-L	183,498		Cisco Catalyst 2960PD-8TT-L	737,065
Cisco Catalyst 2960S-48LPD-L	198,300		Cisco Catalyst 2960-8TC-L	615,549
Cisco Catalyst 2960S-24PD-L	237,016		Cisco Catalyst 2960-24TT-L	407,707
Cisco Catalyst 2960S-48TD-L	311,291		Cisco Catalyst 2960-24TC-L	339,743
Cisco Catalyst 2960S-24TD-L	332,958		Cisco Catalyst 2960-24LT-L	402,926
Cisco Catalyst 2960S-48FPS-L	189,242		Cisco Catalyst 2960-24PC-L	311,781
Cisco Catalyst 2960S-48LPS-L	205,052		Cisco Catalyst 2960-48TT-L	243,277
Cisco Catalyst 2960S-24PS-L	245,604		Cisco Catalyst 2960-48TC-L	336,409
Cisco Catalyst 2960S-48TS-L	328,058		Cisco Catalyst 2960-48PST-L	180,427
Cisco Catalyst 2960S-24TS-L	349,824		Cisco Catalyst 2960G-8TC-L	485,576
Cisco Catalyst 2960S-STACK	25,743,890		Cisco Catalyst 2960G-24TC-L	313,828
			Cisco Catalyst 2960G-48TC-L	221,432

[†] Not more than the following in a 1-year period: 96 consecutive hours, or 360 hours total, or 15 occurrences.

Note: For Catalyst 2960G-8TC-L, reduce the high range temperature by 5°C.

Table 6. Connectors, LED indicators and Dimensions

Connectors and LED Indicators	
Cisco Catalyst 2960-S with SFP+ based ports:	
<ul style="list-style-type: none"> • 10BASE-T ports: RJ-45 connectors, 2-pair Category 3, 4, or 5 unshielded twisted-pair (UTP) cabling • 100BASE-TX ports: RJ-45 connectors, 2-pair Category 5 UTP cabling • 1000BASE-T ports: RJ-45 connectors, 4-pair Category 5 UTP cabling • 1000BASE-T SFP-based ports: RJ-45 connectors, 4-pair Category 5 UTP cabling • 1000BASE-SX, -LX/LH, -ZX, -BX, -T, -FX, and coarse wavelength-division multiplexing (CWDM) SFP-based ports: LC fiber connectors (single/multimode fiber) • 10GBASE-LR, SR, LRM, CX1 SFP+ based ports 	
* The Cisco Catalyst 2960-S with SFP+ does not support the GLC-FE-100BX, GLC-FE-100FX, or GLC-FE-100LX.	
Cisco Catalyst 2960-S and 2960 with SFP-based ports:	
<ul style="list-style-type: none"> • 10BASE-T ports: RJ-45 connectors, 2-pair Category 3, 4, or 5 UTP cabling • 100BASE-TX ports: RJ-45 connectors, 2-pair Category 5 UTP cabling • 1000BASE-T ports: RJ-45 connectors, 4-pair Category 5 UTP cabling • 1000BASE-T SFP-based ports: RJ-45 connectors, 4-pair Category 5 UTP cabling • 1000BASE-SX -LX/LH, -ZX, -BX, -T, -FX, and CWDM SFP-based ports: LC fiber connectors (single/multimode fiber) • 100BASE-LX, -BX, -FX SFP-based ports: LC fiber connectors (single/multimode fiber) 	
* GLC-T and GLC-GE-100FX are not supported on the Catalyst 2960-8TC-S, 2960-8TC-L, or 2960G-8TC-L switches.	
Cisco Catalyst 2960-S FlexStack stacking cables:	
• CAB-STK-E-0.5M	FlexStack stacking cable with a 0.5 m length
• CAB-STK-E-1M	FlexStack stacking cable with a 1.0 m length
• CAB-STK-E-3M	FlexStack stacking cable with a 3.0 m length
Cisco Catalyst 2960-S console cables:	
• CAB-CONSOLE-RJ45	Console cable 6 ft with RJ-45
• CAB-CONSOLE-USB	Console cable 6 ft with USB Type A and mini-B connectors
<ul style="list-style-type: none"> • Customers can provide power to a switch by using the internal power supply. The connector is located at the back of the switch. These switches do not have a redundant-power-supply port • The internal power supply is an auto-ranging unit • The internal power supply supports input voltages between 100 and 240 VAC • Use the supplied AC power cord to connect the AC power connector to an AC power outlet • Cisco RPS connector: <ul style="list-style-type: none"> ◦ The Cisco RPS connector offers connection for an optional Cisco RPS 2300 that uses AC input and supplies DC output to the switch. ◦ The connector offers a 2300W redundant power system that supports up to 6 external network devices and provides power to 2 failed devices at a time ◦ The connector automatically senses when the internal power supply of a connected device fails and provides power to the failed device, preventing loss of network traffic ◦ Only the Cisco RPS 2300 (model PWR-RPS2300) should be attached to the redundant-power-system receptacle 	
Note: The Cisco Catalyst 2960-8TC-L and 2960G-8TC-L do not have RPS ports.	
<ul style="list-style-type: none"> • Per-port status: Link integrity, disabled, activity, speed, and full duplex • System status: System, RPS, link status, link duplex, PoE, and link speed 	

** 1000Base-T not supported on Cisco Catalyst 2960-S switches.

Table 7. Management and Standards Support for Cisco Catalyst 2960-S and 2960 Series Switches with LAN Base Software

Description	Specification
Management	<ul style="list-style-type: none"> • BRIDGE-MIB • CISCO-CABLE-DIAG-MIB • CISCO-CDP-MIB • CISCO-CLUSTER-MIB • CISCO-CONFIG-COPY-MIB • CISCO-CONFIG-MAN-MIB • CISCO-DHCP-SNOOPING-MIB • CISCO-ENTITY-VENDORTYPE-OID-MIB • CISCO-ENVMON-MIB • CISCO-ERR-DISABLE-MIB • CISCO-TC-MIB • CISCO-TCP-MIB • CISCO-UDLD-MIB • CISCO-VLAN-IFTABLE • RELATIONSHIP-MIB • CISCO-VLAN-MEMBERSHIP-MIB • CISCO-VTP-MIB • ENTITY-MIB • ETHERLIKE-MIB • IEEE8021-PAE-MIB

Description	Specification	
	<ul style="list-style-type: none"> • CISCO-FLASH-MIB • CISCO-FTP-CLIENT-MIB • CISCO-IGMP-FILTER-MIB • CISCO-IMAGE-MIB • CISCO-IP-STAT-MIB • CISCO-LAG-MIB • CISCO-MAC-NOTIFICATION-MIB • CISCO-MEMORY-POOL-MIB • CISCO-PAGP-MIB • CISCO-PING-MIB • CISCO-POE-EXTENSIONS-MIB • CISCO-PORT-QOS-MIB • CISCO-PORT-SECURITY-MIB • CISCO-PORT-STORM-CONTROL-MIB • CISCO-PRODUCTS-MIB • CISCO-PROCESS-MIB • CISCO-RTTMON-MIB • CISCO-SMI-MIB • CISCO-STP-EXTENSIONS-MIB • CISCO-SYSLOG-MIB 	<ul style="list-style-type: none"> • IEEE8023-LAG-MIB • IF-MIB • INET-ADDRESS-MIB • OLD-CISCO-CHASSIS-MIB • OLD-CISCO-FLASH-MIB • OLD-CISCO-INTERFACES-MIB • OLD-CISCO-IP-MIB • OLD-CISCO-SYS-MIB • OLD-CISCO-TCP-MIB • OLD-CISCO-TS-MIB • RFC1213-MIB • RMON-MIB • RMON2-MIB • SNMP-FRAMEWORK-MIB • SNMP-MPD-MIB • SNMP-NOTIFICATION-MIB • SNMP-TARGET-MIB • SNMPv2-MIB • TCP-MIB • UDP-MIB • ePM MIB • CISCO-STACKWISE-MIB (2960-S)
Standards	<ul style="list-style-type: none"> • IEEE 802.1D Spanning Tree Protocol • IEEE 802.1p CoS Prioritization • IEEE 802.1Q VLAN • IEEE 802.1s • IEEE 802.1w • IEEE 802.1X • IEEE 802.1ab (LLDP) • IEEE 802.3ad • IEEE 802.3af • IEEE 802.3ah (100BASE-X single/multimode fiber only) • IEEE 802.3x full duplex on 10BASE-T, 100BASE-TX, and 1000BASE-T ports • IEEE 802.3 10BASE-T specification • IEEE 802.3u 100BASE-TX specification • IEEE 802.3ab 1000BASE-T specification • IEEE 802.3z 1000BASE-X specification 	<ul style="list-style-type: none"> • 100BASE-BX (SFP) • 100BASE-FX (SFP) • 100BASE-LX (SFP) • 1000BASE-BX (SFP) • 1000BASE-SX (SFP) • 1000BASE-LX/LH (SFP) • 1000BASE-ZX (SFP) • 1000BASE-CWDM SFP 1470 nm • 1000BASE-CWDM SFP 1490 nm • 1000BASE-CWDM SFP 1510 nm • 1000BASE-CWDM SFP 1530 nm • 1000BASE-CWDM SFP 1550 nm • 1000BASE-CWDM SFP 1570 nm • 1000BASE-CWDM SFP 1590 nm • 1000BASE-CWDM SFP 1610 nm • 10GBASE-LR (SFP+) • 10GBASE-SR (SFP+) • 10GBASE-LRM (SFP+) • 10GBASE-CX1 (SFP+) • RMON I and II standards • SNMP v1, v2c, and v3
RFC compliance	<ul style="list-style-type: none"> • RFC 768 - UDP • RFC 783 - TFTP • RFC 791 - IP • RFC 792 - ICMP • RFC 793 - TCP • RFC 826 - ARP • RFC 854 - Telnet • RFC 951 - Bootstrap Protocol (BOOTP) • RFC 959 - FTP • RFC 1112 - IP Multicast and IGMP • RFC 1157 - SNMP v1 • RFC 1166 - IP Addresses • RFC 1256 - Internet Control Message Protocol (ICMP) 	<ul style="list-style-type: none"> • RFC 1901 - SNMP v2C • RFC 1902-1907 - SNMP v2 • RFC 1981 - Maximum Transmission Unit (MTU) Path Discovery IPv6 • RFC 2068 - HTTP • RFC 2131 - DHCP • RFC 2138 - RADIUS • RFC 2233 - IF MIB v3 • RFC 2373 - IPv6 Aggregatable Addr • RFC 2460 - IPv6 • RFC 2461 - IPv6 Neighbor Discovery • RFC 2462 - IPv6 Autoconfiguration • RFC 2463 - ICMP IPv6

Description	Specification
	<ul style="list-style-type: none"> Router Discovery • RFC 1305 - NTP • RFC 1492 - TACACS+ • RFC 1493 - Bridge MIB • RFC 1542 - BOOTP extensions • RFC 1643 - Ethernet Interface MIB • RFC 1757 - RMON • RFC 2474 - Differentiated Services (DiffServ) Precedence • RFC 2597 - Assured Forwarding • RFC 2598 - Expedited Forwarding • RFC 2571 - SNMP Management • RFC 3046 - DHCP Relay Agent Information Option • RFC 3376 - IGMP v3 • RFC 3580 - 802.1X RADIUS

Table 8. Voltage and power information

AC/DC input voltage and current			
Cisco Catalyst 2960-S	Voltage (Autoranging)	Current	Frequency
Cisco Catalyst 2960S-48FPD-L	100 to 240 VAC	9 to 4 A	50 to 60Hz
Cisco Catalyst 2960S-48LPD-L		5 to 2 A	
Cisco Catalyst 2960S-24PD-L		5 to 2 A	
Cisco Catalyst 2960S-48TD-L		1 to 0.5 A	
Cisco Catalyst 2960S-24TD-L		1 to 0.5 A	
Cisco Catalyst 2960S-48FPS-L		9 to 4 A	
Cisco Catalyst 2960S-48LPS-L		5 to 2 A	
Cisco Catalyst 2960S-24PS-L		5 to 2 A	
Cisco Catalyst 2960S-48TS-L		1 to 0.5 A	
Cisco Catalyst 2960S-24TS-L		1 to 0.5 A	
Cisco Catalyst 2960	Voltage (Autoranging)	Current	Frequency
Cisco Catalyst 2960-8TC-L	100 to 240 VAC	0.5 to 0.25 A	50 to 60Hz
Cisco Catalyst 2960G-8TC-L		0.8 to 0.4 A	
Cisco Catalyst 2960-24LT-L		3.0 to 1.5 A	
Cisco Catalyst 2960-24PC-L		8.0 to 4.0 A	
Cisco Catalyst 2960-48PST-L		5.0 to 2.0 A	
Cisco Catalyst 2960-24TT-L and Catalyst 2960-24TC-L and Catalyst 2960-48TT-L and Catalyst 2960-48TC-L		1.3 to 0.8 A	
Cisco Catalyst 2960G-24TC-L and Catalyst 2960G-48TC-L		3.0 to 1.5 A	
Cisco Catalyst 2960PD-8TT-L	DC input 48 VDC (for AC use PWR-A= sold separately)	0.3 A	
Power Rating			
Cisco Catalyst 2960-S		Cisco Catalyst 2960	
Model	Power Rating	Model	Power Rating
Cisco Catalyst 2960S-48FPD-L	0.89 kVA	Cisco Catalyst 2960PD-8TT-L	11W
Cisco Catalyst 2960S-48LPD-L	0.48 kVA	Cisco Catalyst 2960-8TC-L	0.035 kVA
Cisco Catalyst 2960S-24PD-L	0.46 kVA	Cisco Catalyst 2960-24TT-L	0.05 kVA
Cisco Catalyst 2960S-48TD-L	0.09 kVA	Cisco Catalyst 2960-48TT-L	0.075 kVA
Cisco Catalyst 2960S-24TD-L	0.09 kVA	Cisco Catalyst 2960-24TC-L	0.05 kVA
Cisco Catalyst 2960S-48FPS-L	0.89 kVA	Cisco Catalyst 2960-24LT-L	0.175 kVA
Cisco Catalyst 2960S-48LPS-L	0.48 kVA	Cisco Catalyst 2960-24PC-L	0.470 kVA
Cisco Catalyst 2960S-24PS-L	0.46 kVA	Cisco Catalyst 2960-48PST-L	0.5 kVA
Cisco Catalyst 2960S-48TS-L	0.13 kVA	Cisco Catalyst 2960-48TC-L	0.075 kVA

Cisco Catalyst 2960S-24TS-L	0.09 kVA	Cisco Catalyst 2960G-8TC-L	0.05 kVA
		Cisco Catalyst 2960G-24TC-L	0.075 kVA
		Cisco Catalyst 2960G-48TC-L	0.140 kVA
DC input voltages (RPS input)			
Cisco Catalyst 2960-S			
Cisco Catalyst 2960S-48FPD-L	12V at 4 A		-52 V at 15 A
Cisco Catalyst 2960S-48LPD-L	12V at 4 A		-52 V at 8 A
Cisco Catalyst 2960S-24PD-L	12V at 3 A		-52 V at 8 A
Cisco Catalyst 2960S-48TD-L	12V at 4 A		N/A
Cisco Catalyst 2960S-24TD-L	12V at 3 A		N/A
Cisco Catalyst 2960S-48FPS-L	12V at 4 A		-52 V at 15A
Cisco Catalyst 2960S-48LPS-L	12V at 4 A		-52 V at 8 A
Cisco Catalyst 2960S-24PS-L	12V at 3 A		-52 V at 8 A
Cisco Catalyst 2960S-48TS-L	12V at 4 A		N/A
Cisco Catalyst 2960S-24TS-L	12V at 4 A		N/A
Cisco Catalyst 2960			
Cisco Catalyst 2960-24TT-L	12V at 5 A		5 A
Cisco Catalyst 2960-48TT-L			
Cisco Catalyst 2960-24TC-L			
Cisco Catalyst 2960-24LT-L	12 V at 8.3 A		-48 V at 2.7 A
Cisco Catalyst 2960-24PC-L	12 V at 11.25 A		-48 V at 7.8 A
Cisco Catalyst 2960-48PST-L	12 V at 4 A		-48 V at 7.8 A
Cisco Catalyst 2960-48TC-L	12 V at 5 A		
Cisco Catalyst 2960G-24TC-L	12 V at 10.5 A		
Cisco Catalyst 2960G-48TC-L			
No RPS input for Cisco Catalyst 2960PD-8TT-L, Catalyst 2960-8TC-L, or Catalyst 2960G-8TC-L.			
PoE and PoE+			
<ul style="list-style-type: none"> • Maximum power supplied per port for PoE+ is 30W. • Maximum power supplied per port for PoE is 15.4W. • Total power dedicated to PoE or PoE+ is 370W or 740W. 			

Table 9. Power Specifications for Cisco Catalyst 2960-S and 2960 Series Switches with LAN Base Software

Description	C2960-S Specifications				
Models	C2960S-48FPD-L	C2960S-48LPD-L	C2960S-24PD-L	C2960S-48TD-L	C2960S-24TD-L
100 Percent Throughput					
Measured Power Consumption	81W	71W	55W	55W	39W
5 Percent Throughput					
Measured Power Consumption	80W	70W	54W	53W	38W
5 Percent Throughput (with 50 Percent PoE Loads)					
Measured Power Consumption	Switch Power: 464W PoE Power: 386W	Switch Power: 266W PoE Power: 195W	Switch Power: 249W PoE Power: 195W	-	-
100 Percent Throughput (with Maximum Possible PoE Loads)					
Measured Power Consumption	Switch Power: 870W PoE Power: 744W	Switch Power: 466W PoE Power: 375W	Switch Power: 451W PoE Power: 375W	-	-

Description	C2960-S Specifications				
Models	C2960S-48FPS-L	C2960S-48LPS-L	C2960S-24PS-L	C2960S-48TS-L	C2960S-24TS-L
100 Percent Throughput					
Measured Power Consumption	79W	71W	55W	52W	40W
5 Percent Throughput					
Measured Power Consumption	78W	70W	54W	50W	39W
5 Percent Throughput (with 50 Percent PoE Loads)					
Measured Power Consumption	Switch Power: 464W PoE Power: 386W	Switch Power: 266W PoE Power: 195W	Switch Power: 249W PoE Power: 195W	-	-
100 Percent Throughput (with Maximum Possible PoE Loads)					
Measured Power Consumption	Switch Power: 870W PoE Power: 744W	Switch Power: 466W PoE Power: 375W	Switch Power: 449W PoE Power: 375W	-	-

Description	C2960 Specifications				
Models	C2960-48PST-L	C2960-24PC-L	C2960-24LT-L	C2960-48TC-L	C2960-24TC-L
100 Percent Throughput					
Measured Power Consumption	67W	45W	36W	39W	27W
5 Percent Throughput					
Measured Power Consumption	63W	43W	34W	36W	24W
5 Percent Throughput (with 50 Percent PoE Loads)					
Measured Power Consumption	Switch Power: 262W PoE Power: 187W	Switch Power: 237W PoE Power: 185W	Switch Power: 98W PoE Power: 62W	-	-
100 Percent Throughput (with Maximum Possible PoE Loads)					
Measured Power Consumption	Switch Power: 460W PoE Power: 339W	Switch Power: 433W PoE Power: 357W	Switch Power: 162W PoE Power: 119W	-	-

Description	C2960 Specifications				
Models	C2960-48TT-L	C2960-24TT-L	C2960G-48TC-L	C2960G-24TC-L	C2960-24T-L
100 Percent Throughput					
Measured Power Consumption	42W	28W	123W	72W	22W
5 Percent Throughput					
Measured Power Consumption	38W	26W	114W	65W	21W
5 Percent Throughput (with 50 Percent PoE Loads)					
Measured Power Consumption	-	-	-	-	-
100 Percent Throughput (with Maximum Possible PoE Loads)					
Measured Power Consumption	-	-	-	-	-

Description	Compact Switch Specifications		
Models	C2960-8TC-L	C2960PD-8TT-L	C2960G-8TC-L
100 Percent Throughput			
Measured Power Consumption	12W	11W	22W
5 Percent Throughput			
Measured Power Consumption	11W	N/A	20W
5 Percent Throughput (with 50 Percent PoE Loads)			
Measured Power Consumption	-	-	-
100 Percent Throughput (with Maximum Possible PoE Loads)			
Measured Power Consumption	-	-	-

Note: Disclaimer: All power consumption numbers were measured under controlled laboratory conditions and are provided as an estimate.

The wattage rating on the power supply does not represent actual power draw. It indicates the maximum power draw possible by the power supply. This rating can be used for facility capacity planning. For PoE switches, cooling requirements are smaller than the actual power consumption as a significant portion of PoE loads are dissipated in the endpoints.

Non-PoE Power Consumption

100 Percent Throughput Switch Power Consumption

The numbers indicate the power consumed by a typical switch under normal conditions. Normal conditions signify a temperature of 25 degrees Celsius, atmospheric pressure in the range of 860 to 1060 mbar, and relative humidity from 30 to 75 percent. Typically such power draws are only seen when encountering a 100 percent traffic load made up entirely of 64-byte packets on the switch and the uplinks.

5 Percent Throughput Switch Power Consumption

The numbers indicate the power consumed by a typical switch under normal conditions. Normal conditions signify a temperature of 25 degrees Celsius, atmospheric pressure in the range of 860 to 1060 mbar, and relative humidity from 30 to 75 percent. The numbers below indicate a 5 percent traffic load on the switch and its uplinks.

PoE Power Consumption

100 Percent Throughput Switch Power Consumption (No PoE Loads)

The numbers indicate the power consumed by a typical switch under normal conditions. Normal conditions signify a temperature of 25 degrees Celsius, atmospheric pressure in the range of 860 to 1060 mbar, and relative humidity from 30 to 75 percent. Typically such power draws are only seen when encountering a 100 percent traffic load made up entirely of 64-byte packets with no PoE loads on the switch and uplinks.

Measured 5 Percent Throughput Switch Power Consumption (No PoE Loads)

The numbers indicate the power consumed by a typical switch under normal conditions. Normal conditions signify a temperature of 25 degrees Celsius, atmospheric pressure in the range of 860 to 1060 mbar and relative humidity from 30 to 75 percent. The numbers below indicate a 5 percent traffic load on the switch and its uplinks.

100 Percent Throughput Switch Power Consumption (with Maximum PoE Loads)

The numbers indicate the power consumed by a typical system (the switch and the corresponding PoE loads) under normal conditions. Normal conditions signify a temperature of 25 degrees Celsius, atmospheric pressure in the range of 860 to 1060 mbar and relative humidity from 30 to 75 percent. Typically this power draw is realized when a switch is running 100 percent traffic load of 64 byte sized packets on all its ports and uplinks and also drawing 100 percent PoE load.

5 Percent Throughput Switch Power Consumption (with 50 Percent PoE Loads)

The numbers indicate the power consumed by a typical system (the switch and the corresponding PoE loads) under normal conditions. Normal conditions signify a temperature of 25 degrees Celsius, atmospheric pressure in the range of 860 to 1060 mbar and relative humidity from 30 to 75 percent. The numbers below indicate a 5 percent traffic load and 50 percent PoE load on the switch and its uplinks.

Table 10. Safety and Compliance

Description	Specification
Safety certifications	<ul style="list-style-type: none">• UL 60950-1, Second Edition• CAN/CSA 22.2 No. 60950-1, Second Edition• TUV/GS to EN 60950-1, Second Edition• CB to IEC 60950-1 Second Edition with all country deviations• CE Marking• NOM (through partners and distributors)
Electromagnetic emissions certifications	<ul style="list-style-type: none">• FCC Part 15 Class A• EN 55022 Class A (CISPR22)• EN 55024 (CISPR24)• AS/NZS CISPR22 Class A• CE• CNS13438 Class A• MIC• GOST• China EMC Certifications
Environmental	Reduction of Hazardous Substances (ROHS) 5
Telco	Common Language Equipment Identifier (CLEI) code
Warranty	Limited lifetime warranty

Cisco Limited Lifetime Hardware Warranty

Cisco Catalyst 2960-S and 2960 Series Switches come with a limited lifetime warranty (Table 11). The warranty for the Catalyst 2960-S has the same terms as our standard limited lifetime warranty plus the addition of next business day delivery of replacement hardware where available and 90 days of 8X5 Cisco Technical Assistance Center (TAC) support.

Your formal warranty statement, including the warranty applicable to Cisco software, appears in the Cisco information packet that accompanies your Cisco product. We encourage you to review carefully the warranty statement shipped with your specific product before use.

Cisco reserves the right to refund the purchase price as its exclusive warranty remedy.

For further information on warranty terms, visit <http://www.cisco.com/go/warranty>.

Table 11. Limited Lifetime Warranty Terms

	Cisco Limited Lifetime Hardware Warranty	Cisco Enhanced Limited Lifetime Hardware Warranty
Device covered	Applies to Cisco Catalyst 2960 Series Switches sold on or after May 1, 2009.	Applies to Cisco Catalyst 2960-S Series Switches.
Warranty duration	As long as the original customer owns the product.	As long as the original end user continues to own or use the product, provided that: fan and power supply warranty is limited to five (5) years.
End-of-life policy	In the event of discontinuance of product manufacture, Cisco warranty support is limited to five (5) years from the announcement of discontinuance.	In the event of discontinuance of product manufacture, Cisco warranty support is limited to five (5) years from the announcement of discontinuance.
Hardware replacement	Cisco or its service center will use commercially reasonable efforts to ship a replacement part within ten (10) working days after receipt of the RMA request. Actual delivery times may vary depending on customer location.	Cisco or its service center will use commercially reasonable efforts to ship a Catalyst 2960-S replacement part for next business day delivery, where available. Otherwise, a replacement will be shipped within ten (10) working days after the receipt of the RMA request. Actual delivery times may vary depending on customer location.
Effective date	Hardware warranty commences from the date of shipment to customer (and in case of resale by a Cisco reseller, not more than ninety [90] days after original shipment by Cisco).	Hardware warranty commences from the date of shipment to customer (and in case of resale by a Cisco reseller, not more than ninety [90] days after original shipment by Cisco).
TAC support	Not included.	Cisco will provide during customer's local business hours, 8 hours per day, 5 days per week basic configuration, diagnosis, and troubleshooting of device-level problems for up to 90 days from the date of shipment of the originally purchased Cisco Catalyst 2960-S product. This support does not include solution or network-level support beyond the specific device under consideration.
Cisco.com Access	Warranty allows guest access only to Cisco.com	Warranty allows guest access only to Cisco.com

Software Update Policy for Cisco Catalyst 2960-S and 2960 Series Switches with LAN Base Software

Customers with Cisco Catalyst LAN Base software licenses will be provided with maintenance updates and bug fixes designed to maintain the compliance of the software with published specifications, release notes, and industry standards compliance as long as the original end user continues to own or use the product or up to one year from the end-of-sale date for this product, whichever occurs earlier. Customers with licenses for our premium software images, Enterprise Services or IP Services, require a service support contract such as Cisco SMARTnet® Service to download updates.

This policy supersedes any previous warranty or software statement and is subject to change without notice.

Cisco and Partner Services for the Catalyst 2960

Minimize operating costs and reduce power consumption with the Cisco Catalyst 2960 Switch using intelligent, personalized services from Cisco and our partners. Through a discovery process that begins with understanding your business objectives, we help you integrate the Cisco Catalyst into your architecture and incorporate network services onto it. Sharing knowledge and leading practices, we support your success every step of the way as you deploy, absorb, manage, and scale new technology. Choose from a flexible suite of support services designed to meet your business needs and help you maintain high-quality network performance while controlling operational costs. Table 10 lists the technical services available for the Cisco Catalyst 2960-S and 2960 Series Switches.

Table 12. Technical Services Available for Cisco Catalyst 2960-S and 2960 Series Switches

Technical Services
<p>Cisco SMARTnet Service</p> <ul style="list-style-type: none"> • Around-the-clock, global access to the Cisco TAC • Unrestricted access to the extensive Cisco.com knowledge base and tools • Next-business-day, 8x5x4, 24x7x4, or 24x7x2 advance hardware replacement and onsite parts replacement and installation available¹ • Ongoing operating system software updates within the licensed feature set² • Proactive diagnostics and real-time alerts on Smart Call Home enabled devices
<p>Cisco Smart Foundation Service</p> <ul style="list-style-type: none"> • Next-business-day advance hardware replacement as available • Access to SMB TAC during business hours (access levels vary by region) • Access to Cisco.com SMB knowledge base • Online technical resources through Smart Foundation Portal • Operating system software bug fixes and patches
<p>Cisco Smart Care Service</p> <ul style="list-style-type: none"> • Network-level coverage for the needs of small and medium-sized businesses • Proactive health checks and periodic assessments of Cisco network foundation, voice, and security technologies • Technical support for eligible Cisco hardware and software through Smart Care Portal • Cisco operating system and application software updates and upgrades² • Next-business-day advance hardware replacement as available, 24x7x4 option available¹
<p>Cisco SP Base Service</p> <ul style="list-style-type: none"> • Around-the-clock, global access to the Cisco TAC • Registered access to Cisco.com • Next-business-day, 8x5x4, 24x7x4, and 24x7x2 advance hardware replacement. Return to factory option available¹ • Ongoing operating system software updates²
<p>Cisco Focused Technical Support Services</p> <p>Three levels of premium, high-touch services are available:</p> <ul style="list-style-type: none"> • Cisco High-Touch Operations Management Service • Cisco High-Touch Technical Support Service • Cisco High-Touch Engineering Service <p>Valid Cisco SMARTnet or SP Base contracts are required on all network equipment.</p>

Ordering Information

Tables 13, 14, and 15 give ordering information for the Cisco Catalyst 2960-S and 2960 Series Switches with LAN Base Software.

Table 13. Ordering Information for Cisco Catalyst 2960-S Series Switches with LAN Base Software

Part Numbers	Description
10 Gigabit Uplinks with 10/100/1000 Ethernet Connectivity	
WS-C2960S-48FPD-L	<ul style="list-style-type: none"> • 48 Ethernet 10/100/1000 PoE+ ports • 740W PoE capacity • 2 10 Gigabit Ethernet or 2 1 Gigabit Ethernet SFP+ uplink ports • Optional Cisco FlexStack stacking support • LAN Base image

¹ Advance hardware replacement is available in various service-level combinations. For example, 8x5xNBD indicates that shipment will be initiated during the standard 8-hour business day, 5 days a week (the generally accepted business days within the relevant region), with next-business-day (NBD) delivery. Where NBD is not available, same day shipping is provided. Restrictions apply; please review the appropriate service descriptions for details.

² Cisco operating system updates include the following: maintenance releases, minor updates, and major updates within the licensed feature set.

Part Numbers	Description
WS-C2960S-48LPD-L	<ul style="list-style-type: none"> • 48 Ethernet 10/100/1000 PoE+ ports • 370W PoE capacity • 2 10 Gigabit Ethernet or 2 1 Gigabit Ethernet SFP+ uplink ports • Optional Cisco FlexStack stacking support • LAN Base image
WS-C2960S-24PD-L	<ul style="list-style-type: none"> • 24 Ethernet 10/100/1000 PoE+ ports • 370W PoE capacity • 2 10 Gigabit Ethernet or 2 1 Gigabit Ethernet SFP+ uplink ports • Optional Cisco FlexStack stacking support • LAN Base image
WS-C2960S-48TD-L	<ul style="list-style-type: none"> • 48 Ethernet 10/100/1000 ports • 2 10 Gigabit Ethernet or 2 1 Gigabit Ethernet SFP+ uplink ports • Optional Cisco FlexStack stacking support • LAN Base image
WS-C2960S-24TD-L	<ul style="list-style-type: none"> • 24 Ethernet 10/100/1000 ports • 2 10 Gigabit Ethernet or 2 1 Gigabit Ethernet SFP+ uplink ports • Optional Cisco FlexStack stacking support • LAN Base image
1 Gigabit Uplinks with 10/100/1000 Ethernet Connectivity	
WS-C2960S-48FPS-L	<ul style="list-style-type: none"> • 48 Ethernet 10/100/1000 PoE+ ports • 740W PoE capacity • 2 1 Gigabit Ethernet SFP uplink ports • Optional Cisco FlexStack stacking support • LAN Base image
WS-C2960S-48LPS-L	<ul style="list-style-type: none"> • 48 Ethernet 10/100/1000 PoE+ ports • 370W PoE capacity • 2 1 Gigabit Ethernet SFP uplink ports • Optional Cisco FlexStack stacking support • LAN Base image
WS-C2960S-24PS-L	<ul style="list-style-type: none"> • 24 Ethernet 10/100/1000 PoE+ ports • 370W PoE capacity • 2 1 Gigabit Ethernet SFP uplink ports • Optional Cisco FlexStack stacking support • LAN Base image
WS-C2960S-48TS-L	<ul style="list-style-type: none"> • 48 Ethernet 10/100/1000 ports • 2 1 Gigabit Ethernet SFP uplink ports • Optional Cisco FlexStack stacking support • LAN Base image
WS-C2960S-STACK	FlexStack hot-swappable stacking module

Table 14. Ordering Information for Cisco Catalyst 2960 Series Switches with LAN Base Software

Part Numbers	Description
WS-C2960PD-8TT-L	<ul style="list-style-type: none"> • 8 Ethernet 10/100 ports and 1 10/100/1000 PoE input port • Power adaptor (PWR-A=) and power cord sold separately • Compact size with no fan; magnet included • LAN Base image
WS-C2960-8TC-L	<ul style="list-style-type: none"> • 8 Ethernet 10/100 ports • 1 dual-purpose uplink (dual-purpose uplink port has 1 10/100/1000 Ethernet port, 1 SFP-based Gigabit Ethernet port, 1 port active) • Compact size with no fan; magnet included • LAN Base image

Part Numbers	Description
WS-C2960-24TT-L	<ul style="list-style-type: none"> • 24 Ethernet 10/100 ports and 2 10/100/1000 TX uplinks • 1 RU fixed-configuration • LAN Base image
WS-C2960-48TT-L	<ul style="list-style-type: none"> • 48 Ethernet 10/100 ports and 2 10/100/1000 TX uplinks • 1 RU fixed-configuration • LAN Base image
WS-C2960-24LT-L	<ul style="list-style-type: none"> • 24 Ethernet 10/100 ports with 8 PoE ports and 2 10/100/1000 TX uplinks • 1 RU fixed-configuration • LAN Base image
WS-C2960-24PC-L	<ul style="list-style-type: none"> • 24 Ethernet 10/100 PoE ports and 2 dual-purpose uplinks • 1 RU fixed-configuration • LAN Base image
WS-C2960-48PST-L	<ul style="list-style-type: none"> • 48 Ethernet 10/100 PoE ports and 2 10/100/1000 uplinks and 2 SFP uplinks • 1 RU fixed-configuration • LAN Base image
WS-C2960-48TC-L	<ul style="list-style-type: none"> • 48 Ethernet 10/100 ports and 2 dual-purpose uplinks (each dual-purpose uplink port has 1 10/100/1000 Ethernet port and 1 SFP-based Gigabit Ethernet port, 1 port active) • 1 RU fixed-configuration • LAN Base image
WS-C2960G-8TC-L	<ul style="list-style-type: none"> • 7 Ethernet 10/100/1000 ports and 1 dual-purpose uplink (dual-purpose uplink port has 1 10/100/1000 Ethernet port and 1 SFP-based Gigabit Ethernet port, 1 port active) • Compact size with no fan; magnet included • LAN Base image
WS-C2960G-24TC-L	<ul style="list-style-type: none"> • 20 Ethernet 10/100/1000 ports and 4 dual-purpose uplinks (each dual-purpose uplink port has 1 10/100/1000 Ethernet port and 1 SFP-based Gigabit Ethernet port, 1 port active) • 1 RU fixed-configuration • LAN Base image
WS-C2960G-48TC-L	<ul style="list-style-type: none"> • 44 Ethernet 10/100/1000 ports and 4 dual-purpose uplinks (each dual-purpose uplink port has 1 10/100/1000 Ethernet port and 1 SFP-based Gigabit Ethernet port, 1 port active) • 1 RU fixed-configuration • LAN Base image

Table 15. Ordering Information for Cisco Catalyst 2960-S and 2960 Series Switches with LAN Base Software Accessories

Part Numbers	Description
CAB-STK-E-0.5M	FlexStack stacking cable with a 0.5 m length
CAB-STK-E-1M	FlexStack stacking cable with a 1.0 m length
CAB-STK-E-3M	FlexStack stacking cable with a 3.0 m length
CAB-CONSOLE-RJ45	Console cable 6 ft with RJ45
CAB-CONSOLE-USB	Console cable 6 ft with USB Type A and mini-B connectors
CAB-16AWG-AC	AC power cord, 16AWG
CAB-ACE	AC power cord (Europe), C13, CEE 7, 1.5M
CAB-L620P-C13-US	Power cord, 250VAC, 15A, NEMA L6-20 to C13, US
CAB-ACI	AC power cord (Italy), C13, CEI 23-16, 2.5m
CAB-ACU	AC power cord (UK), C13, BS 1363, 2.5m
CAB-ACA	AC power cord (China/Australia), C13, AS 3112, 2.5m
CAB-ACS	AC power cord (Switzerland), C13, IEC 60884-1, 2.5m
CAB-ACR	AC power cord (Argentina), C13, EL 219 (IRAM 2073), 2.5m

Part Numbers	Description
CAB-ACC	Power cord (China) 10A, IEC 320, C13 (APN=CS-PWR-CH)
CAB-3P-JPN	CABASY,POWER CORD, JAPAN 3P, PSE, 12A @125VAC
CAB-L620P-C13-JPN	Power cord (Japan) 250VAC, 15A, NEMA L6-20 to C13, JAPAN
CAB-IND-10A	Power cord (India)
PWR-RPS2300	Cisco Redundant Power System 2300 and blower, no power supply
BLNK-RPS2300=	Spare bay insert for Cisco Redundant Power System 2300 for Cisco Catalyst 2960 and Catalyst 2960-S switches
CAB-RPS2300-E=	Spare RPS2300 cable for Cisco Catalyst 2960-48PST-L, 2960-24PC-L and 2960-24LT-L switches and Catalyst 2960-S switches
CAB-RPS2300=	Spare RPS2300 cable for Cisco Catalyst 2960 except as noted with CAB-RPS2300-E above
BLWR-RPS2300=	Spare 45 CFM blower for Cisco Redundant Power System 2300
C3K-PWR-750WAC=	Catalyst 2960 and Catalyst 2960-S RPS 2300 750W AC power supply spare
PWR-A=	Power adapter for Cisco Catalyst 2960PD-8TT-L compact switch
CBLGRD-C2960-8TC=	Cable guard for Cisco Catalyst 2960-8TC compact switch
CBLGRD-C2960G-8TC=	Cable guard for Cisco Catalyst 2960G-8TC compact switch
RCKMNT-19-CMPCT=	Rack mount for Cisco Catalyst 2960-8TC and Catalyst 2960G-8TC compact switches
RCKMNT-1RU=	Spare rack-mount kit for Cisco Catalyst 2960 and 2960-S Series for 19- and 24-inch racks
RCKMNT-REC-1RU=	1 RU recessed rack-mount kit for Cisco Catalyst 2960 and 2960-S Series
GLC-LH-SM=	1000BASE-LX/LH SFP transceiver module for MMF and SMF, 1300-nm wavelength
GLC-SX-MM=	1000BASE-SX SFP transceiver module for MMF, 850-nm wavelength
GLC-ZX-SM=	1000BASE-ZX SFP transceiver module for SMF, 1550-nm wavelength
GLC-T=	1000BASE-T SFP transceiver module for Category 5 copper wire Not supported on the Cisco Catalyst 2960-8TC and Catalyst 2960G-8TC compact switches
GLC-BX-D=	1000BASE-BX10 SFP transceiver module for single strand SMF, 1490-nm TX/1310-nm RX wavelength
GLC-BX-U=	1000BASE-BX10 SFP transceiver module for single strand SMF, 1310-nm TX/1490-nm RX wavelength
GLC-GE-100FX=	100BASE-FX SFP module for Gigabit Ethernet ports, 1310-nm wavelength, 2 km over MMF Not supported on the Cisco Catalyst 2960-8TC and Catalyst 2960G-8TC compact switches
GLC-FE-100FX=	100BASE-FX SFP module for 100-Mb ports, 1310-nm wavelength, 2 km over MMF
GLC-FE-100LX=	100BASE-LX10 SFP module for 100-Mb ports, 1310-nm wavelength, 10 km over SMF
GLC-FE-100BX-D=	100BASE-BX10-D SFP module for 100-Mb ports, 1550-nm TX/1310-nm RX wavelength, 10 km over single-strand SMF
GLC-FE-100BX-U=	100BASE-BX10-U SFP module for 100-Mb ports, 1310-nm TX/1550-nm RX wavelength, 10 km over single-strand SMF
CWDM-SFP-1470=	Cisco CWDM SFP 1470 nm; Gigabit Ethernet and 1G/2G Fibre Channel (FC) (gray)
CWDM-SFP-1490=	Cisco CWDM SFP, 1490 nm; Gigabit Ethernet and 1G/2G FC (violet)
CWDM-SFP-1510=	Cisco CWDM SFP, 1510 nm; Gigabit Ethernet and 1G/2G FC (blue)
CWDM-SFP-1530=	Cisco CWDM SFP, 1530 nm; Gigabit Ethernet and 1G/2G FC (green)
CWDM-SFP-1550=	Cisco CWDM SFP, 1550 nm; Gigabit Ethernet and 1G/2G FC (yellow)
CWDM-SFP-1570=	Cisco CWDM SFP, 1570 nm; Gigabit Ethernet and 1G/2G FC (orange)
CWDM-SFP-1590=	Cisco CWDM SFP, 1590 nm; Gigabit Ethernet and 1G/2G FC (red)
CWDM-SFP-1610=	Cisco CWDM SFP, 1610 nm; Gigabit Ethernet and 1G/2G FC (brown)
CAB-SM-LCSC-1M	1m fiber single-mode LC-to-SC connectors
CAB-SM-LCSC-5M	5m fiber single-mode LC-to-SC connectors

Part Numbers	Description
SFP-10G-LR=	10GBASE-LR SFP+ module
SFP-10G-SR=	10GBASE-SR SFP+ module
SFP-10G-LRM=	10GBASE-LRM SFP module
SFP-10G-CX1=	10GBASE-CX1 SFP module
SFP-H10GB-CU1M=	10GBASE-CU SFP+ Cable 1 Meter
SFP-H10GB-CU3M=	10GBASE-CU SFP+ Cable 3 Meter
SFP-H10GB-CU5M=	10GBASE-CU SFP+ Cable 5 Meter

For the latest SFP compatibility information with C2960 model switches, please consult the tables available here: http://www.cisco.com/en/US/products/hw/modules/ps5455/products_device_support_tables_list.html.

For more information about Cisco products, contact:

- United States and Canada: (toll free) 800 553-NETS (6387)
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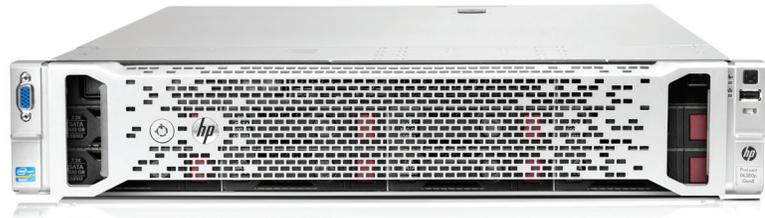
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HP ProLiant DL380p Gen8 Server

The no compromise data center standard

Respond to rapid data growth in a manner that protects your IT budget with the DL380p Gen8 server, designed to change with your evolving needs.



Are technology advances holding you back from making the right investments?

To accommodate explosive data growth, today's data center managers are forced to continually adopt new technologies and ever-more-efficient management tools. They also wrestle with pressing questions about how to keep pace with immediate demands while making wise strategic investments.

The ProLiant DL380p Gen8 Server is engineered to protect your server investment and extend the life of your data center with reliability, accessibility, and serviceability. This versatile rack-optimized server balances efficiency and performance, and makes management simple and effective. It is designed to be future-proof, with the HP-exclusive Flexible LAN-On-Motherboard (FlexibleLOM), giving you a choice of 1 Gb or 10 Gb network interface controllers (NICs). This flexibility allows easy upgradability for future NIC capacities as they become available during the Gen8 lifecycle—giving you a server that is future-ready, today.

Propel your business forward with next-generation technology

The HP ProLiant DL380p Gen8 Server:

- Increases performance with greater processor core count, memory capacities, and internal storage capacities
- Improves manageability with next-generation HP Smart Array technology
- Enhances serviceability with improved fan cage, baffle, and PCIe riser solutions; HP Smart Socket guides; and new thin cabling and cable guides
- Enables a variety of customer-selected primary network solutions with FlexibleLOM NICs
- Provides embedded provisioning tools, active health monitoring, and system maintenance capabilities built using the industry-leading HP Integrated Lights-Out (iLO) Management Engine

Whether you are an enterprise-class data center or a small or midsize business looking to expand in the future, the HP ProLiant DL380p Gen8 Server provides configuration flexibility that can cater to your growing server needs while driving ongoing gains in efficiency.

Key features and benefits

Intel® Xeon® E5-2600 and E5-2600 v2 series processors	Up to 30% more performance ¹
4 Channels per DIMM and 24 memory DIMM slots	2X the memory capacity over G7 with 768 GB maximum memory
Up to 25 small form factor (SFF) or 12 large form factor (LFF) hard drives	Up to two times the internal storage capacity ²
Flexible Network options (FlexibleLOM)	Flexibility of choice with 4x1 G or 2x10 G Ethernet; or 2x10 G FlexFabric
Up to 6 PCIe slots	200% more I/O capacities with PCIe 3.0 ³
HP SmartStorage Solution	Up to 200% more performance with HP SmartDrives, HP Smart Array ⁴
HP iLO Management Engine	4th generation iLO manageability
HP Active Health	Always-on root-cause diagnostics ⁵
HP Specific Options	Enhanced performance with additional GPU support for high workload acceleration

Increase performance, durability, and storage capacity

The HP ProLiant DL380p Gen8 Server brings you:

- Higher performance, power efficiency and security via Intel Xeon E5-2600 and E5-2600 v2 processors, including Intel QuickPath, Integrated Memory Controller, Turbo Boost, Intelligent Power Technologies, Trusted Execution Technology, and Intel Secure Key and Intel OS Guard
- Greater memory bandwidth, DIMM count, and new memory health programs with less downtime with HP SmartMemory; new memory slots allow up to 768 GB of maximum memory and 512 GB at maximum speeds of 1866 MHz
- Complete data protection with embedded HP Smart Array P420i RAID controller, transportable Flash Backed Write Cache (FBWC), and RAID 6 options
- Quicker access to data, increased storage bandwidth, and cutting-edge storage performance with up to 25 SFF HP SmartDrives and new Smart Array RAID controllers
- Communication with HP Intelligent Power Distribution Units (PDUs) with high-efficiency (up to 96% efficient) common-slot power supplies (460 W, 750 W, or 1200 W)
- Enhanced computing with 2x double wide GPU support⁵
- Available ENERGY STAR® qualified configurations
- Cable management flexibility with a redesigned ambidextrous cable management arm option
- Customize your server's primary networking solution today and meet future needs with FlexibleLOM options (choice of 1 Gb, 10 Gb, 10 Gb Base-T, Ethernet, FCoE, or InfiniBand).

¹ Performance results per Intel® testing on E5-2600 v2 processors over previous generation. June 2013.

² Additional internal storage capacities over G7 (total LFF storage capacity = 36 TB SAS, 48 TB SATA, 4.8 TB SSD); (supporting SSD/SAS/SATA in SFF/LFF).

³ More I/O bandwidth to the processor resulting in lower latency as compared with G7 version (Gen8 = 40 lanes/processor, G7 = 24 lanes/processor).

⁴ HP Gen8 Smart Arrays bring significant.

⁵ HP internal lab testing, HP, 2011.

Technical specifications

Processor	Intel Xeon E5-2600 and E5-2600 v2 Series (up to 12 cores, up to 3.5 GHz)
Chipset	Intel C600
Memory	(24) DDR3 DIMMs, up to 1866 MHz, ECC, Lock-step, and Online Spare
Maximum memory	768 GB (24 DIMM slots x 32 GB LRDIMMs)
Internal storage	Supports SATA, SAS, or SSD drives (8+8 or 25) 2.5-inch hot plug bays/(8 or 12) 3.5-inch hot plug bays
Maximum internal storage	30 TB SAS (SFF); 48 TB SATA (LFF); 20 TB SSD (SFF)
Networking	1 FlexibleLOM
I/O slots	Choice of: 4x1 Gb, 2x10 Gb Ethernet, 2x10 Gb Base-T, or 2x10 Gb FlexFabric 6 PCIe slots: Riser 1 1x16 PCIe 3.0 FL/FH; 1x8 PCIe 3.0 HL/FH; 1x4 PCIe 2.0 HL/FH Riser 2 (Optional) 1x16 PCIe 3.0 FL/FH; 1x8 PCIe 3.0 HL/FH; 1x8 PCIe 3.0 HL/FH or 1x16 PCIe 3.0 FL/FH; 1x16 PCIe 3.0 HL/FH
Ports	Front: 2 USB; Rear: 4 USB, video (1600 x 1200), network; Internal: 1 USB, 1 SD Card
Power supplies	460 W, 750 W, 1200 W (92%, 94%, or 96% efficient) AC or DC hot plug redundant
Integrated management	HP iLO Management Engine
Additional features	Up to 2 double wide graphics cards supported
Form factor	2P/2U Rack
QuickSpecs	h18000.www1.hp.com/products/quickspecs/14212_div/14212_div.html

Remove tedious, time-consuming tasks with an intuitive, configurable management system

Unlock your server's capacity with HP StoreVirtual VSA and gain fully-featured shared storage for your applications right on your server:
hp.com/go/freeVSA

The HP ProLiant DL380p Gen8 Server:

- Takes strengths from products like HP SmartStart, HP Smart Update Manager, and HP ProLiant Support Packs on Intelligent Provisioning and enhances them with the latest ease-of-use features and places them on the system board for instant access.
- Starts working the moment a power cord and an Ethernet cable are connected to the server. Agentless hardware monitoring and alerting capabilities are built into the server with HP Agentless Management (runs on the iLO 4 chipset).
- Provides 24x7 continuous health monitoring with HP Active Health System that logs 100% configuration changes and helps quicken analysis of problems with HP Service and Support.⁵

HP OneView helps enterprises close the IT management gap by bringing the best of the consumer world to the enterprise, allowing teams to work in a more natural and collaborative way. Visit hp.com/go/management-oneview

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Redefine the server experience

- Automated Energy Optimization improves the server's ability to analyze and respond to "3D sea of sensors" data within the server.
- The server self-identifies location and inventory through HP Insight Control for maximum workload optimization across the entire data center.
- The server maintains precise control of server fans to direct cooling and reduce unnecessary fan power with the first 3D array of temperature sensors that is part of HP-unique Thermal Discovery.
- Dynamic Workload Acceleration delivers smarter data protection for ever-increasing drive capacities, real-time workload-aware analysis to optimize and adapt storage performance, and 6x faster solid state performance versus the previous generation.
- User-inspired design features—HP SmartDrives, Smart Socket guide, flat cabling design, and easy tool-less access—anticipate your needs and help eliminate common issues that result in downtime of customer-serviceable components.

HP Services

HP Technology Services offers a set of consultancy, deployment, and support solutions designed to meet the lifecycle needs of your IT environments.

HP Care Pack Services for industry-standard servers include support for qualified options at no additional cost.

HP Foundation Care services delivers scalable support packages for HP industry-standard servers and software. You can choose the type and level of service that is most suitable for your business needs. New to this portfolio is HP Collaborative Support. This service offers a single point of contact for server problem diagnosis, hardware problem resolution, basic software problem diagnosis, fault isolation, and resolution if available to HP. In case the issue is with HP or supported third-party software product and cannot be resolved by applying known fixes, HP will contact the third-party vendor and create a problem incident on your behalf.

If you are running business-critical environments, HP offers **HP Proactive Care** or **HP Critical Advantage**. These services help you deliver high levels of application availability through proactive service management.

All service options include HP Insight Remote Support for secure remote monitoring, diagnosis, and problem resolution. Also included is the HP Support Center that provides access to information, tools, and experts to support HP business products. hp.com/go/services

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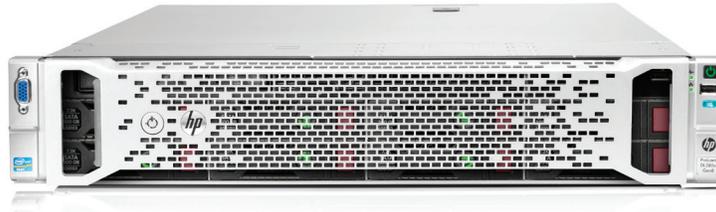
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HP ProLiant DL380e Generation 8 Server



Flexibility, performance, and enterprise-class uptime



Enterprise and SMB customers face the spiraling demand for multi-tier applications, many with dense storage requirements and uncertain processing and I/O requirements over time. As IT budgets continue to be constrained, businesses are looking for ways to future-proof their infrastructure investments. They need to invest in technology that will help them adapt to changing environments, offer configuration flexibility, and reduce downtime.

The all-new HP ProLiant DL380e Gen8 is specifically designed to meet these new and emerging realities. With enterprise-class uptime, enhanced storage performance, serviceability, and management capabilities, the DL380e Gen8 is a perfect match for customers looking for great value and essential features with the flexibility to boost configurations in the future.

The all-new HP ProLiant DL380e Gen8 Server is purpose-built to:

- Enhance flexibility and lower cost—meet essential data center requirements while allowing for future growth
- Redefine the customer experience through user-inspired design features
- Eliminate tedious, time-consuming tasks with agentless hardware monitoring, built-in alerting, and Intelligent Provisioning
- Boost application, storage, and I/O performance—deliver up to 200% more memory over previous generations and support the latest HP Storage and Smart Array controllers

What's new

The HP ProLiant DL380e Gen8 Server is built to protect your investment and extend server life with reliability, accessibility, and serviceability features designed in.

New Generation 8 features include:

- Optimized efficiency and performance with up to two Intel® Xeon® E5-2400v2 and E5-2400 series processors, which automatically regulate power consumption and intelligently adjust server performance.
- Enhanced flexibility with capacity for up to 384 GB of HP SmartMemory, three available PCI-express Gen 3 expansion slots, and a PCI Gen 2 slot. The server also includes an optional 2 x16 riser for an additional two PCI Gen3 slots (six total).
- Unprecedented storage performance, flexibility, and density. The DL380e Gen8 offers a variety of drive cages to meet vastly different storage requirements based on workload. For small form factor, we offer eight and 25 drive cage options. For LFF we standardize on a cage that can support up to eight LFF drives based on controller selection and offer a 12 LFF drive cage option for increased affordable storage density, as well as two LFF or two SFF rear drives for increased capacity or OS mirroring with additional physical security.
- Support for the full lineup of standup Smart Array controllers as well as Dynamic Smart Array controllers. Customers looking for up to six LFF SATA drives support can utilize our base controller offering, the B120i controller with an optional upgrade to B320i with up to 512 MB cache, and Smart Array standup upgrade with up to 2G flash backed write cache.
- Enterprise-class serviceability including improved cable design, HP's exclusive Smart Socket Guide, redundant fan capability, telescoping rails, and cable management arm.

Key features and benefits

Key features	Benefits
Essential performance features in a sleek design	
HP SmartMemory	Unmatched performance, quality, and manageability advantages above industry standards memory
Intel Xeon 2400 v2 or 2400 series processors	Higher performance, power efficiency, and more adaptability
HP Dynamic Smart Array Controllers	Increased data availability, fault tolerance, and recovery mechanisms, allowing higher I/O throughput in a reliable, predictable way
1 PCIe 3.0 x16 slot for high wattage cards	Increased expansion flexibility
1GbE quad-port network adapter	Delivers better network performance and improved response time
Storage flexibility and density	
Support for up to 27 SFF and 14 LFF drives	Unprecedented flexibility in storage capacity
Up to 56 TB utilizing 4 TB drives in a 2U rack form factor	Increased storage density
Support for 2 LFF or 2 SFF rear drives	Increased capacity or additional physical OS security
Essential SAS support via B320i controller on riser	Cost-effective performance and reliability
Support for up to 6 drives via B120i SATA RAID	Additional storage expansion capability for customers looking to minimize initial cap-ex

Key features	Benefits
Simplified management with integrated Lights-out Management Engine	
Intelligent Provisioning	Save time with simpler server startup, pre-loaded firmware, drivers, and tools
HP Active Health	24x7 continuous health monitoring with 100% configuration change logging and faster troubleshooting analysis with HP Service and Support
Smart Update	Streamlined installation and updating of firmware and system software components
Enterprise-class serviceability and support experience	
Smart Socket Guide	Better performance and foolproof, faster installation of processors
Thumb screw locking removable PCI cages	Tool-less, faster configurability
Enhanced ball bearing sliding rails	Simpler deployment and serviceability
HP Smart Drives	Increased internal storage capacity
HP Insight Online and ServiceONE advantage	Intelligent remote monitoring, troubleshooting and problem resolution
High energy efficiency	
HP Location, Thermal, and Power Discovery services	Optimized energy consumption to maximize data center efficiency and reduce costs
High efficiency, common slot power supply	Lower power consumption
ENERGY STAR® certified configurations	Conserve power and save money

HP ProLiant DL380e Gen8 Server Specifications



Processor	Intel Xeon E5-2400v2 or E5-2400 family
Chipset	Intel C600 Series
Processor number	1 or 2
Processor core available	4, 6, 8 or 10
Processor speed	2.5 GHz
Processor cache	25 MB L3 20 MB L3 15 MB L3 10 MB L3
Memory slots	12 DIMM slots
Memory maximum	384 GB
Memory type	DDR3, RDIMM, UDIMM or LRDIMM
Memory protection features	Advanced ECC Memory Lock Step Mode Online Spare
Internal storage	SATA, SAS, SSD (8 or 25) 2.5 inch hot plug bays/(8 or 12) 3.5 inch hot plug bays 12 and 25 drive configuration also support additional 2 rear drive cages. 16 SFF also available with optional second drive cage.

Max internal storage	32.4 TB SAS or SATA (SFF) 56 TB SAS or SATA (LFF) 21.6 TB SSD (SSF)
Storage controllers	Smart Array B120i SATA RAID Smart Array B320i (with FBWC – 512 MB, 1 G) Smart Array P420i (with FBWC – 1 G, 2 G)
Network controller	1Gb 4P 4-port 366i Ethernet Adapter
Expansion slots	4 standard 3 PCIe Gen3 Slots and 1 PCIe Gen2 low profile slot Expandable to 6 slots with 2nd processor and optional riser
Remote management software	Insight Control with iLO Advanced
Form factor chassis	Rack
System fans features	Redundant optional
Power supply type	up to 96% efficient (Titanium), redundant standard on performance models, optional on entry and base models
Graphic card	Integrated to iLo4
Full configuration form factor	2U
Warranty Standard Statement	Standard warranty
Warranty (parts-labor-onsite)	3/1/1

Entry models	Base models	Performance models	Storage models
<ul style="list-style-type: none"> • 1 Intel Xeon E5-2403v2 or E5-2403 processor (80w) • 4 GB RDIMM • HP Ethernet 1Gb 4-port 366i Adapter • HP Dynamic Smart Array B120i Controller • 4 PCIe slots • 8 LFF HDD bays • 1 HP 460W CS Gold Hot Plug Power Supply (92% efficient) • Fixed rail kit 	<ul style="list-style-type: none"> • 1 Intel Xeon E5-2407v2 or E5-2407 processor (95w) • 8 GB RDIMM • HP Ethernet 1Gb 4-port 366i Adapter • HP Dynamic Smart Array B320i Controller • 3 PCIe slots • 8 SFF HDD bays • 1 HP 460W CS Gold Hot Plug Power Supply (92% efficient) • Telescoping ball bearing rail kit 	<ul style="list-style-type: none"> • 2 Intel Xeon E5-2450v2 or E5-2450 processors (95w) • 24 GB RDIMM • HP Ethernet 1Gb 4-port 366i Adapter • HP Dynamic Smart Array B420i Controller • 4 PCIe slots • 8 SFF HDD bays • 2 HP 750W CS Platinum Hot Plug Power Supplies (94% efficient) • Telescoping ball bearing rail kit 	<ul style="list-style-type: none"> • 1 Intel Xeon E5-2420v2 or E5-2420 processors (95w) • 12 GB RDIMM • HP Ethernet 1Gb 4-port 366i Adapter • HP Dynamic Smart Array B420i Controller • 4 PCIe slots • 12 LFF or 25 SFF • 1 HP 750W CS Gold Hot Plug Power Supply (92% efficient) • Telescoping ball bearing rail kit

QuickSpecs

Ideal environment

If your business operation plans on meeting the growing demand for complex applications, then you'll want to future-proof your infrastructure while getting a quick return on investment. The HP ProLiant DL380e Gen8 offers unprecedented configuration flexibility to suit a wide range of customer sizes and compute environments, including those with dense storage requirements and uncertain compute and I/O requirements over time.

Customize your IT lifecycle management, from acquisition of new IT, management of existing assets, and removal of unneeded equipment. hp.com/go/hpfinancialservices

HP Factory Express provides customization and deployment services along with your storage and server purchases. You can customize hardware to your exact specifications in the factory—helping speed deployment. hp.com/go/factoryexpress

Gain the skills you need with ExpertOne training and certification from HP. With HP ProLiant training, you will accelerate your technology transition, improve operational performance, and get the best return on your HP investment. Our training is available when and where you need it, through flexible delivery options and a global training capability. hp.com/learn/proliant

HP Services

When technology works, business works

When you buy HP ProLiant Options for your HP ProLiant servers, it is also good time to think about services.

Recommended HP Care Pack Services

3-Year HP 24x7 4-hour Response, Hardware Support Onsite Service OR 3-Year HP 24x7 4 hour Response, HP Collaborative Support
HP ProLiant Server Hardware Installation Service

Related HP Care Pack Services

3-Year HP 24x7 4 hour Response, Proactive Care OR 3-Year HP 6-hour Onsite Call-to-Repair, HP Collaborative Support
HP Proactive Select Service

All support services come with Insight Remote Support, providing 24 X 7 remote monitoring, proactive notifications, and problem resolution.

Coverage: For ProLiant servers, HP Care Pack Services provide cover for HP-branded hardware options qualified for the server, purchased at the same time or afterward, internal to the enclosure, as well as external monitors up to 22 inch diagonal and tower UPS products; these items will be covered at the same service level and for the same coverage period as the server unless the maximum supported lifetime and/or the maximum usage limitation has been exceeded. Coverage of UPS battery is not included; standard warranty terms and conditions apply.

For more information, visit:
hp.com/services/proliant
hp.com/services/bladesystem

Learn more at
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4AA4-1986ENW, January 2014, Rev. 1





8-Port Gigabit GREENnet Switch TEG-S80g (V2.0R)

The compact 8-Port Gigabit GREENnet Switch provides high bandwidth performance, ease of use and reliability, all while reducing power consumption by up to 70%.

GREENnet technology automatically adjusts power voltage as needed, resulting in substantial energy savings.

Boost your office efficiency and eliminate network congestion with Gigabit speeds and total switching capacity of 16Gbps with Full-Duplex Mode. Plug and Play this sturdy metal switch for reliable high-speed network connectivity.



FEATURES

- 8 x 10/100/1000Mbps Auto-Negotiation, Auto-MDIX Gigabit Ethernet ports
- GREENnet technology reduces power consumption when:
 - a. Ethernet port is not in use
 - b. Connected device is turned off
 - c. Connected device is in power-saving mode
 - d. Based on Ethernet cable length
- Store-and-Forward switching architecture with non-blocking wire-speed performance
- IEEE 802.3x Flow Control for full-duplex mode
- Back pressure Flow Control for half-duplex mode
- Integrated address look-up engine with an 8K absolute MAC address table and 128KBytes RAM data buffering
- Operates and maximizes packet filtering and forwarding rate
- Physical layer port polarity detection and correction
- IEEE 802.3az Energy Efficient Ethernet and GREENnet technology
- Jumbo Frame support up to 9216Bytes
- Sturdy metal housing
- Diagnostic LEDs and Plug & Play
- 3-year limited warranty

*Max power savings compared with standard TRENDnet switches.

8-Port Gigabit GREENnet Switch

TEG-S80g (V2.0R)

SPECIFICATIONS

HARDWARE

Standards	<ul style="list-style-type: none"> • IEEE 802.3 10Base-T; IEEE 802.3u 100Base-TX • IEEE 802.3ab 1000Base-T; IEEE 802.3x Flow Control; IEEE 802.3az Energy Efficient Ethernet
Network Media	<ul style="list-style-type: none"> • Ethernet: Cat. 3,4,5, up to 100m • Fast Ethernet: Cat. 5, up to 100m • Gigabit Ethernet: Cat. 5, 5e,6, up to 100m
Data Rate	<ul style="list-style-type: none"> • Ethernet: 10Mbps/20Mbps (half/full-duplex) • Fast Ethernet: 100Mbps/200Mbps (half/full-duplex) • Gigabit Ethernet: 2000Mbps (full-duplex)
Protocol / Topology	<ul style="list-style-type: none"> • CSMA/CD, Star
Power Consumption	<ul style="list-style-type: none"> • 3.5 Watts (max)
Switch Fabric	<ul style="list-style-type: none"> • 16Gbps forwarding capacity
Interface	<ul style="list-style-type: none"> • 8 x 10/100/1000Mbps Auto-MDIX RJ-45 ports
Data RAM Buffer	<ul style="list-style-type: none"> • 128KBytes
Filtering Table	<ul style="list-style-type: none"> • 8K entries
Jumbo Frame Support	<ul style="list-style-type: none"> • 9216Bytes
Diagnostic LEDs	<ul style="list-style-type: none"> • Power, Link/ACT, 100Mbps/1000Mbps
Power Adapter	<ul style="list-style-type: none"> • 5V DC, 1A external power adapter
Dimension	<ul style="list-style-type: none"> • 171 x 98 x 28mm (6.7 x 3.86 x 1.1 in)
Weight	<ul style="list-style-type: none"> • 450g (15.9oz)
Temperature	<ul style="list-style-type: none"> • Operating: 0° ~ 40° C (32° ~ 104° F) • Storage: -10° ~ 70° C (14° ~ 158° F)
Humidity	<ul style="list-style-type: none"> • Max. 90% (non-condensing)
Certifications	<ul style="list-style-type: none"> • FCC, CE

NETWORKING SOLUTIONS

1 Delivers less power to unused ports

2 Delivers less power when devices are off

3 Delivers less power with shorter cable lengths

Flex-Power: 20m, 60m, 100m

Full Power: 20m, 60m, 100m

GREENnet Switch

Regular Switch

*Max power savings compared with standard TRENDnet switches.

PACKAGE CONTENTS

- TEG-S80g
- Multi-Language Quick Installation Guide
- Power Adapter (5V DC, 1A)

RELATED PRODUCTS

TEW-691GR	450Mbps Wireless N Gigabit Router
TEG-PCBUSR	Gigabit PC Card
TEG-PCITXR	Gigabit PCI Adapter
TEG-S50g	5-Port Gigabit GREENnet Switch

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Fax: 1-310-961-5511

Web: www.trendnet.com

Email: sales@trendnet.com

1-888-326-6061



AXIS Q1922/-E Thermal Network Cameras

Superior detection and wide range coverage.



- > Thermal imaging for IP-Surveillance
- > Multiple lens options
- > VGA detection quality
- > Easy integration of intelligent video
- > Power over Ethernet
- > Full duplex audio

AXIS Q1922/-E Thermal Network Cameras are a perfect complement to any network video system that needs to secure an area or a perimeter 24 hours a day, seven days a week. The cameras use thermal imaging, which allows users to detect people, objects and incidents in complete darkness and difficult conditions such as smoke, haze, dust and light fog.

AXIS Q1922 is intended for indoor environments, while AXIS Q1922-E is an out-of-the-box, outdoor-ready model that is designed to withstand harsh weather conditions.

A resolution of 640x480 (VGA) and a range of lenses make it possible to optimize detection performance to meet high security application requirements. The high resolution, the advanced software processing and a frame rate of up to 30 fps improve thermal image quality, providing more pixels on target and enhancing the possibility to efficiently integrate intelligent video applications.

Since thermal cameras are less sensitive to problems with light conditions and shadows, they can achieve higher accuracy than conventional cameras in most intelligent video applications.

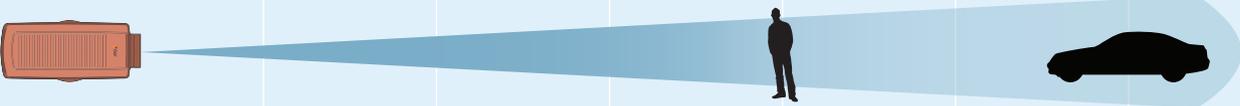
AXIS Q1922/-E cameras offer motion detection, audio detection, and detection of tampering attempts. The cameras also provide capacity for third-party analytics modules, including support for AXIS Camera Application Platform. AXIS Q1922/-E cameras support ONVIF for interoperability between network video products.

Installation is made easy and cost-effective with Power over Ethernet (IEEE 802.3af). AXIS Q1922/-E cameras support H.264 video compression, which reduces bandwidth usage and storage needs. The cameras provide multiple, individually configurable video streams in H.264 and Motion JPEG.



Range Chart

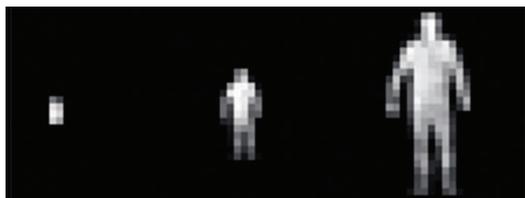
Wide range coverage for AXIS Q1922/-E

	Focal length	Viewing angle	Human: 1.8 x 0.5 m Critical dimension: 0.75 m		Vehicle: 1.4 x 4.0 m Critical dimension: 2.3 m	
						
	mm	Horizontal	meters	yards	meters	yards
Detection (1.5 pixels on target) An observer can see an object	10	57°	320	350	990	1083
	19	32°	580	634	1800	1969
	35	18°	1050	1148	3200	3500
	60	10°	1800	1970	5500	6015
Recognition (6 pixels on target) An observer can distinguish an object	10	57°	80	87	250	273
	19	32°	150	164	440	481
	35	18°	260	284	800	875
	60	10°	440	481	1350	1476
Identification (12 pixels on target) An observer can distinguish a specific object	10	57°	40	44	125	136
	19	32°	75	82	220	241
	35	18°	130	142	400	437
	60	10°	220	240	680	744

According to Johnson's criteria. The ranges vary in different weather conditions.

Environmental considerations

Johnson's criteria assume ideal conditions. The weather conditions at site will affect the thermal energy emitted from the object and decrease the effective detection range. The detection range in the tables above ideally requires a temperature difference of 2° C between the targeted object and the background. However, the weather conditions such as rain, snow and fog will attenuate the radiated energy from the object since the heat radiation from the object is scattered when it hits particles in the air. To avoid performance and reliability problems always test the camera in the actual environment where it needs to be used.



The difference in number of pixels between detection, recognition and identification illustrated with a human target.

Integration of intelligent applications

The sensor in a thermal camera reacts to differences in thermal energy. Thus, the sensor is less sensitive to changing light conditions, darkness and other challenging conditions. This makes thermal cameras a perfect platform to integrate intelligent video applications to build more efficient 24/7 surveillance systems. Through our Application Development Partner Program Axis can offer the widest range of third party applications available.

Integrated with intelligent video applications such as video motion detection or tripwire, the camera can automatically trigger an alert to the operator. To maximize performance of the application and safeguard reliable operation 6 pixels across the object is recommended and the surrounding environment always needs to be considered.

Technical specifications – AXIS Q1922/-E Thermal Network Cameras

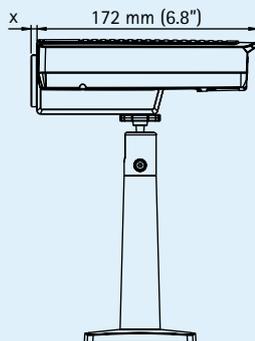
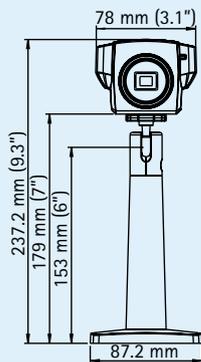
Camera	
Models	Indoor: AXIS Q1922, 10 mm and 19 mm Outdoor: AXIS Q1922-E, 10 mm, 19 mm, 35 mm and 60 mm
Image sensor	Uncooled Micro bolometer 640x480, pixel size: 17µm, spectral range: 8-14µm
Sensitivity	NETD < 100 mK
Video	
Video compression	H.264 (MPEG-4 Part 10/AVC) Motion JPEG
Resolutions	Sensor is 640x480. Image can be scaled up to 800x600 (D1)
Standard frame rate	Up to 30 fps within EU, Norway, Switzerland, Canada, USA, Japan, Australia, New Zealand Up to 8.3 fps in other countries* <i>*Frame rate above 9 fps may be subject to export control regulations</i>
Video streaming	At least 3 H.264 and Motion JPEG streams using the same palette, simultaneous and individually configured in max. resolution at 30 fps. Controllable frame rate and bandwidth. VBR/CBR H.264
Image settings	Compression, brightness, exposure control, rotation, mirroring of images, text and image overlay, privacy mask, palettes
Audio	
Audio streaming	Two-way, full duplex
Audio compression	AAC LC 8/16 kHz, G.711 PCM 8 kHz, G.726 ADPCM 8 kHz Configurable bit rate
Audio input/output	AXIS Q1922: Built-in microphone, external microphone or line input, line output AXIS Q1922-E: External microphone or line input, line output
Network	
Security	Password protection, IP address filtering, HTTPS** encryption, IEEE 802.1X** network access control, digest authentication, user access log
Supported protocols	IPv4/v6, HTTP, HTTPS SSL/TLS**, QoS Layer 3 DiffServ, FTP, SMTP, Bonjour, UPnP, SNMPv1/v2c/v3(MIB-II), DNS, DynDNS, NTP, RTSP, RTP, TCP, UDP, IGMP, RTCP, ICMP, DHCP, ARP, SOCKS. Wide range of PT heads supported (drivers available for download at www.axis.com).

**This product includes software developed by the OpenSSL. Project for use in the OpenSSL Toolkit. (www.openssl.org)

More information is available at www.axis.com

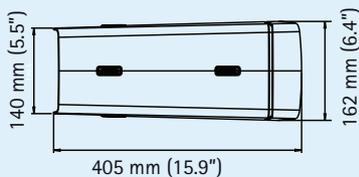
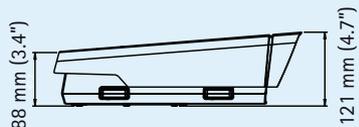
System integration	
Application Programming Interface	Open API for software integration, including the ONVIF specification available at www.onvif.org , as well as VAPIX® and AXIS Camera Application Platform from Axis Communications, specifications available at www.axis.com Support for AXIS Video Hosting System (AVHS) with One-Click Camera connection
Intelligent video	Video motion detection, active tampering alarm, audio detection. Support for AXIS Camera Application Platform enables installation of additional applications
Alarm triggers	Intelligent video and external input
Alarm events	File upload via FTP, HTTP and email; notification via email, HTTP and TCP; external output activation, pre- and post- alarm video buffering
General	
Casing	AXIS Q1922: Zinc chassis AXIS Q1922-E: IP66-rated aluminum casing and a germanium window
Memory	128 MB RAM, 128 MB Flash
Power	Power over Ethernet IEEE 802.3af Class 3 AXIS Q1922: 8 – 20 V DC, max 9 W or 20 – 24 V AC 50-60 Hz, max 14 VA, Power supply not included AXIS Q1922-E: 8 – 20 V DC, max 13 W or 20 – 24 V AC 50-60 Hz, max 20 VA, Power supply not included
Connectors	RJ-45 10BASE-T/100BASE-TX PoE, terminal block for power, terminal block for two configurable inputs/outputs 3.5 mm mic/line in, 3.5 mm line out RS-422/RS-485 AXIS Q1922/-E: Terminal block for heater
Edge storage	SD/SDHC memory card slot (card is not included)
Operating conditions	-40 °C to +60 °C (-40 °F to 140 °F) AXIS Q1922: Humidity 20-80% RH (non-condensing) AXIS Q1922-E: Humidity 10-85% RH
Approvals	EN 55022 Class A, EN 61000-3-2, EN 61000-3-3, EN 55024, EN 50121-4, EN 61000-6-1, EN 61000-6-2, EN 60950-1, FCC Part 15 Subpart B Class A, VCCI Class A ITE, IEC 60068-2-1, IEC 60068-2-2, IEC 60068-2-6, IEC 60068-2-27, IEC 60068-2-78, KC Class A AXIS Q1922-E: EN 60950-22, IEC 60068-2-6, IEC 60068-2-27 (shock/vibration), IEC 60529 IP66
Weight	AXIS Q1922: 950 g (2.10 lb.) – 970 g (2.14 lb.) AXIS Q1922-E: 3475 g (7.66 lb.) – 3650 g (8.05 lb.)
Included accessories	Connector kit, Installation Guide, CD with User's Manual, recording software, installation and management tools, Windows decoder 1-user license AXIS Q1922-E: wall mount bracket, 5 m (16 ft.) Ethernet cable

Dimensions: AXIS Q1922 Thermal Network Camera

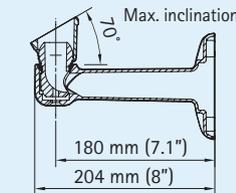
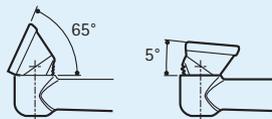


(X)= Lens length (mm/inch)	Lens focal length (mm)
18/0.7	10
21/0.8	19
38/1.5	35
55/2.2	60

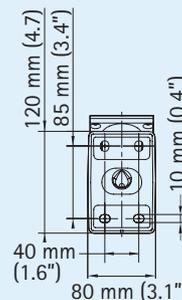
Dimensions: AXIS Q1922-E Thermal Network Camera and wall mount bracket with internal cable channel



With sunshield



Wall mount arm



Back side of wall mount bracket

Optional accessories

AXIS PoE Midspan 1-port



YP3040 Pan-Tilt Motor



Lenses



AXIS T8412 Installation Display



For information on AXIS Camera Station and video management software from Axis' Application Development Partners, see www.axis.com/products/video/software/

Optional mounting accessories for outdoor models

Wall bracket accessories

Adapter plate



Pole mount



Corner mount adapter



Ceiling brackets with ball joint



Column mount with ball joint



AXIS Q60-E PTZ Dome Network Cameras

Outdoor, high-speed PTZ domes: AXIS Q6042-E/Q6044-E/Q6045-E



- > Up to HDTV 1080p
- > Up to 36x optical zoom
- > Outdoor-ready and Arctic Temperature Control
- > Vandal-resistant and shock detection
- > Automatic defog (AXIS Q6044-E)
- > High PoE

AXIS Q60-E cameras are top-of-the-line, outdoor-ready pan/tilt/zoom (PTZ) domes that provide exceptional coverage of wide areas and great detail when zooming in. Designed for easy installation and reliable operation outdoors, they are ideal for city surveillance and airports, train stations, harbors and stadiums.

AXIS Q6045-E offers a rich viewing experience with HDTV 1080p and 20x optical zoom. AXIS Q6044-E provides HDTV 720p and 30x optical zoom. AXIS Q6042-E supports full frame rate Extended D1 resolution and 36x optical zoom.

AXIS Q60-E cameras are vandal-resistant (IK10) and have shock detection, surge protection (railway standards), and protection against dust, rain and snow (IP66 and NEMA 4X). They can operate in temperatures ranging from -50 °C to 50 °C (-58 °F to 122 °F). The cameras' Arctic Temperature Control ensures safe start-up in extreme cold. AXIS Q6042-E and AXIS Q6044-E support electronic image stabilization—useful for get-

ting smoother video in windy conditions. In fog, AXIS Q6044-E can provide clearer video with its automatic defog functionality.

The PTZ domes support autotracking and Active Gatekeeper, and have substantial capacity for third-party intelligent video applications. AXIS Q6045-E offers additional built-in analytics such as highlight compensation, object removed and enter/exit detection.

AXIS Q60-E cameras have a built-in memory card slot for local storage of recordings. The cameras are powered by High Power over Ethernet using the supplied High PoE midspan.



Note: Mounting brackets are sold separately.



High-performance outdoor-ready PTZ domes

The robust AXIS Q60-E PTZ domes are designed for round-the-clock pan/tilt/zoom operation in outdoor environments. The cameras can be automatically directed to 256 preset positions using guard tour. With endless 360° pan, they enable surveillance of an extremely wide area. High zoom, in combination with high resolution, enables detailed surveillance at great distances. AXIS Q60-E cameras have fast and precise pan/tilt performance. They can also tilt 20° above the horizon, which makes it possible for the cameras to see higher than their mounting position. This can be useful, for example, at a stadium where there is a need to look up at the stands.



The images above show the field of view and level of detail provided by the three AXIS Q60-E PTZ domes.



Snapshots of HDTV 1080p views from AXIS Q6045-E: at left, wide view; at right, 20x zoomed-in view where the license plate of a car 275 m (900 ft.) away can be read.

Great detail with HDTV

Among the three cameras, AXIS Q6045-E provides the widest field of view—with a 62.98° horizontal angle of view. In addition, AXIS Q6045-E offers the highest level of detail as it delivers HDTV 1080p performance in compliance with the SMPTE 274M standard regarding a 1920x1080 pixel resolution, full frame rate at 25/30 frames per second, HDTV color fidelity and a 16:9 format.

HDTV 1080p provides more than double the number of pixels as HDTV 720p (1280x740p). While AXIS Q6045-E has 20x optical zoom, the combination of the zoom factor and HDTV 1080p allows the license plate of a vehicle to be read some 275 m (900 ft) away—at a further distance than with AXIS Q6044-E, which has 30x optical zoom, and AXIS Q6042-E, which has 36x optical zoom.

AXIS Q6044-E also offers a wide horizontal viewing angle at 62.9°. The camera's 30x optical zoom, in combination with HDTV 720p, provides superb zoomed-in views, enabling, for instance, the license plate of a vehicle to be read up to 245 m (800 ft) away. AXIS Q6042-E offers Extended D1 resolution (736x576 in 50 Hz, 752x480 in 60 Hz) and can enable a vehicle's license plate to be read some 190 m (620 ft) away.

All three PTZ domes support H.264 Main Profile for efficient compression of video that maintains image quality while at the same time minimizing bandwidth use and storage space. The cameras offer day/night functionality, enabling excellent color video during day time, and clear black and white video in low light.

Electronic image stabilization in AXIS Q6042-E and AXIS Q6044-E

Cameras with high zoom are sensitive to vibrations from wind and traffic. AXIS Q6042-E and AXIS Q6044-E support electronic image stabilization (EIS), which reduces the effects of camera vibration. In windy conditions, EIS provides clearer, more useful video and helps reduce the size of video files, which leads to lower bandwidth and storage use.



Under vibrating conditions: at left, image without EIS; at right, a snapshot from a vibrating AXIS Q6044-E with EIS activated.

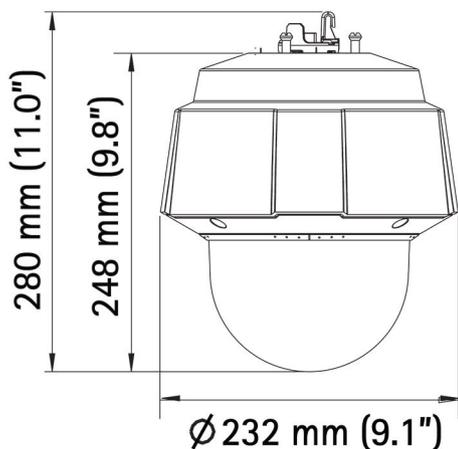
Automatic defog with AXIS Q6044-E

AXIS Q6044-E supports automatic defog, which when activated, automatically detects fog in the scene and digitally filters it out of view to provide clearer video.



Images from AXIS Q6044-E: at left, without automatic defog; at right, with automatic defog activated.

Dimensions



Optional accessories

1. AXIS T91A
2. Smoked Dome D
3. Axis High PoE midspans
4. AXIS T8129 PoE Extender
5. AXIS P8221
6. AXIS T8310
7. RJ45 IP66-rated cables with premounted connector (CAT6)



Technical Specifications - AXIS Q60-E PTZ Dome Network Cameras

Models	AXIS Q6042-E 50 Hz, AXIS Q6042-E 60 Hz AXIS Q6044-E 50 Hz, AXIS Q6044-E 60 Hz AXIS Q6045-E 50 Hz, AXIS Q6045-E 60 Hz
Camera	
Image sensor	AXIS Q6042-E: 1/4" ExView HAD progressive scan CCD AXIS Q6044-E: 1/3" progressive scan CCD AXIS Q6045-E: 1/3" progressive scan CMOS
Lens	AXIS Q6042-E: f=3.3–119 mm, F1.4–4.2, autofocus Horizontal angle of view: 57.2° – 1.7° AXIS Q6044-E: f=4.4–132 mm, F1.4–4.6, autofocus Horizontal angle of view: 62.9° – 2.2° AXIS Q6045-E: f=4.45–89 mm, F1.6–2.9, autofocus Horizontal angle of view: 62.98°–3.49°
Day and night	Automatically removable infrared-cut filter
Minimum illumination	AXIS Q6042-E: Color: 0.5 lux at 30 IRE F1.4, B/W: 0.008 lux at 30 IRE F1.4 AXIS Q6044-E: Color: 0.2 lux at 30 IRE F1.4, B/W: 0.04 lux at 30 IRE F1.4 AXIS Q6045-E: Color: 0.6 lux at 30 IRE F1.6, B/W: 0.04 lux at 30 IRE F1.6
Shutter time	AXIS Q6042-E: 1/30000 s to 1.5 s (50 Hz), 1/30000 s to 0.5 s (60 Hz) AXIS Q6044-E: 1/10000 s to 1/4 s AXIS Q6045-E: 1/33000 s to 1/3 s (50 Hz), 1/33000 s to 1/4 s (60 Hz)
Pan/Tilt/Zoom	E-flip, 256 preset positions, Tour recording, Guard tour, Control queue, On-screen directional indicator Pan: 360° endless, 0.05°–450°/s; Tilt: 220°, 0.05°–450°/s AXIS Q6042-E: 36x optical zoom and 12x digital zoom, total 432x zoom AXIS Q6044-E: 30x optical zoom and 12x digital zoom, total 360x zoom AXIS Q6045-E: 20x optical zoom and 12x digital zoom, total 240x zoom
Video	
Video compression	H.264 Main and Baseline Profiles (MPEG-4 Part 10/AVC) Motion JPEG
Resolutions	AXIS Q6042-E: Extended D1 736x576 to 176x144 (50 Hz), Extended D1 752x480 to 176x120 (60 Hz) AXIS Q6044-E: 1280x720 (HDTV 720p) to 320x180 AXIS Q6045-E: 1920x1080 (HDTV 1080p) to 320x180
Frame rate	H.264: Up to 25/30 fps (50/60 Hz) in all resolutions Motion JPEG: Up to 25/30 fps (50/60 Hz) in all resolutions
Video streaming	Multiple, individually configurable streams in H.264 and Motion JPEG Controllable frame rate and bandwidth VBR/CBR H.264
Image settings	Wide dynamic range (WDR), Manual shutter time, Compression, Color, Brightness, Sharpness, White balance, Exposure control, Exposure zones, Backlight compensation, Fine tuning of behavior at low light, Rotation, Text and image overlay, 32 individual 3D privacy masks, Image freeze on PTZ AXIS Q6042-E: Electronic image stabilization AXIS Q6044-E: Electronic image stabilization, Automatic defog AXIS Q6045-E: Highlight compensation
Network	
Security	Password protection, IP address filtering, HTTPS ⁹ encryption, IEEE 802.1X ⁹ network access control, Digest authentication, User access log
Supported protocols	IPv4/v6, HTTP, HTTPS ⁹ , SSL/TLS ⁹ , QoS Layer 3 DiffServ, FTP, CIFS/SMB, SMTP, Bonjour, UPnP TM , SNMPv1/v2c/v3 (MIB-II), DNS, DynDNS, NTP, RTSP, RTP, TCP, UDP, IGMP, RTCP, ICMP, DHCP, ARP, SOCKS, SSH, NTCIP
System integration	
Application Programming Interface	Open API for software integration, including VAPIX [®] and AXIS Camera Application Platform; specifications at www.axis.com AXIS Video Hosting System (AVHS) with One-Click Camera Connection. ONVIF Profile S, specification at www.onvif.org
Intelligent video	Video motion detection, Autotracking, Active Gatekeeper, AXIS Camera Application Platform enabling installation of additional applications AXIS Q6044-E: Automatic defog AXIS Q6045-E: Basic analytics (not to be compared with third-party analytics): Object removed, Enter/exit detector, Fence detector, Object counter, Highlight compensation
Event triggers	Video motion detection, Shock detection, Fan, Heater, Temperature, Manual trigger, Autotracking, Moving, PTZ preset, Edge storage events, AXIS Camera Application Platform AXIS Q6045-E: Enter/exit, Fence detector, Object removed
Event actions	File upload: FTP, HTTP, network share and email Notification: email, HTTP and TCP PTZ preset, Guard tour, Autotracking, Day/night mode, Video recording to edge storage, Pre- and post-alarm video buffering
Built-in installation aids	Pixel counter
General	
Casing	IP66-, NEMA 4X- and IK10-rated metal casing (aluminum), polycarbonate (PC) clear dome, sunshield (PC/ASA)
Memory	512 MB RAM, 128 MB Flash
Power	High Power over Ethernet (High PoE), max. 60 W AXIS T8124 High PoE 60 W Midspan 1-port: 100–240 V AC, max. 74 W
Connectors	RJ45 for 10BASE-T/100BASE-TX PoE RJ45 Push-pull Connector (IP66) included
Edge storage	SD/SDHC/SDXC slot supporting memory card up to 64 GB (card not included); support for recording to network share (network-attached storage or file server)
Operating conditions	-50 °C to 50 °C (-58 °F to 122 °F) Arctic Temperature Control enables camera start-up at temperatures as low as -50 °C (-58 °F) Humidity 10–100% RH (condensing)
Storage conditions	-50 °C to 50 °C (-58 °F to 122 °F)
Approvals	EN 55022 Class A, EN 61000-3-2, EN 61000-3-3, EN 61000-6-1, EN 61000-6-2, EN 55024, EN 50121-4, IEC 62236-4, FCC Part 15 Subpart B Class A, ICES-003 Class A, VCCI Class A, C-tick AS/NZS CISPR 22 Class A, KCC KN22 Class A, KN24, IEC/EN/UL 60950-1, IEC/EN/UL 60950-22, IEC/EN 60529 IP66, NEMA 250 Type 4X, NEMA TS-2-2003 v 02.06, subsection 2.2.7, 2.2.8, 2.2.9; IEC 62262 IK10, IEC 60068-2-1, IEC 60068-2-2, IEC 60068-2-78, IEC 60068-2-14, IEC 60068-2-30, IEC 60068-2-6, IEC 60068-2-27, IEC 60068-2-60, ISO 4892-2 Midspan: EN 60950-1, GS, UL, cUL, CE, FCC, VCCI, CB, KCC, UL-AR
Weight	3.7 kg (8.2 lb.)
Included accessories	AXIS T8124 High PoE 60 W Midspan 1-port, RJ45 Push-pull Connector (IP66), Sunshield, Installation Guide, Installation and Management Software CD, Windows decoder 1-user license
Video management software	AXIS Camera Companion (included), AXIS Camera Station and video management software from Axis' Application Development Partners (not included). For more information, see www.axis.com/products/video/software
Warranty	Axis 3-year warranty and AXIS Extended Warranty option, see www.axis.com/warranty

- a. This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit. (www.openssl.org), and cryptographic software written by Eric Young (ey@cryptsoft.com).

More information is available at www.axis.com

AXIS Q16 Network Camera Series

Outstanding image performance in demanding lighting conditions.



- > HDTV 720p @ 50/60 fps
- > WDR with dynamic capture
- > Lightfinder technology
- > Power over Ethernet
- > Outdoor-ready models with Arctic Temperature Control

AXIS Q16 Network Camera Series comprises indoor and outdoor-ready fixed cameras that deliver outstanding image quality in demanding video surveillance conditions, such as poor or highly variable lighting.

The unique Lightfinder technology makes the cameras extremely sensitive to low light, effectively allowing them to 'see' even in dark conditions. The Wide Dynamic Range with 'dynamic capture' allows to provide homogeneous images, without too dark or too bright parts.

AXIS Q16 Series ranges from extended D1 resolution cameras to 1-megapixel cameras, with the advantage of HDTV 720p video at 50/60 frame per second in some models.

Installation is made easy with Power over Ethernet (IEEE 802.3af), which eliminates the need for power cables. The cameras also have a memory card slot for storing recordings locally.

The IP66-rated outdoor-ready cameras operate in temperatures from -40 °C to 50 °C (-40 °F to 122 °F) using High PoE. They feature Axis' unique Arctic Temperature Control to pre-heat the camera module for securing start up even at very low temperatures following a power failure.



Low-light sensitive and wide dynamic range cameras for indoor and outdoor use

AXIS Q16 Fixed Network Cameras offers outstanding models supporting WDR-dynamic capture capability, which are suitable for surveillance in highly variable lighting conditions, and models supporting Lightfinder technology that are suitable for environments with poor light conditions. Models supporting high frame rate ensures that quick movements are captured in more details.

Easy installation with innovative features

Setting the focus on AXIS Q16 Series is made easy with the focus assistant, indicated by a green LED when an image is in focus. Moreover, the focus can be remotely fine tuned with the remote back focus. The pixel counter helps the installer verify that the pixel resolution of an object fulfills regulatory or customer requirements. AXIS Q1614/-E can be installed wherever but always have a perfect image thanks to the leveling assistance, which guides you to the correct level; and the auto rotation that flips the image to the right orientation, also when Corridor Format is used.

Superior image quality

When light comes through a glass window or entrance, it creates both dark and bright zones. Identification of people or objects becomes critical. AXIS Q1604/-E, with Wide Dynamic Range-dynamic capture, ensures that no part of the image is too dark or too bright. Additionally, AXIS Q1614/-E provide a manual fine tuning of the high-contrast image for ease and clear identification even in very complicated scenes. AXIS Q1614/-E deliver smooth and highly detailed video in fast-paced environments. Identify of an incident is easy thanks to clear video with 50 or 60 frames per second in HDTV 720p video quality.

AXIS Q1602/-E and AXIS Q1614/-E incorporate Axis' revolutionary Lightfinder technology. Resulting in life-like colors in low-light conditions, the outstanding performance is the combination of well-founded decisions regarding the sensor and lens and carefully tuned image processing.

For more on WDR-dynamic capture and Lightfinder technology, go to: www.axis.com/corporate/corp/tech_papers.htm

Weather and impact protection



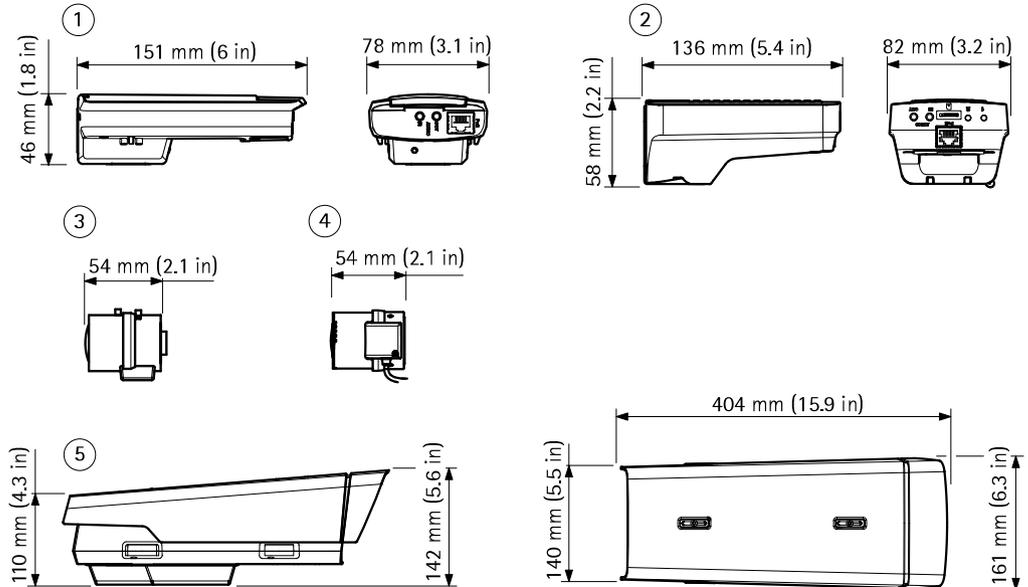
AXIS Q16-E Network Cameras save installation time and costs since they are ready out of the box for mounting outdoors. The IP66- and NEMA 4X- rated cameras have protection against dust, rain, snow and sunlight, and can operate in temperatures as low as -40 °C (-40 °F). Furthermore, they support IK10 rating for protection against impact and vandal acts. Additionally, AXIS Q1614/-E provides shock detection with adjustable sensitivity to send an alarm to personnel during attempted vandalism. Powered by Power over Ethernet makes installation easy since there is no need for a separate power cable.



Lightfinder technology with AXIS Q1602/-E, AXIS Q1614/-E Network Cameras
Left: Reference image, Middle: High-end surveillance camera, Right: AXIS Q1602/-E Network Cameras

Dimensions

1. AXIS Q1602/Q1604
2. AXIS Q1614
3. AXIS Q1602 lens
4. AXIS Q1604/Q1614 lens
5. AXIS Q16-E



Technical Specifications - AXIS Q16 Network Camera Series

Models	AXIS Q1602/-E: Extended D1 (768x576), indoor/outdoor AXIS Q1604/-E: 1 MP/HDTV 720p, indoor/outdoor AXIS Q1614/-E: 1 MP/HDTV 720p, indoor/outdoor	720p 50/60 fps: 1280x720 to 160x90; Extended D1: 768x576 to 160x90
Camera		
Image sensor	Progressive scan RGB CMOS 1/3"	
Lens	IR corrected, CS-mount, Megapixel resolution AXIS Q1602/-E: DC-iris AXIS Q1604/-E, AXIS Q1614/-E: P-Iris AXIS Q1602/Q1604/Q1614: Varifocal 2.8–8 mm: 100°–34° view ^a , F1.2 AXIS Q1602-E/Q1604-E/Q1614-E: Varifocal 2.8–8 mm: 80°–34° view ^a , F1.2	Frame rate AXIS Q1602/-E: 30 fps in all resolutions AXIS Q1604/-E: 25 fps in 50 Hz capture mode 30 fps in 60 Hz capture mode AXIS Q1614/-E: Extended D1 and 720p 25/30 fps: 25 fps with power line frequency 50 Hz 30 fps with power line frequency 60 Hz 720p 50/60 fps: 50 fps with power line frequency 50 Hz 60 fps with power line frequency 60 Hz
Day and night	Automatically removable infrared-cut filter	Video streaming Multiple, individually configurable streams in H.264/Motion JPEG, Controllable frame rate and bandwidth, VBR/CBR H.264
Minimum illumination	AXIS Q1602/-E: Color: 0.05 lux, F1.2, B/W: 0.008 lux, F1.2 AXIS Q1604/-E: Color: 0.1 lux, F1.2, B/W: 0.02 lux, F1.2 With WDR-dynamic capture: Color: 0.4 lux, F1.2, B/W: 0.06 lux, F1.2 AXIS Q1614/-E: Extended D1: Color: 0.05 lux, F1.2, B/W: 0.008 lux, F1.2; 720p 25/30 fps: Color: 0.1 lux, F1.2, B/W: 0.02 lux, F1.2; With WDR-dynamic capture: Color: 0.4 lux, F1.2, B/W: 0.06 lux, F1.2; 720p 50/60 fps: Color: 0.2 lux, F1.2, B/W: 0.04 lux, F1.2	Image settings Compression, Color, Brightness, Sharpness, Contrast, White balance, Exposure control, Exposure zones, Backlight compensation, WDR-dynamic contrast, Fine tuning of behavior at low light, Text and image overlay, Privacy mask, Mirroring of images AXIS Q1604/-E: WDR-dynamic capture: Up to 120dB (0.4–400,000 lux) depending on scene AXIS Q1614/-E: WDR-dynamic capture: Up to 120dB (0.4–400,000 lux) depending on scene, Auto-rotation, Shadow and highlight recovery, Day/Night shift level AXIS Q1602/Q1604/Q1614: Rotation: 0°, 90°, 180°, 270° including Corridor Format
Shutter time	AXIS Q1602/-E: 1/29500 s to 2 s AXIS Q1604/-E: 1/24500 s to 2 s with power line frequency 50 Hz 1/29500 s to 2 s with power line frequency 60 Hz With WDR-dynamic capture: 1/192 s to 1/37 s with power line frequency 50 Hz 1/231 s to 1/44 s with power line frequency 60 Hz AXIS Q1614/-E: Extended D1 and 720p 25/30 fps: 1/24500 s to 2 s with power line frequency 50 Hz 1/29500 s to 2 s with power line frequency 60 Hz 720p 25/30 fps with WDR-dynamic capture: 1/192 s to 1/37 s with power line frequency 50 Hz 1/231 s to 1/44 s with power line frequency 60 Hz 720p 50/60 fps: 1/37000 s to 2 s with power line frequency 50 Hz 1/43500 s to 2 s with power line frequency 60 Hz	Audio Audio streaming Two-way Audio compression AAC LC 8/16 kHz, G.711 PCM 8 kHz, G.726 ADPCM 8 kHz Configurable bit rate AXIS Q1614/-E: AAC LC 8/16/32 kHz Audio input/output External microphone, input or line input, line output AXIS Q1602/Q1604/Q1614: Built-in microphone (can be disabled) AXIS Q1614/-E: External balanced/unbalanced microphone or line input, line output
Video		Network Security Password protection, IP address filtering, HTTPS ^c encryption, IEEE 802.1X ^c network access control, Digest authentication, User access log Supported protocols IPv4/v6, HTTP, HTTPS, SSL/TLS ^c , QoS Layer 3 DiffServ, FTP, CIFS/SMB, SMTP, Bonjour, UPnP TM , SNMPv1/v2c/v3 (MIB-II), DNS, DynDNS, NTP, RTSP, RTP, TCP, UDP, IGMP, RTCP, ICMP, DHCP, ARP, SOCKS
Video compression	H.264 (MPEG-4 Part 10/AVC), H.264 Main and Baseline Profile, Motion JPEG	
Resolutions	AXIS Q1602/-E: 768x576 to 160x90 AXIS Q1604/-E: 1280x960 ^b (1 MP) to 160x90 AXIS Q1614/-E: 720p 25/30 fps: 1280x960 ^b to 160x90;	

System integration	
Application Programming Interface	Open API for software integration, including VAPIX® and AXIS Camera Application Platform; specifications at www.axis.com. AXIS Video Hosting System (AVHS) with One-Click Camera Connection. ONVIF Profile S; specification available at www.onvif.org
Intelligent video	Video motion detection, Active tampering alarm, Audio detection, Support for AXIS Camera Application Platform enabling installation of additional applications
Event triggers	Intelligent video, Edge storage events, External input AXIS Q1614/-E: Shock detection
Event actions	File upload: FTP, HTTP, network share and email Notification: email, HTTP and TCP Video and audio recording to edge storage Pre- and post-alarm video buffering External output activation; Play audio clip
Data streaming	Event data
Built-in installation aids	Focus assistant, Pixel counter, Remote back focus AXIS Q1614/-E: Leveling assistant
General	
Casing	Camera: Metal (zinc) AXIS Q1602-E/Q1604-E/Q1614-E: IP66- and NEMA 4X-rated, IK10 impact resistant aluminum enclosure Color: White NCS S 1002-B
Memory	256 MB RAM, 128 MB Flash
Power	AXIS Q1602/Q1604: 8–20 V DC or Power over Ethernet IEEE 802.3af/802.3at Type 1 Class 3 AXIS Q1602: max. 6.5 W, AXIS Q1604: max. 6.9 W AXIS Q1614: 8–28 V DC or Power over Ethernet IEEE 802.3af/802.3at Type 1 Class 3, max. 10.8 W AXIS Q1602-E/Q1604-E/Q1614-E: Power over Ethernet IEEE 802.3af/802.3at Type 1 Class 3, max. 12.95 W or High PoE max. 25.5 W
Connectors	RJ45 10BASE-T/100BASE-TX PoE, 3.5 mm mic/line in, 3.5 mm line out AXIS Q1602/Q1604/Q1614: DC input AXIS Q1602/-E, AXIS Q1604/-E: Terminal block for 1 alarm input and 1 output AXIS Q1614/-E: RS485/422, Terminal block for two configurable inputs/outputs (12 V DC output, max. load 50 mA)
Edge storage	Support for recording to dedicated network-attached storage (NAS)

	AXIS Q1602/-E, AXIS Q1604/-E: SD/SDHC/SDXC slot supporting memory card up to 64 GB (card not included) AXIS Q1614/-E: microSD/microSDHC/microSDXC slot supporting memory card up to 64 GB (card not included)
Operating conditions	AXIS Q1602/Q1604/Q1614: 0 °C to 50 °C (32 °F to 122 °F) Humidity 10–85% RH (non-condensing) AXIS Q1602-E/Q1604-E/Q1614-E: -30 °C to 50 °C (-22 °F to 122 °F) with PoE; down to -40 °C (-40 °F) with Axis High PoE midspan, max. 30 W Humidity 10–100% RH (condensing)
Approvals	EN 55022 Class B, EN 61000-3-2, EN 61000-3-3, EN 55024, EN 61000-6-1, EN 61000-6-2, FCC Part 15 Subpart B Class B, ICES-003 Class B, VCCI Class B, C-tick AS/NZS CISPR 22 Class B, KCC KN22 Class B, KN24, IEC/EN/UL 60950-1 AXIS Q1602-E/Q1604-E/Q1614-E: EN 50121-4, IEC 62236-4, IEC/EN/UL 60950-22, IEC/EN 60529 IP66, NEMA 250 Type 4X, IEC 60068-2-6, IEC 60068-2-27, IEC/EN 62262 IK10
Weight	AXIS Q1602/Q1604: 600 g (1.3 lb) AXIS Q1614: 925 g (2 lb) AXIS Q1602-E/Q1604-E: 3100 g (6.8 lb) AXIS Q1614-E: 3525 g (7.7 lb)
Included accessories	Stand, Connector kit, ResiTorx20 tool, Installation Guide, Installation and Management Software CD, Windows decoder 1-user license AXIS Q1602-E/Q1604-E/Q1614-E: Wall mount bracket, Sunshield
Optional accessories	AXIS T91A47 Pole Mount, VT mounts, AXIS T98A16-VE Surveillance Cabinet, Optional lenses, Axis Power over Ethernet Midspans, AXIS T90A Illuminators
Video management software	AXIS Camera Station and video management software from Axis' Application Development Partners (not included). For more information, see www.axis.com/products/video/software
Warranty	Axis 3-year warranty and AXIS Extended Warranty option, see www.axis.com/warranty

- Horizontal angle of view
- 1400x1050 (1.4 MP) scaled resolution available via VAPIX®
- This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (<http://www.openssl.org/>), and cryptographic software written by Eric Young (ey@cryptsoft.com).

More information is available at www.axis.com

DigitalMedia™ Switcher Output Cards

- > A complete family of output cards for the DM-MD8X8, DM-MD16X16, and DM-MD32X32
- > Available in five types of DM®, plus HDBaseT®, HDMI®, analog audio, and H.264 streaming
- > Modular concept enables versatile combinations of multiple output types on one switcher chassis
- > Affords a unified HD signal distribution solution incorporating both point-to-point wired and IP streaming technologies
- > Easily configured using the online DigitalMedia™ Switcher Configuration Tool
- > Support for 4K Ultra HD and 4K DCI resolutions via Type 8 DM 8G+™ output cards

The DMCO series is a family of output cards for Crestron® DigitalMedia™ Matrix Switchers. A complete selection of cards is offered to allow numerous combinations of DigitalMedia, HDBaseT®, HDMI®, H.264 streaming, and analog audio outputs on a single switcher chassis. The **DM-MD8X8** accepts up to two DMCO cards, with up to four outputs per card, for a total of 8 possible outputs. The **DM-MD16X16** accepts up to two DMCO cards, with up to eight outputs per card, for a total of 16 possible outputs. Finally, the **DM-MD32X32** accepts up to eight DMCO cards, with up to four outputs per card, for a total of 32 possible outputs.

DigitalMedia™ Outputs

DigitalMedia (DM®) outputs are offered in five types — DM Fiber, DM CAT, DM 8G® Fiber, DM 8G Single-Mode Fiber, and DM 8G+™. Each type of DM is available in pairs of two completely independent outputs. An HDMI output is also provided in parallel with every odd-numbered DM output (excluding DM Fiber), providing a supplemental connection for feeding a centralized audio processor or display device via HDMI while simultaneously driving a remote display device via DM.

DM Fiber and DM CAT represent the first generation of DigitalMedia, while DM 8G Fiber, DM 8G Single-Mode Fiber, and DM 8G+ are the latest generation. DM 8G provides a true one-wire transport for moving high-definition video, audio, and Ethernet over low-cost twisted-pair or fiber optic cable without any compression or repeaters. Engineered for ultra high-bandwidth and ultimate scalability, DM 8G handles uncompressed video beyond high-definition, with support for HDCP, Deep Color, and 3D. Audio capabilities include simultaneous stereo and multichannel surround sound signals, with support for high-bitrate 7.1 audio formats like Dolby® TrueHD and DTS-HD Master Audio™ as well as uncompressed linear PCM.

HDBaseT® Certified

DM 8G+ outputs are also compatible with HDBaseT, allowing a DM switcher to connect directly to HDBaseT compliant devices without requiring any DM receivers. Crestron DM 8G+ technology is designed using HDBaseT Alliance specifications, ensuring interoperability with third-party HDBaseT products.

4K Ultra HD

4K Ultra HD and 4K DCI video resolutions are supported via DM 8G+, HDBaseT, and HDMI outputs using “Type 8” DM 8G+ output cards.



H.264 Streaming

High-performance H.264 streaming capability enables enterprise-wide distribution of HD content over an IP network. Streaming expands the capabilities of DM to remove all distance limitations and allow distribution to virtually any device — anywhere in the world. Streaming is an essential component of any complete DM system, allowing for high-definition signal routing to Crestron touch screens, digital signage displays, remote buildings, and global offices without requiring any new or dedicated wiring. Large-scale streaming to computers and mobile devices can be facilitated through integration with a streaming media system such as Wowza® or Kaltura®.

DigitalMedia with streaming affords the ability to distribute any combination of sources to virtually any device anywhere. Each streaming output supports resolutions up to HD 1080p at bitrates up to 25 Mbps. Built-in scaling enables fast, trouble-free switching between sources of any type or resolution. Audio support includes stereo signals, as well as multichannel audio signals down-mixed to stereo via a DM switcher input card with DSP.^[1] High-quality video and audio is maintained using high-performance H.264 video and AAC audio compression. The encoded video and audio can be output as independent RTP streams or encapsulated in an MPEG-TS (MPEG-2 Transport Stream) container. HDCP management ensures that protected content cannot be distributed via streaming.

Each streaming output is actually fed internally by two separate switcher outputs, allowing any two input sources to appear picture-in-picture or side-by-side in a single stream. Instant, single-frame switching between two full screen images is also possible. The audio signals from both input sources can also be mixed, allowing both signals to be heard simultaneously.

DigitalMedia provides many deployment options to address a wide range of streaming applications and accommodate each organization's specific

DMCO DigitalMedia™ Switcher Output Cards

IT requirements. DM with streaming supports both unicast and multicast, with or without RTSP (Real Time Streaming Protocol). Streaming connections can be configured to stream directly to one or more specific IP addresses, or to use RTSP to manage the configuration of numerous connections automatically. Any streaming output may be configured to stream via the DM switcher's LAN port or via a dedicated "CONTENT LAN" port, allowing the option to combine control and content on a single network or isolate them onto separate networks.

HDMI® and Analog Audio Outputs

For applications that do not require a long-distance wiring or streaming solution, pairs of dedicated HDMI outputs are offered. Each HDMI output is accompanied by a balanced analog stereo audio output, making any 2-channel audio signal available to feed an analog audio mixer, processor, or amplifier.

NOTE: DMCO cards for the DM-MD8X8 and DM-MD32X32 are field-installable, allowing output configurations to be customized and changed at any time. DMCO cards for the DM-MD16X16 must be installed by a Crestron-authorized technician, and new DM-MD16X16 switchers are shipped with the desired DMCO output card(s) installed.

To configure a DM switcher complete with input and output cards, cables, and other peripherals, please use the [DigitalMedia™ Switcher Configuration Tool](#).

Please refer to the *DigitalMedia Resources Webpage* at <http://www.crestron.com/dmresources/> for additional design tools and reference documents.

SPECIFICATIONS

Video & Audio

DM Fiber (Type 1):

Output Signal Type: DM® Fiber (DigitalMedia™ over two multimode fiber optic strands);

Video Formats: DM Fiber with Deep Color & 3D, HDCP content protection support;

Audio Formats: Dolby Digital®, Dolby Digital EX, Dolby Digital Plus, Dolby® TrueHD, DTS®, DTS-ES, DTS 96/24, DTS-HD High Res, DTS-HD Master Audio™, Up to 8ch PCM;

Output Resolutions, Progressive: 640x480@60Hz, 720x480@60Hz (480p), 720x576@50Hz (576p), 800x600@60Hz, 848x480@60Hz, 852x480@60Hz, 854x480@60Hz, 1024x768@60Hz, 1024x852@60Hz, 1024x1024@60Hz, 1280x720@50Hz (720p50), 1280x720@60Hz (720p60), 1280x768@60Hz, 1280x800@60Hz, 1280x960@60Hz, 1280x1024@60Hz, 1360x768@60Hz, 1365x1024@60Hz, 1366x768@60Hz, 1400x1050@60Hz, 1440x900@60Hz, 1600x900@60Hz, 1600x1200@60Hz, 1680x1050@60Hz, 1920x1080@24Hz (1080p24), 1920x1080@25Hz (1080p25), 1920x1080@50Hz (1080p50), 1920x1080@60Hz (1080p60), 1920x1200@60Hz, 2048x1080@24Hz, 2048x1152@60Hz, plus any other resolution allowed by HDMI up to 165MHz pixel clock;

Output Resolutions, Interlaced: 720x480@30Hz (480i), 720x576@25Hz (576i), 1920x1080@25Hz (1080i25), 1920x1080@30Hz (1080i30), plus

any other resolution allowed by HDMI up to 165MHz pixel clock

DM CAT (Type 2):

Output Signal Types: DM CAT (DigitalMedia over shielded twisted-pair copper wire), HDMI®, DVI²;

Video Formats: DM CAT & HDMI with Deep Color & 3D, HDCP content protection support;

Audio Formats: Dolby Digital, Dolby Digital EX, Dolby Digital Plus, Dolby TrueHD, DTS, DTS-ES, DTS 96/24, DTS-HD High Res, DTS-HD Master Audio, Up to 8ch PCM;

Output Resolutions, Progressive: 640x480@60Hz, 720x480@60Hz (480p), 720x576@50Hz (576p), 800x600@60Hz, 848x480@60Hz, 852x480@60Hz, 854x480@60Hz, 1024x768@60Hz, 1024x852@60Hz, 1024x1024@60Hz, 1280x720@50Hz (720p50), 1280x720@60Hz (720p60), 1280x768@60Hz, 1280x800@60Hz, 1280x960@60Hz, 1280x1024@60Hz, 1360x768@60Hz, 1365x1024@60Hz, 1366x768@60Hz, 1400x1050@60Hz, 1440x900@60Hz, 1600x900@60Hz, 1600x1200@60Hz, 1680x1050@60Hz, 1920x1080@24Hz (1080p24), 1920x1080@25Hz (1080p25), 1920x1080@50Hz (1080p50), 1920x1080@60Hz (1080p60), 1920x1200@60Hz, 2048x1080@24Hz, 2048x1152@60Hz, plus any other resolution allowed by HDMI up to 165MHz pixel clock;

Output Resolutions, Interlaced: 720x480@30Hz (480i), 720x576@25Hz (576i), 1920x1080@25Hz (1080i25), 1920x1080@30Hz (1080i30), plus any other resolution allowed by HDMI up to 165MHz pixel clock

HDMI & Analog Audio (Type 3):

Output Signal Types, Video: HDMI, DVI²;

Output Signal Types, Audio: HDMI, Analog Stereo;

Video Formats: HDMI with Deep Color & 3D, HDCP content protection support;

Audio Formats, Digital: Dolby Digital, Dolby Digital EX, Dolby Digital Plus, Dolby TrueHD, DTS, DTS-ES, DTS 96/24, DTS-HD High Res, DTS-HD Master Audio, Up to 8ch PCM;

Audio Formats, Analog: Stereo 2-channel;

Output Resolutions, Progressive: 640x480@60Hz, 720x480@60Hz (480p), 720x576@50Hz (576p), 800x600@60Hz, 848x480@60Hz, 852x480@60Hz, 854x480@60Hz, 1024x768@60Hz, 1024x852@60Hz, 1024x1024@60Hz, 1280x720@50Hz (720p50), 1280x720@60Hz (720p60), 1280x768@60Hz, 1280x800@60Hz, 1280x960@60Hz, 1280x1024@60Hz, 1360x768@60Hz, 1365x1024@60Hz, 1366x768@60Hz, 1400x1050@60Hz, 1440x900@60Hz, 1600x900@60Hz, 1600x1200@60Hz, 1680x1050@60Hz, 1920x1080@24Hz (1080p24), 1920x1080@25Hz (1080p25), 1920x1080@50Hz (1080p50), 1920x1080@60Hz (1080p60), 1920x1200@60Hz, 2048x1080@24Hz, 2048x1152@60Hz, plus any other resolution allowed by HDMI up to 165MHz pixel clock;

Output Resolutions, Interlaced: 720x480@30Hz (480i), 720x576@25Hz (576i), 1920x1080@25Hz (1080i25), 1920x1080@30Hz (1080i30), plus any other resolution allowed by HDMI up to 165MHz pixel clock;

Digital-To-Analog Audio Conversion: 24-bit 48 kHz;

Audio Performance (analog):

Frequency Response: 20Hz to 20kHz ±0.5 dB;

S/N Ratio: >95 dB;

THD+N: <0.005% @ 1 kHz;

Stereo Separation: >90 dB;

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Volume Gain Range (analog): -80dB to 0dB, adjustable from 0% to 100%

DM 8G Fiber (Type 4):

Output Signal Types: DM 8G® Fiber (DigitalMedia over one multimode fiber optic strand), HDMI, DVI^[2];

Video Formats: DM 8G Fiber & HDMI with Deep Color & 3D, HDCP content protection support;

Audio Formats: Dolby Digital, Dolby Digital EX, Dolby Digital Plus, Dolby TrueHD, DTS, DTS-ES, DTS 96/24, DTS-HD High Res, DTS-HD Master Audio, Up to 8ch PCM;

Output Resolutions, Progressive: 640x480@60Hz, 720x480@60Hz (480p), 720x576@50Hz (576p), 800x600@60Hz, 848x480@60Hz, 852x480@60Hz, 854x480@60Hz, 1024x768@60Hz, 1024x852@60Hz, 1024x1024@60Hz, 1280x720@50Hz (720p50), 1280x720@60Hz (720p60), 1280x768@60Hz, 1280x800@60Hz, 1280x960@60Hz, 1280x1024@60Hz, 1360x768@60Hz, 1365x1024@60Hz, 1366x768@60Hz, 1400x1050@60Hz, 1440x900@60Hz, 1600x900@60Hz, 1600x1200@60Hz, 1680x1050@60Hz, 1920x1080@24Hz (1080p24), 1920x1080@25Hz (1080p25), 1920x1080@50Hz (1080p50), 1920x1080@60Hz (1080p60), 1920x1200@60Hz, 2048x1080@24Hz, 2048x1152@60Hz, plus any other resolution allowed by HDMI up to 165MHz pixel clock;

Output Resolutions, Interlaced: 720x480@30Hz (480i), 720x576@25Hz (576i), 1920x1080@25Hz (1080i25), 1920x1080@30Hz (1080i30), plus any other resolution allowed by HDMI up to 165MHz pixel clock

DM 8G+ (Type 5):

Output Signal Types: DM 8G+™ (DigitalMedia over one CAT5e twisted-pair copper wire), HDBaseT®, HDMI, DVI^[2];

Video Formats: DM 8G+, HDBaseT, & HDMI with Deep Color & 3D; HDCP content protection support;

Audio Formats: Dolby Digital, Dolby Digital EX, Dolby Digital Plus, Dolby TrueHD, DTS, DTS-ES, DTS 96/24, DTS-HD High Res, DTS-HD Master Audio, Up to 8ch PCM;

Output Resolutions, Progressive: 640x480@60Hz, 720x480@60Hz (480p), 720x576@50Hz (576p), 800x600@60Hz, 848x480@60Hz, 852x480@60Hz, 854x480@60Hz, 1024x768@60Hz, 1024x852@60Hz, 1024x1024@60Hz, 1280x720@50Hz (720p50), 1280x720@60Hz (720p60), 1280x768@60Hz, 1280x800@60Hz, 1280x960@60Hz, 1280x1024@60Hz, 1360x768@60Hz, 1365x1024@60Hz, 1366x768@60Hz, 1400x1050@60Hz, 1440x900@60Hz, 1600x900@60Hz, 1600x1200@60Hz, 1680x1050@60Hz, 1920x1080@24Hz (1080p24), 1920x1080@25Hz (1080p25), 1920x1080@50Hz (1080p50), 1920x1080@60Hz (1080p60), 1920x1200@60Hz, 2048x1080@24Hz, 2048x1152@60Hz, plus any other resolution allowed by HDMI up to 165MHz pixel clock;

Output Resolutions, Interlaced: 720x480@30Hz (480i), 720x576@25Hz (576i), 1920x1080@25Hz (1080i25), 1920x1080@30Hz (1080i30), plus any other resolution allowed by HDMI up to 165MHz pixel clock

DM 8G Single-Mode Fiber (Type 6):

Output Signal Types: DM 8G SMF (DigitalMedia over one single-mode fiber optic strand), HDMI, DVI^[2];

Video Formats: DM 8G SMF & HDMI with Deep Color & 3D, HDCP content protection support;

Audio Formats: Dolby Digital, Dolby Digital EX, Dolby Digital Plus, Dolby

TrueHD, DTS, DTS-ES, DTS 96/24, DTS-HD High Res, DTS-HD Master Audio, Up to 8ch PCM;

Output Resolutions, Progressive: 640x480@60Hz, 720x480@60Hz (480p), 720x576@50Hz (576p), 800x600@60Hz, 848x480@60Hz, 852x480@60Hz, 854x480@60Hz, 1024x768@60Hz, 1024x852@60Hz, 1024x1024@60Hz, 1280x720@50Hz (720p50), 1280x720@60Hz (720p60), 1280x768@60Hz, 1280x800@60Hz, 1280x960@60Hz, 1280x1024@60Hz, 1360x768@60Hz, 1365x1024@60Hz, 1366x768@60Hz, 1400x1050@60Hz, 1440x900@60Hz, 1600x900@60Hz, 1600x1200@60Hz, 1680x1050@60Hz, 1920x1080@24Hz (1080p24), 1920x1080@25Hz (1080p25), 1920x1080@50Hz (1080p50), 1920x1080@60Hz (1080p60), 1920x1200@60Hz, 2048x1080@24Hz, 2048x1152@60Hz, plus any other resolution allowed by HDMI up to 165MHz pixel clock;

Output Resolutions, Interlaced: 720x480@30Hz (480i), 720x576@25Hz (576i), 1920x1080@25Hz (1080i25), 1920x1080@30Hz (1080i30), plus any other resolution allowed by HDMI up to 165MHz pixel clock

Streaming (Type 7):

Video Streaming Formats: H.264 @ 360p60, 480p30, 480p60, 720p10, 720p15, 720p30, 720p60, 1080p10, 1080p15, and 1080p30;

Video Streaming Bitrate: Up to 25 Mbps;

Audio Format: AAC stereo;

Streaming Protocols: RTP, RTSP, SDP;

Container: MPEG-2 transport stream (.ts) or none;

Session Initiation Modes:

0: By receiver (unicast);

1: By transmitter (unicast);

2: Multicast via RTSP;

3: Multicast via UDP;

Audio Controls:

Volume: Adjustable 0% to 100%, plus mute;

Bass: ±15.0 dB;

Treble: ±15.0 dB;

Delay: 0.0 to 40.0 ms;

Source 1 – 2 Mix Level: -80.0 to 0.0 dB

DM 8G+ w/4K Support (Type 8):

Output Signal Types: DM 8G+ (DigitalMedia over one CAT5e twisted-pair copper wire), HDBaseT, HDMI, DVI^[2];

Video Formats: DM 8G+, HDBaseT, & HDMI with Deep Color, 3D, & 4K; HDCP content protection support;

Audio Formats: Dolby Digital, Dolby Digital EX, Dolby Digital Plus, Dolby TrueHD, DTS, DTS-ES, DTS 96/24, DTS-HD High Res, DTS-HD Master Audio, Up to 8ch PCM;

Output Resolutions, Progressive: 640x480@60Hz, 720x480@60Hz (480p), 720x576@50Hz (576p), 800x600@60Hz, 848x480@60Hz, 852x480@60Hz, 854x480@60Hz, 1024x768@60Hz, 1024x852@60Hz, 1024x1024@60Hz, 1280x720@50Hz (720p50), 1280x720@60Hz (720p60), 1280x768@60Hz, 1280x800@60Hz, 1280x960@60Hz, 1280x1024@60Hz, 1360x768@60Hz, 1365x1024@60Hz, 1366x768@60Hz, 1400x1050@60Hz, 1440x900@60Hz, 1600x900@60Hz, 1600x1200@60Hz, 1680x1050@60Hz, 1920x1080@24Hz (1080p24), 1920x1080@25Hz (1080p25), 1920x1080@50Hz (1080p50), 1920x1080@60Hz (1080p60), 1920x1200@60Hz, 2048x1080@24Hz, 2048x1152@60Hz,

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2560x1440@60Hz, 2560x1600@60Hz, 3840x2160@24Hz, 3840x2160@25Hz, 3840x2160@30Hz, 3840x2160@50Hz^[3], 3840x2160@60Hz^[3], 4096x2160@24Hz, 4096x2160@50Hz^[3], 4096x2160@60Hz^[3], plus any other resolution allowed by HDMI up to 300MHz pixel clock;

Output Resolutions, Interlaced: 720x480@30Hz (480i), 720x576@25Hz (576i), 1920x1080@25Hz (1080i25), 1920x1080@30Hz (1080i30), plus any other resolution allowed by HDMI up to 300MHz pixel clock

Connectors & Indicators

DM Fiber (Type 1):

D, M: (2, 4, 6, or 8) DM Fiber outputs, each composed of (2) SC female optical fiber connectors;

Connect to DM Fiber inputs of DM receivers or other DM devices via CresFiber® 8G fiber optic cable^[4,9]

DM CAT (Type 2):

D, M: (2, 4, 6, or 8) DM CAT outputs, each composed of (2) 8-pin RJ45 female, shielded;

Connect to DM CAT inputs of DM receivers or other DM devices via DM-CBL DigitalMedia cable^[5,9];

HDMI: (1 per each odd-numbered DM port) 19-pin Type A HDMI, female, digital video/audio outputs

HDMI & Analog Audio (Type 3):

HDMI: (2, 4, 6, or 8) 19-pin Type A HDMI, female, digital video/audio outputs;

L, R: (1 per each HDMI port) 5-pin 3.5mm detachable terminal blocks; Balanced/unbalanced stereo line-level outputs, variable level; Output Impedance: 200 Ohms balanced, 100 Ohms unbalanced; Maximum Output Level: 4 Vrms balanced, 2 Vrms unbalanced

DM 8G Fiber (Type 4):

MMF/SC: (2, 4, 6, or 8) DM 8G Fiber outputs, each composed of (1) SC female optical fiber connector;

Connect to DM 8G Fiber inputs of DM receivers or other DM devices via CresFiber 8G fiber optic cable^[6,9];

HDMI: (1 per each odd-numbered MMF/SC port) 19-pin Type A HDMI, female, digital video/audio outputs;

DM Link Indicator: (1 per each MMF/SC port) green LED, indicates DM link status

DM 8G+ (Type 5):

DM OUT: (2, 4, 6, or 8) DM 8G+ outputs (HDBaseT compliant), each composed of (1) 8-pin RJ45 female, shielded;

PoDM and PoH PSE (Power Sourcing Equipment) ports^[10];

Connect to DM 8G+ inputs of DM receivers or other DM devices, or to HDBaseT devices, via CAT5e or Crestron DM-CBL-8G DigitalMedia 8G^a cable^[7,9];

POE IN: (1 per each DM OUT port) 8-pin RJ45 female, PoE inputs;

Connect to a DM-PSU-8 or DM-PSU-16 PoDM Power Supply, or to an 802.3af or 802.3at compliant PoE PSE (Power Sourcing Equipment), to enable PoDM and PoH power sourcing via the corresponding DM 8G+ output^[10];

HDMI: (1 per each odd-numbered DM OUT port) 19-pin Type A HDMI, female, digital video/audio outputs;

DM Link Indicator: (1 set per each DM OUT port) green & amber LEDs, green indicates DM link status, amber indicates DM signal stream and HDCP status

DM 8G Single-Mode Fiber (Type 6):

SMF/LC: (2, 4, 6, or 8) DM 8G Single-Mode Fiber outputs, each composed of (1) LC female optical fiber connector;

Connect to DM 8G SMF inputs of DM receivers or other DM devices via CresFiber 8G SM single-mode fiber optic cable^[8,9];

HDMI: (1 per each odd-numbered SMF/LC port) 19-pin Type A HDMI, female, digital video/audio outputs;

DM Link Indicator: (1 per each SMF/LC port) green LED, indicates DM link status

Streaming (Type 7):

CONTENT LAN: (1, 2, 3, or 4) 8-wire RJ45 female; 10Base-T/100Base-TX/1000Base-T Ethernet ports;

Each port provides a dedicated LAN connection per streaming output for use in lieu of streaming via the switcher's main LAN port;

LAN Link Indicators: (1 set per each CONTENT LAN port) green & amber LEDs, green indicates Ethernet link status, amber indicates Ethernet activity

DM 8G+ w/4K Support (Type 8):

DM OUT: (2, 4, 6, or 8) DM 8G+ outputs (HDBaseT compliant), each composed of (1) 8-pin RJ45 female, shielded;

PoDM and PoH PSE (Power Sourcing Equipment) ports^[10];

Connect to DM 8G+ inputs of DM receivers or other DM devices, or to HDBaseT devices, via CAT5e or Crestron DM-CBL-8G DigitalMedia 8G^a cable^[7,9];

POE IN: (1 per each DM OUT port) 8-pin RJ45 female, PoE inputs;

Connect to a DM-PSU-8 or DM-PSU-16 PoDM Power Supply, or to an 802.3af or 802.3at compliant PoE PSE (Power Sourcing Equipment), to enable PoDM and PoH power sourcing via the corresponding DM 8G+ output^[10];

HDMI: (1 per each odd-numbered DM OUT port) 19-pin Type A HDMI, female, digital video/audio outputs;

DM Link Indicator: (1 set per each DM OUT port) green & amber LEDs, green indicates DM link status, amber indicates DM signal stream and HDCP status

Construction

DMCO-xx: Plug-in card for DM-MD8X8 and DM-MD32X32, occupies (1) output card slot, includes metal faceplate w/black finish

DMCO-xxxx: Factory-installed card for DM-MD16X16, occupies (1) output card slot, includes metal faceplate w/black finish

DMCO DigitalMedia™ Switcher Output Cards

MODELS & ACCESSORIES

Available Models – for DM-MD8X8 & DM-MD32X32

DMCO-10: 2 DM Fiber Output Card
DMCO-11: 4 DM Fiber Output Card
DMCO-20: 2 DM CAT w/1 HDMI Output Card
DMCO-22: 4 DM CAT w/2 HDMI Output Card
DMCO-30: 2 HDMI w/2 Stereo Analog Audio Output Card
DMCO-33: 4 HDMI w/4 Stereo Analog Audio Output Card
DMCO-40: 2 DM 8G Fiber w/1 HDMI Output Card
DMCO-44: 4 DM 8G Fiber w/2 HDMI Output Card
DMCO-50: 2 DM 8G+ w/1 HDMI Output Card
DMCO-55: 4 DM 8G+ w/2 HDMI Output Card
DMCO-60: 2 DM 8G SM Fiber w/1 HDMI Output Card
DMCO-66: 4 DM 8G SM Fiber w/2 HDMI Output Card
DMCO-70: 1 Streaming Output Card
DMCO-77: 2 Streaming Output Card
DMCO-80: 2 DM 8G+ w/1 HDMI Output Card, 4K Support
DMCO-88: 4 DM 8G+ w/2 HDMI Output Card, 4K Support
DMCO-12: 2 DM Fiber & 2 DM CAT w/1 HDMI Output Card
DMCO-13: 2 DM Fiber & 2 HDMI w/2 Stereo Analog Audio Output Card
DMCO-15: 2 DM Fiber & 2 DM 8G+ w/1 HDMI Output Card
DMCO-23: 2 DM CAT w/1 HDMI & 2 HDMI w/2 Stereo Analog Audio Output Card
DMCO-43: 2 DM 8G Fiber w/1 HDMI & 2 HDMI w/2 Stereo Analog Audio Output Card
DMCO-45: 2 DM 8G Fiber w/1 HDMI & 2 DM 8G+ w/1 HDMI Output Card
DMCO-53: 2 DM 8G+ w/1 HDMI & 2 HDMI w/2 Stereo Analog Audio Output Card
DMCO-63: 2 DM 8G SM Fiber w/1 HDMI & 2 HDMI w/2 Stereo Analog Audio Output Card
DMCO-64: 2 DM 8G SM Fiber w/1 HDMI & 2 DM 8G Fiber w/1 HDMI Output Card
DMCO-65: 2 DM 8G SM Fiber w/1 HDMI & 2 DM 8G+ w/1 HDMI Output Card
DMCO-73: 1 Streaming & 2 HDMI w/2 Stereo Analog Audio Output Card
DMCO-74: 1 Streaming & 2 DM 8G Fiber w/1 HDMI Output Card
DMCO-75: 1 Streaming & 2 DM 8G+ w/1 HDMI Output Card
DMCO-76: 1 Streaming & 2 DM 8G SM Fiber w/1 HDMI Output Card

Available Models – for DM-MD16X16

DMCO-1000: 2 DM Fiber Output Card
DMCO-1100: 4 DM Fiber Output Card
DMCO-1110: 6 DM Fiber Output Card
DMCO-1111: 8 DM Fiber Output Card
DMCO-2000: 2 DM CAT w/1 HDMI Output Card
DMCO-2200: 4 DM CAT w/2 HDMI Output Card
DMCO-2220: 6 DM CAT w/3 HDMI Output Card
DMCO-2222: 8 DM CAT w/4 HDMI Output Card

DMCO-3000: 2 HDMI w/2 Stereo Analog Audio Output Card
DMCO-3300: 4 HDMI w/4 Stereo Analog Audio Output Card
DMCO-3330: 6 HDMI w/6 Stereo Analog Audio Output Card
DMCO-3333: 8 HDMI w/8 Stereo Analog Audio Output Card

DMCO-4000: 2 DM 8G Fiber w/1 HDMI Output Card
DMCO-4400: 4 DM 8G Fiber w/2 HDMI Output Card
DMCO-4440: 6 DM 8G Fiber w/3 HDMI Output Card
DMCO-4444: 8 DM 8G Fiber w/4 HDMI Output Card

DMCO-5000: 2 DM 8G+ w/1 HDMI Output Card
DMCO-5500: 4 DM 8G+ w/2 HDMI Output Card
DMCO-5550: 6 DM 8G+ w/3 HDMI Output Card
DMCO-5555: 8 DM 8G+ w/4 HDMI Output Card

DMCO-6000: 2 DM 8G SM Fiber w/1 HDMI Output Card
DMCO-6600: 4 DM 8G SM Fiber w/2 HDMI Output Card
DMCO-6660: 6 DM 8G SM Fiber w/3 HDMI Output Card
DMCO-6666: 8 DM 8G SM Fiber w/4 HDMI Output Card

DMCO-7000: 1 Streaming Output Card
DMCO-7700: 2 Streaming Output Card
DMCO-7770: 3 Streaming Output Card
DMCO-7777: 4 Streaming Output Card

DMCO-8000: 2 DM 8G+ w/1 HDMI Output Card, 4K Support
DMCO-8800: 4 DM 8G+ w/2 HDMI Output Card, 4K Support
DMCO-8880: 6 DM 8G+ w/3 HDMI Output Card, 4K Support
DMCO-8888: 8 DM 8G+ w/4 HDMI Output Card, 4K Support

DMCO-1112: 6 DM Fiber & 2 DM CAT w/1 HDMI Output Card
DMCO-1113: 6 DM Fiber & 2 HDMI w/2 Stereo Analog Audio Output Card
DMCO-1115: 6 DM Fiber & 2 DM 8G+ w/1 HDMI Output Card
DMCO-1120: 4 DM Fiber & 2 DM CAT w/1 HDMI Output Card
DMCO-1122: 4 DM Fiber & 4 DM CAT w/2 HDMI Output Card
DMCO-1130: 4 DM Fiber & 2 HDMI w/2 Stereo Analog Audio Output Card
DMCO-1133: 4 DM Fiber & 4 HDMI w/4 Stereo Analog Audio Output Card
DMCO-1150: 4 DM Fiber & 2 DM 8G+ w/1 HDMI Output Card
DMCO-1155: 4 DM Fiber & 4 DM 8G+ w/2 HDMI Output Card
DMCO-2100: 2 DM Fiber & 2 DM CAT w/1 HDMI Output Card
DMCO-1220: 2 DM Fiber & 4 DM CAT w/2 HDMI Output Card
DMCO-2221: 2 DM Fiber & 6 DM CAT w/3 HDMI Output Card
DMCO-1300: 2 DM Fiber & 2 HDMI w/2 Stereo Analog Audio Output Card
DMCO-1330: 2 DM Fiber & 4 HDMI w/4 Stereo Analog Audio Output Card
DMCO-1333: 2 DM Fiber & 6 HDMI w/6 Stereo Analog Audio Output Card
DMCO-5100: 2 DM Fiber & 2 DM 8G+ w/1 HDMI Output Card
DMCO-1550: 2 DM Fiber & 4 DM 8G+ w/2 HDMI Output Card
DMCO-5551: 2 DM Fiber & 6 DM 8G+ w/3 HDMI Output Card
DMCO-2223: 6 DM CAT w/3 HDMI & 2 HDMI w/2 Stereo Analog Audio Output Card
DMCO-2230: 4 DM CAT w/2 HDMI & 2 HDMI w/2 Stereo Analog Audio Output Card
DMCO-2233: 4 DM CAT w/2 HDMI & 4 HDMI w/4 Stereo Analog Audio Output Card
DMCO-2300: 2 DM CAT w/1 HDMI & 2 HDMI w/2 Stereo Analog Audio Output Card

DMCO DigitalMedia™ Switcher Output Cards

DMCO-2330: 2 DM CAT w/1 HDMI & 4 HDMI w/4 Stereo Analog Audio Output Card

DMCO-2333: 2 DM CAT w/1 HDMI & 6 HDMI w/6 Stereo Analog Audio Output Card

DMCO-4300: 2 DM 8G Fiber w/1 HDMI & 2 HDMI w/2 Stereo Analog Audio Output Card

DMCO-4330: 2 DM 8G Fiber w/1 HDMI & 4 HDMI w/4 Stereo Analog Audio Output Card

DMCO-4333: 2 DM 8G Fiber w/1 HDMI & 6 HDMI w/6 Stereo Analog Audio Output Card

DMCO-4430: 4 DM 8G Fiber w/2 HDMI & 2 HDMI w/2 Stereo Analog Audio Output Card

DMCO-4433: 4 DM 8G Fiber w/2 HDMI & 4 HDMI w/4 Stereo Analog Audio Output Card

DMCO-4443: 6 DM 8G Fiber w/3 HDMI & 2 HDMI w/2 Stereo Analog Audio Output Card

DMCO-5300: 2 DM 8G+ w/1 HDMI & 2 HDMI w/2 Stereo Analog Audio Output Card

DMCO-5330: 2 DM 8G+ w/1 HDMI & 4 HDMI w/4 Stereo Analog Audio Output Card

DMCO-5333: 2 DM 8G+ w/1 HDMI & 6 HDMI w/6 Stereo Analog Audio Output Card

DMCO-5400: 2 DM 8G+ w/1 HDMI & 2 DM 8G Fiber w/1 HDMI Output Card

DMCO-5440: 2 DM 8G+ w/1 HDMI & 4 DM 8G Fiber w/2 HDMI Output Card

DMCO-5444: 2 DM 8G+ w/1 HDMI & 6 DM 8G Fiber w/3 HDMI Output Card

DMCO-5530: 4 DM 8G+ w/2 HDMI & 2 HDMI w/2 Stereo Analog Audio Output Card

DMCO-5533: 4 DM 8G+ w/2 HDMI & 4 HDMI w/4 Stereo Analog Audio Output Card

DMCO-5540: 4 DM 8G+ w/2 HDMI & 2 DM 8G Fiber w/1 HDMI Output Card

DMCO-5544: 4 DM 8G+ w/2 HDMI & 4 DM 8G Fiber w/2 HDMI Output Card

DMCO-5553: 6 DM 8G+ w/3 HDMI & 2 HDMI w/2 Stereo Analog Audio Output Card

DMCO-5554: 6 DM 8G+ w/3 HDMI & 2 DM 8G Fiber w/1 HDMI Output Card

DMCO-6300: 2 DM 8G SM Fiber w/1 HDMI & 2 HDMI w/2 Stereo Analog Audio Output Card

DMCO-6330: 2 DM 8G SM Fiber w/1 HDMI & 4 HDMI w/4 Stereo Analog Audio Output Card

DMCO-6333: 2 DM 8G SM Fiber w/1 HDMI & 6 HDMI w/6 Stereo Analog Audio Output Card

DMCO-6400: 2 DM 8G SM Fiber w/1 HDMI & 2 DM 8G Fiber w/1 HDMI Output Card

DMCO-6440: 2 DM 8G SM Fiber w/1 HDMI & 4 DM 8G Fiber w/2 HDMI Output Card

DMCO-6444: 2 DM 8G SM Fiber w/1 HDMI & 6 DM 8G Fiber w/3 HDMI Output Card

DMCO-6500: 2 DM 8G SM Fiber w/1 HDMI & 2 DM 8G+ w/1 HDMI Output Card

DMCO-6550: 2 DM 8G SM Fiber w/1 HDMI & 4 DM 8G+ w/2 HDMI Output Card

DMCO-6555: 2 DM 8G SM Fiber w/1 HDMI & 6 DM 8G+ w/3 HDMI Output Card

DMCO-6630: 4 DM 8G SM Fiber w/2 HDMI & 2 HDMI w/2 Stereo Analog Audio Output Card

DMCO-6633: 4 DM 8G SM Fiber w/2 HDMI & 4 HDMI w/4 Stereo Analog Audio Output Card

DMCO-6640: 4 DM 8G SM Fiber w/2 HDMI & 2 DM 8G Fiber w/1 HDMI Output Card

DMCO-6644: 4 DM 8G SM Fiber w/2 HDMI & 4 DM 8G Fiber w/2 HDMI Output Card

DMCO-6650: 4 DM 8G SM Fiber w/2 HDMI & 2 DM 8G+ w/1 HDMI Output Card

DMCO-6655: 4 DM 8G SM Fiber w/2 HDMI & 4 DM 8G+ w/2 HDMI Output Card

DMCO-6663: 6 DM 8G SM Fiber w/3 HDMI & 2 HDMI w/2 Stereo Analog Audio Output Card

DMCO-6664: 6 DM 8G SM Fiber w/3 HDMI & 2 DM 8G Fiber w/1 HDMI Output Card

DMCO-6665: 6 DM 8G SM Fiber w/3 HDMI & 2 DM 8G+ w/1 HDMI Output Card

DMCO-7300: 1 Streaming & 2 HDMI w/2 Stereo Analog Audio Output Card

DMCO-7330: 1 Streaming & 4 HDMI w/4 Stereo Analog Audio Output Card

DMCO-7333: 1 Streaming & 6 HDMI w/6 Stereo Analog Audio Output Card

DMCO-7400: 1 Streaming & 2 DM 8G Fiber w/1 HDMI Output Card

DMCO-7440: 1 Streaming & 4 DM 8G Fiber w/2 HDMI Output Card

DMCO-7444: 1 Streaming & 6 DM 8G Fiber w/3 HDMI Output Card

DMCO-7500: 1 Streaming & 2 DM 8G+ w/1 HDMI Output Card

DMCO-7550: 1 Streaming & 4 DM 8G+ w/2 HDMI Output Card

DMCO-7555: 1 Streaming & 6 DM 8G+ w/3 HDMI Output Card

DMCO-7600: 1 Streaming & 2 DM 8G SM Fiber w/1 HDMI Output Card

DMCO-7660: 1 Streaming & 4 DM 8G SM Fiber w/2 HDMI Output Card

DMCO-7666: 1 Streaming & 6 DM 8G SM Fiber w/3 HDMI Output Card

DMCO-7730: 2 Streaming & 2 HDMI w/2 Stereo Analog Audio Output Card

DMCO-7733: 2 Streaming & 4 HDMI w/4 Stereo Analog Audio Output Card

DMCO-7740: 2 Streaming & 2 DM 8G Fiber w/1 HDMI Output Card

DMCO-7744: 2 Streaming & 4 DM 8G Fiber w/2 HDMI Output Card

DMCO-7750: 2 Streaming & 2 DM 8G+ w/1 HDMI Output Card

DMCO-7755: 2 Streaming & 4 DM 8G+ w/2 HDMI Output Card

DMCO-7760: 2 Streaming & 2 DM 8G SM Fiber w/1 HDMI Output Card

DMCO-7766: 2 Streaming & 4 DM 8G SM Fiber w/2 HDMI Output Card

DMCO-7773: 3 Streaming & 2 HDMI w/2 Stereo Analog Audio Output Card

DMCO-7774: 3 Streaming & 2 DM 8G Fiber w/1 HDMI Output Card

DMCO-7775: 3 Streaming & 2 DM 8G+ w/1 HDMI Output Card

DMCO-7776: 3 Streaming & 2 DM 8G SM Fiber w/1 HDMI Output Card

DMCO-8833: 4 DM 8G+ (4K) w/2 HDMI (4K) & 4 HDMI (not 4K) w/4 Stereo Analog Audio Output Card

DMCO-8883: 6 DM 8G+ (4K) w/3 HDMI (4K) & 2 HDMI (not 4K) w/2 Stereo Analog Audio Output Card

DMCO DigitalMedia™ Switcher Output Cards

Notes:

1. Streaming output supports stereo audio only. Multichannel surround sound audio cannot be streamed unless down-mixed to stereo. Stereo down-mix capability requires a [DMC-HD-DSP](#) or other DSP-based DM Switcher Input Card, sold separately.
2. DVI is supported via an HDMI output using a suitable adapter or interface cable. [CBL-HD-DVI](#) interface cable available separately.
3. 4K support at 50/60 Hz with 4:2:0 color sampling will be enabled through a future firmware update.
4. The maximum cable length for DigitalMedia Fiber (DM Fiber) is 1000 ft (300 m) using [CRESFIBER](#), [CRESFIBER8G](#), [CRESFIBER-DUAL-SC](#), or third-party OM2/OM3 duplex multimode fiber optic cable.
5. The maximum cable length for DigitalMedia CAT (DM CAT) is 450 ft (137 m) using [DM-CBL](#) DigitalMedia Cable. Actual cable length depends upon multiple factors. Up to two DM Repeaters (Model [DM-DR](#)) may be required.
6. The maximum cable length for DigitalMedia 8G Fiber (DM 8G Fiber) is 1000 ft (300 m) using [CRESFIBER8G](#) fiber optic cable, or 500 ft (150 m) using standard [CRESFIBER](#), [CRESFIBER-SINGLE-SC](#), or third-party OM3 simplex multimode fiber optic cable.
7. The maximum cable length for DigitalMedia 8G+ (DM 8G+) or HDBaseT is 330 ft (100 m) for resolutions up to 1600x1200 and 1920x1200 (including 1080p60 and 2K) using [DM-CBL-8G](#) DigitalMedia 8G cable, [DM-CBL](#) DigitalMedia Cable, [DM-CBL-D](#) DigitalMedia D Cable, or third-party CAT5e (or better) UTP or STP. For higher resolutions (including 4K), the maximum wire length is 230 ft (70 m) using [DM-CBL-8G](#), or 165 ft (50 m) using [DM-CBL](#), [DM-CBL-D](#), or CAT5e. Shielded cable and connectors are recommended to safeguard against unpredictable environmental electrical noise which may impact performance at resolutions above 1080p. DM 8G+ is compatible with HDBaseT Alliance specifications for connecting to HDBaseT compliant equipment.
8. The maximum cable length for DigitalMedia 8G Single-Mode Fiber (DM 8G SM Fiber) is 7.5 miles (12 km) using [CRESFIBER8G-SM](#) or third-party G.652.D (or better) simplex single-mode fiber optic cable.
9. Refer to the [Crestron DigitalMedia Design Guide, Doc. #4546](#) for complete system design guidelines. All wire and cables sold separately.
10. Supplying Power over DM (PoDM) or Power over HDBaseT (PoH) via a DM 8G+ output requires connection of the corresponding POE IN port to a PoDM Power Supply ([DM-PSU-8](#) or [DM-PSU-16](#), sold separately) or an 802.3af or 802.3at compliant PoE PSE ([PWE-4803RU](#), [CEN-SW-POE-5](#), [CEN-SWPOE-16](#), or [CEN-SWPOE-24](#), sold separately). Refer to the connected DM 8G+ or HDBaseT device for its PoDM or PoH capabilities and requirements.

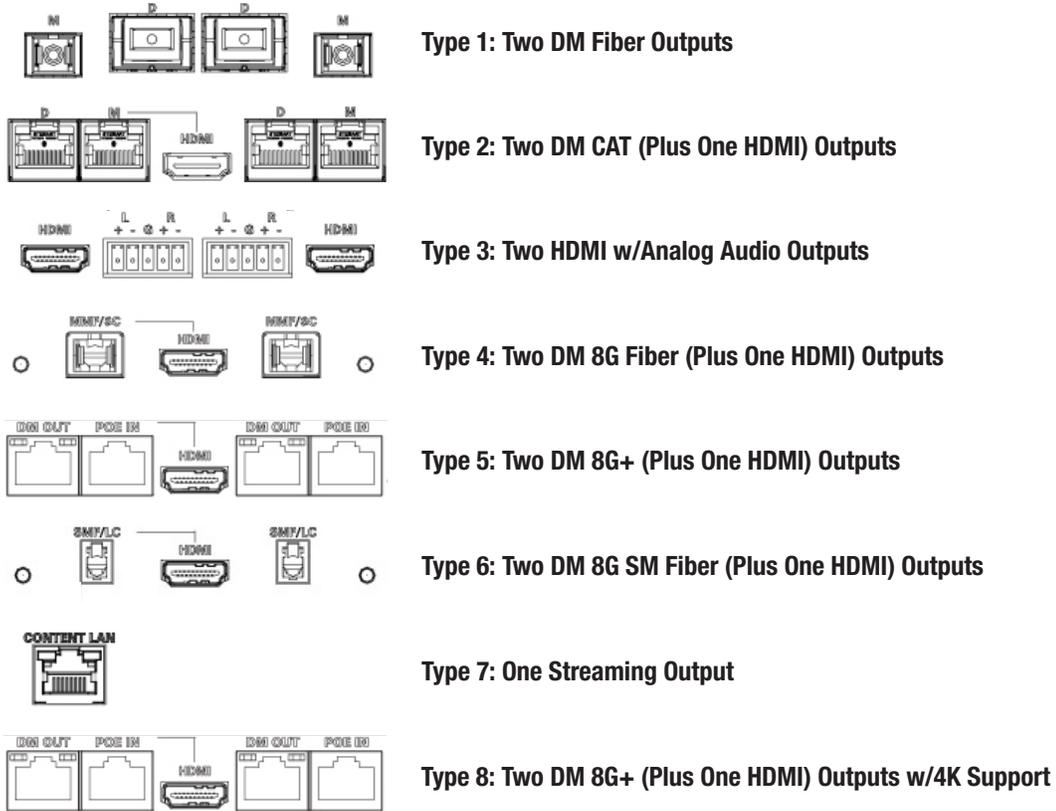
This product may be purchased from an authorized Crestron dealer. To find a dealer, please contact the Crestron sales representative for your area. A list of sales representatives is available online at www.crestron.com/salesreps or by calling 800-237-2041.

The specific patents that cover Crestron products are listed online at: patents.crestron.com.

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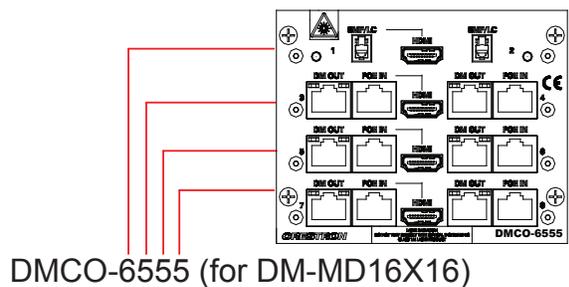
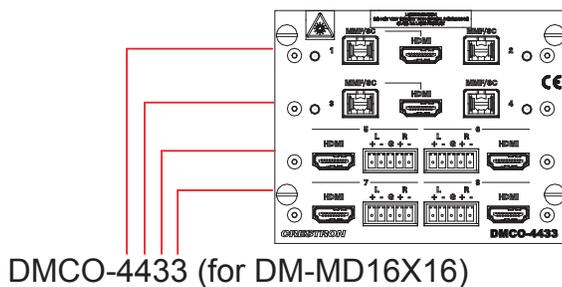
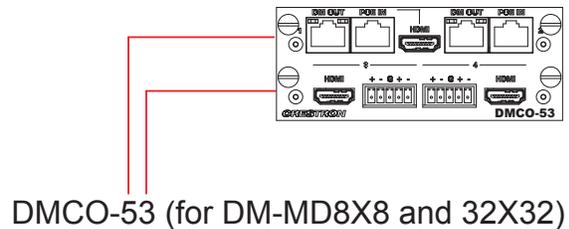
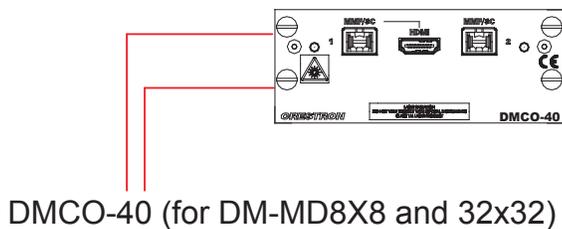
DMCO DigitalMedia™ Switcher Output Cards

DM Switcher Card Output Types



DMCO Card Model Numbering

DMCO Cards have either two or four digits, defining the output types, in order, from top to bottom. NOTE: 0 (zero) indicates none. Refer to the following examples:



Cisco Catalyst 3750-X and 3560-X Series Switches

Product Overview

The Cisco® Catalyst® 3750-X and 3560-X Series Switches are an enterprise-class lines of stackable and standalone switches, respectively. These switches provide high availability, scalability, security, energy efficiency, and ease of operation with innovative features such as Cisco StackPower (available only on the Catalyst 3750-X), IEEE 802.3at Power over Ethernet Plus (PoE+) configurations, optional network modules, redundant power supplies, and Media Access Control Security (MACsec) features. The Cisco Catalyst 3750-X Series with StackWise® Plus technology provides scalability, ease of management and investment protection for the evolving business needs. The Cisco Catalyst 3750-X and 3560-X enhance productivity by enabling applications such as IP telephony, wireless, and video for borderless network experience.

Cisco Catalyst 3750-X and 3560-X Series primary features:

- 24 and 48 10/100/1000 PoE+, non-PoE models, and 12 and 24 GE SFP port models
- 24 and 48 10/100/1000 UPOE-capable models with Energy Efficient Ethernet (EEE) support
- Four optional uplink network modules with GE or 10GE ports
- Industry first PoE+ with 30W power on all ports in 1 rack unit (RU) form factor
- Dual redundant, modular power supplies and fans
- Media Access Control Security (MACsec) hardware-based encryption
- Flexible NetFlow and switch-to-switch hardware encryption with the Service Module uplink
- Open Shortest Path First (OSPF) for routed access in IP Base image
- IPv4 and IPv6 routing, Multicast routing, advanced quality of service (QoS), and security features in hardware
- Enhanced limited lifetime warranty (LLW) with next business day (NBD) advance hardware replacement and 90 day access to Cisco Technical Assistance Center (TAC) support
- Enhanced Cisco EnergyWise for operational cost optimization by measuring actual power consumption of the PoE devices, reporting, and reducing energy consumption across the network
- USB Type-A and Type-B ports for storage and console respectively and an out-of-band Ethernet management port

In addition to the above features, the Cisco Catalyst 3750-X switches also offer:

- Cisco StackPower™ technology: An innovative feature and industry first for sharing power among stack members
- Cisco StackWise Plus technology for ease of use and resiliency with 64 Gbps of throughput
- Investment protection with backward compatibility with all other models of Cisco Catalyst 3750 Series Switches

Switch Configurations

All switch models can be configured with four optional network modules. The UPOE, PoE+, and non-PoE switch models are available with either the LAN Base or IP Base feature set. IP Services feature set is available as an upgrade option at the time of ordering or through a license at a later time. The GE SFP switch models are available with either IP Base or IP Services feature set.

Stackable Switches

Figure 1 shows the Cisco Catalyst 3750-X Series Switches (front and back).

Figure 1. Cisco Catalyst 3750-X Series Switches (Front and Back)



Table 1 shows the Cisco Catalyst 3750-X Series configurations.

Table 1. Cisco Catalyst 3750-X Series Configurations

Feature Set	Models	Total 10/100/1000 Ethernet Ports	Default AC Power Supply	Available PoE Power	Stackpower
LAN Base	WS-C3750X-24T-L	24	350W	-	Yes- starting 15.0(2)SE software release (cables purchased separately)
	WS-C3750X-48T-L	48			
	WS-C3750X-24P-L	24 PoE+	715W	435W	
	WS-C3750X-48P-L	48 PoE+			
	WS-C3750X-48PF-L	48 PoE+	1100W	800W	
	WS-C3750X-24U-L	24 UPOE	1100W	800W	
	WS-C3750X-48U-L	48 UPOE	1100W	800W	
IP Base	WS-C3750X-24T-S	24	350W	-	
	WS-C3750X-48T-S	48			
	WS-C3750X-24P-S	24 PoE+	715W	435W	
	WS-C3750X-48P-S	48 PoE+			
	WS-C3750X-48PF-S	48 PoE+	1100W	800W	
	WS-C3750X-24U-S	24 UPOE	1100W	800W	
	WS-C3750X-48U-S	48 UPOE	1100W	800W	
	WS-C3750X-12S-S	12 GE SFP	350W	-	
	WS-C3750X-24S-S	24 GE SFP	350W	-	

Feature Set	Models	Total 10/100/1000 Ethernet Ports	Default AC Power Supply	Available PoE Power	Stackpower
IP Services	WS-C3750X-24T-E	24	350W	-	
	WS-C3750X-48T-E	48			
	WS-C3750X-24P-E	24 PoE+	715W	435W	
	WS-C3750X-48P-E	48 PoE+			
	WS-C3750X-48PF-E	48 PoE+	1100W	800W	
	WS-C3750X-24U-E	24 UPOE	1100W	800W	
	WS-C3750X-48U-E	48 UPOE	1100W	800W	
	WS-C3750X-12S-E	12 GE SFP	350W	-	
	WS-C3750X-24S-E	24 GE SFP	350W	-	

Standalone Switches

Figure 2 shows Cisco Catalyst 3560-X Series Switches.

Figure 2. Cisco Catalyst 3560-X Series Switches



Table 2 shows the Cisco Catalyst 3560-X Series configurations.

Table 2. Cisco Catalyst 3560-X Series Configurations

Feature Set	Models	Total 10/100/1000 Ethernet Ports	Default AC Power Supply	Available PoE Power
LAN Base	WS-C3560X-24T-L	24	350W	-
	WS-C3560X-48T-L	48		
	WS-C3560X-24P-L	24 PoE+	715W	435W
	WS-C3560X-48P-L	48 PoE+		
	WS-C3560X-48PF-L	48 PoE+	1100W	800W
	WS-C3560X-24U-L	24 UPOE	1100W	800W
	WS-C3560X-48U-L	48 UPOE	1100W	800W
IP Base	WS-C3560X-24T-S	24	350W	-
	WS-C3560X-48T-S	48		
	WS-C3560X-24P-S	24 PoE+	715W	435W
	WS-C3560X-48P-S	48 PoE+		
	WS-C3560X-48PF-S	48 PoE+	1100W	800W
	WS-C3560X-24U-S	24 UPOE	1100W	800W
	WS-C3560X-48U-S	48 UPOE	1100W	800W

Feature Set	Models	Total 10/100/1000 Ethernet Ports	Default AC Power Supply	Available PoE Power
IP Services	WS-C3560X-24T-E	24	350W	-
	WS-C3560X-48T-E	48		
	WS-C3560X-24P-E	24 PoE+	715W	435W
	WS-C3560X-48P-E	48 PoE+		
	WS-C3560X-48PF-E	48 PoE+	1100W	800W
	WS-C3560X-24U-E	24 UPOE	1100W	800W
	WS-C3560X-48U-E	48 UPOE	1100W	800W

Cisco Catalyst 3750-X and 3560-X Series Software

In addition to IP Base and IP Services feature sets, the Cisco Catalyst 3750-X and 3560-X Series come with a new LAN Base feature set. The three feature sets available with all Cisco Catalyst 3750-X and 3560-X Series Switches are:

- LAN Base: enterprise access Layer 2 switching features
- IP Base: baseline enterprise access Layer 3 switching features
- IP Services: advanced Layer 3 switching (IPv4 and IPv6) features

The LAN Base feature set includes comprehensive Layer 2 features, with up-to 255 VLANs. The IP Base feature set provides baseline enterprise services in addition to all LAN Base features, with 1K VLANs. IP Base also includes the support for routed access, StackPower (available only on the Catalyst 3750-X), MACsec, and the new Cisco Service Module. The IP Services feature set provides full enterprise services that includes advanced Layer 3 features such as Enhanced Interior Gateway Routing Protocol (EIGRP), Open Shortest Path First (OSPF), Border Gateway Protocol (BGP), Protocol Independent Multicast (PIM), and IPv6 routing such as OSPFv3 and EIGRPv6. All software feature sets support advanced security, QoS, and management features.

The Cisco Catalyst 3750-X Series Switches with LAN Base feature set can only stack with other Cisco Catalyst 3750-X Series LAN Base switches. A mixed stack of LAN Base switch with IP Base or IP Services features set is not supported.

Customers can transparently upgrade the software feature set in the Cisco Catalyst 3750-X and 3560-X Series Switches through Cisco IOS® Software activation. Software activation authorizes and enables the Cisco IOS Software feature sets. A special file contained in the switch, called a license file, is examined by Cisco IOS Software when the switch is powered on. Based on the license's type, Cisco IOS Software activates the appropriate feature set. License types can be changed, or upgraded, to activate a different feature set. For detailed information about Software Activation, visit <http://www.cisco.com/go/sa>.

Cisco StackWise Plus Technology

Cisco StackWise Plus technology is built on the highly successful industry leading StackWise technology, which is a premium stacking architecture optimized for GbE. StackWise technology was designed to respond to additions, deletions, and redeployment while maintaining constant performance. The stack behaves as a single switching unit that is managed by a master switch elected from one of the member switches. The master switch automatically creates and updates all the switching and optional routing tables. A working stack can accept new members or delete old ones without service interruption. StackWise creates a highly resilient single unified system of up to nine switches, providing simplified management using a single IP address, single telnet session, single command-line interface (CLI), auto-version checking, autoconfiguration, and more. StackWise Plus supports all the features of StackWise and provides backward compatibility with the existing Cisco Catalyst 3750 Series Switches while enhancing the throughput of the system up to 64 Gbps. StackWise Plus also enables local switching in Cisco Catalyst 3750-X Series Switches. Local switching packets coming into a port in the Cisco Catalyst 3750-X Series or 3750-E Series Switch destined for another port in the same switch do not have to traverse through the stack ring, thus increasing the forwarding capacity of the switch. The Cisco Catalyst 3750-X Series stacks up to nine switches as a single logical unit for a total of 432 Ethernet 10/100/1000 ports with 18 10GbE ports. Individual 10/100/1000 units can be joined in any combination to evolve with network needs.

Cisco StackPower Technology

The Cisco Catalyst 3750-X Series introduces Cisco StackPower technology, innovative power interconnect system that allows the power supplies in a stack to be shared as a common resource among all the switches. Cisco StackPower unifies the individual power supplies installed in the switches and creates a pool of power, directing that power where it is needed. This feature is available in all Cisco Catalyst 3750-X Series Switches feature sets*. Up to four switches can be configured in a StackPower stack with the special connector at the back of the switch using the StackPower cable**, which is different than the StackWise cables. (See Figure 3.)

Figure 3. StackPower Connector



StackPower can be deployed in either power sharing mode or redundancy mode. In power sharing mode, the power of all the power supplies in the stack is aggregated and distributed among the switches in the stack. In redundant mode, when the total power budget of the stack is calculated, the wattage of the largest power supply is not included. That power is held in reserve and used to maintain power to switches and attached devices when one power supply fails, enabling the network to operate without interruption. Following the failure of one power supply, the StackPower mode becomes power sharing.

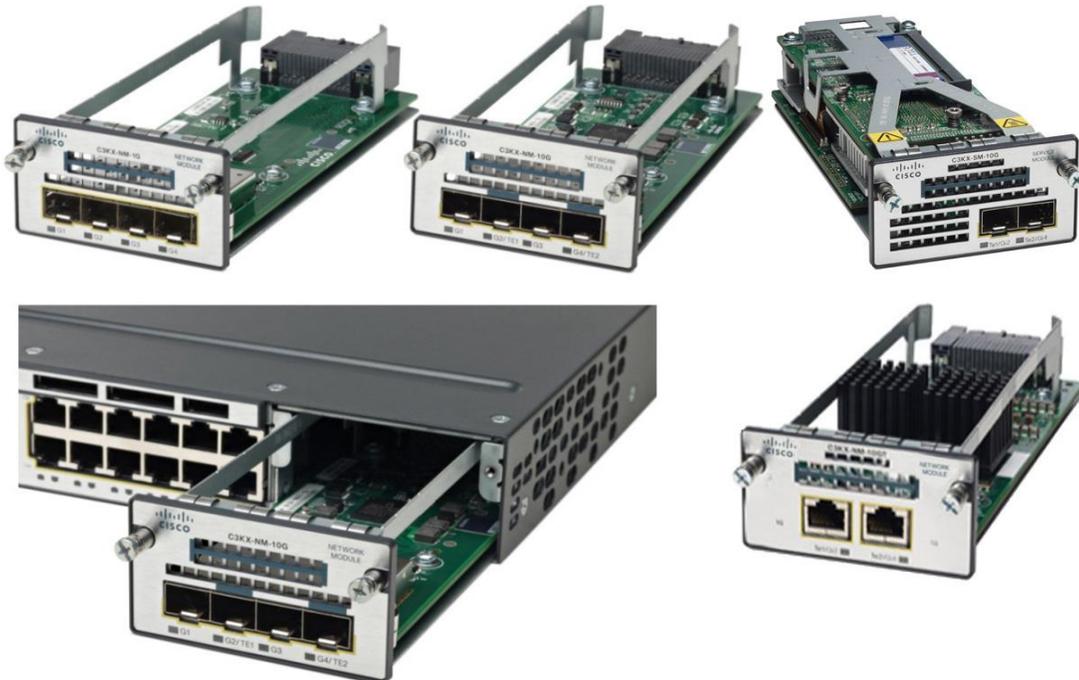
StackPower allows customers to simply add one extra power supply in any switch of the stack and provide either power redundancy for any of the stack members or simply add more power to the shared pool. StackPower eliminates the need for an external redundant power system or installation of dual power supplies in all the stack members.

* Available in LAN Base in the 15.0(2)SE software release
** For LAN Base, cables need to be purchased separately

Network Module

Figure 4 shows various Network Modules with Four GbE, Two 10GbE SFP+ Interfaces, Two 10GB-T and Service Module with Two 10GbE SFP+ Interfaces.

Figure 4. Network Modules with Four GbE, Two 10GbE SFP+ Interfaces, Two 10GB-T and Service Module with Two 10GbE SFP+ Interfaces



The Cisco Catalyst 3750-X Series and 3560-X Series Switches support four optional network modules for uplink ports. The default switch configuration doesn't include the uplink module; at the time of switch purchase the customer has the flexibility to choose from the network modules described in Table 3.

Table 3. Network Module Numbers and Descriptions

Product Number	Product Description
C3KX-NM-1G	Four GbE port network module
C3KX-NM-10G	Two 10GbE SFP+ ports network module with four physical ports with two SFP+ and two regular SFP ports
C3KX-NM-10GT	Two 10GB-T ports network module
C3KX-SM-10G	Service Module with two 10GbE SFP+ ports network module for Netflow and MACsec encryption

The SFP+ interface supports both 10GbE and GbE port, allowing customers to use their investment in GbE SFP and upgrade to 10GbE when business demands change, without having to do a comprehensive upgrade of the access switch. The four uplink modules are hot swappable. The four network modules can be used in any of the combinations shown in Table 4.

Table 4. 10GbE Network Module Configuration

Network Module	Interface Options	
	10GbE SFP+ Ports	GbE SFP Ports
1GbE	0	4
10GbE Network Module	2	0
	0	4
	1	2
10GB-T	2 (RJ-45)	0
Service Module	2	0
	1	1
	0	2

Service Module

The new Cisco Service Module offers enhanced security and Flexible Netflow (FNF) features on the uplink ports of the Catalyst 3750-X and 3560-X. The service module is supported with IP Base or IP Services feature set. It can be used with SFP or SFP+ at 1G or 10G speeds. The new Cisco Service Module has custom dedicated hardware for FNF monitoring, separate from the dedicated hardware for MACSec. Therefore there is no impact on packet forwarding performance & latency. It offers flexibility with the user being able to define flows. The new Cisco Service Module enables the following services:

- Line rate (40G) Flexible NetFlow for Network Monitoring and Security Anomaly Detection
 - Supported version 9
 - 32,000 simultaneous flows
 - 128 of simultaneous active monitors
- Line rate (40G) MACsec encryption (please refer to MACsec section below)

FNF is a networking monitoring technology. A NetFlow table can be used to collect flow statistics. The flow information can be used by customers for a variety of use cases like understanding:

1. Applications running on the network, and identify undesired applications, P2P etc
2. Granular Local and aggregated Campus view (Top N applications, drill down etc).
3. Top talkers (ports, users, applications) for application usage, productivity and asset utilization etc.

4. Security Anomaly Detection by examining flows that do not traverse trust boundaries for inside the perimeter attacks
5. Impacts of network and application changes
6. Compliance conformation
7. Traffic patterns for capacity planning

Enabling FNF at the access switch ensures you get all flows. The access switch is the most logical place in the network for collecting statistics and monitoring all flows. With Netflow, you can obtain MAC-address and access port information associated with the flow, to get directly to the source of the flow. Most collectors are able to leverage the location based on MAC-address and interface port number provided by the access switch to the collector. Thus by enabling FNF at the access switch you are able to get the location information of the flow. The access switch has a variety of identity mechanism for user authentication and adding user awareness is the natural progression that can be developed. Access switches are an order of magnitude greater than distribution and core which makes them scale well for FNF and ensure there are no performance impacts of oversubscription at aggregation and core.

10GB-T Module

The new Cisco 10G Base-T module is hot-swappable and can operate at either 10GE or GE speed (with manual configuration).

Table 5 shows the cable types and supported lengths of the new Cisco 10G Base-T module.

Table 5. 10GB-T Cable Types and Supported Lengths

Cable Type	Supported Length
Category 7a	100 meters
Category 7	100 meters
Category 6	55 meters
Category 6a*	100 meters

* Category 6a requires 3db Insertion Loss margin at 250MHz.

MACsec

The Cisco Catalyst 3750-X and 3560-X Series Switches offer exceptional security with integrated hardware support for MACsec defined in IEEE 802.1AE. MACsec provides MAC layer encryption over wired networks using out-of-band methods for encryption keying. The MACsec Key Agreement (MKA) protocol provides the required session keys and manages the keys required for encryption when configured. MKA and MACsec are implemented following successful authentication using 802.1x Extensible Authentication Protocol (EAP) framework. In Cisco Catalyst 3750-X and 3560-X Series Switches both the user/down-link ports (links between the switch and endpoint devices such as a PC or IP phone) and, using the service module, the network/up-link ports can be secured using MACsec. With the service module you can encrypt switch to switch links such as access to distribution, or encrypt dark fiber links within a building or between buildings.

Dual Redundant Modular Power Supplies

The Cisco Catalyst 3750-X Series and 3560-X Series Switches support dual redundant power supplies. The switch ships with one power supply by default, and the second power supply can be purchased at the time of ordering the switch or at a later time. If only one power supply is installed, it should always be in the power supply bay 1. (See Figure 5).

Figure 5. Dual Redundant Power Supplies



Table 6 shows the different power supplies available in these switches and available PoE power.

Table 6. Power Supply Models

Models	Default Power Supply	Available PoE Power
24 Port Data Switch	C3KX-PWR-350WAC	-
48 Port Data Switch		
24 Port PoE Switch	C3KX-PWR-715WAC	435W
48 Port PoE Switch		
48 Port Full PoE Switch	C3KX-PWR-1100WAC	800W
24 Port UPOE Switch	C3KX-PWR-1100WAC	800W
48 Port UPOE Switch		

In addition to the above power supplies a 440W DC power supply is available as a spare (should be ordered separately) on all switch models. The DC power supply also delivers PoE capabilities for maximum flexibility, (please refer to table 7 for available PoE for different configurations) and customers can mix and match the AC and DC power supplies in the two available power supply slots. Any of these power supplies can be installed in any of the switches.

Table 7. Available PoE with DC power supply

Model	# of 440W DC PS	Total Available PoE Budget
24-Port PoE Switch	1	220W
	2	660W
48-Port PoE Switch	1	185W
	2	625W

Power over Ethernet Plus (PoE+)/Universal Power Over Ethernet (UPOE)

In addition to PoE 802.3af, the Cisco Catalyst 3750-X and 3560-X Series Switches support PoE+ (IEEE 802.3at standard), which provides up to 30W of power per port and UPOE, which provides 60W of power per port (only on UPOE-capable models). The Cisco Catalyst 3750-X and 3560-X Series Switches can provide a lower total cost of ownership for deployments that incorporate Cisco IP phones, Cisco Aironet® wireless LAN (WLAN) access points, or any IEEE 802.3af-compliant end device. PoE removes the need for wall power to each PoE-enabled device and eliminates the cost for additional electrical cabling and circuits that would otherwise be necessary in IP phone and WLAN deployments. Table 8 shows the power supply combinations required for different PoE needs. Cisco UPOE switches extend the IEEE 802.3 PoE+ standard to double the power per port to 60 watts. UPOE-enabled ports can be used to deliver power for all current PoE/PoE+ solutions in addition to UPOE devices, including VDI clients, IP turrets for financial trading, personal Cisco TelePresence® systems, and more. The maximum UPOE budget available on the Cisco Catalyst 3750-X/3560-X switch is 1800W per switch. This requires the 1100W AC power supply in both the power supply slots. 1800W in POE budget makes sure that the 24-port models support full UPOE on all ports (24 x 60W/port = 1440W) and the 48-port models support up to 30 UPOE connections (30 x 60W/port = 1800W) per switch.

Table 8. Power Supply Requirements for PoE/PoE+ and UPOE models

POE/POE+	24 Port PoE Switch	48 Port PoE Switch
PoE (15.4W per port)	One C3KX-PWR-715WAC	One C3KX-PWR-1100WAC or Two C3KX-PWR-715WAC
PoE+ (30W per port)	One C3KX-PWR-1100WAC or Two C3KX-PWR-715WAC	Two C3KX-PWR-1100WAC or One C3KX-PWR-1100WAC and one C3KX-PWR-715WAC
UPOE (60W per port)	One C3KX-PWR-715WAC and one C3KX-PWR-1100WAC or Two C3KX-PWR-1100WAC	One C3KX-PWR-715WAC and one C3KX-PWR-1100WAC or Two C3KX-PWR-1100WAC

eXpandable Power System (XPS) 2200

The XPS 2200 is the next-generation redundant power system (RPS). It not only provides the functionalities offered by the RPS but also provides enhanced services with the support for Cisco StackPower technology. When used with the Cisco Catalyst 3560-X, it provides RPS functionality, but when used with the Cisco Catalyst 3750-X, it provides StackPower functionality to all the stack members, including power supply redundancy.

The XPS supports dual redundant power supplies and fans. Up to nine switches can be connected to the XPS 2200, and it can provide power backup to two of the failed switches concurrently (when appropriately sized power supplies are used). The power supplies used by the XPS 2200 are the same as the ones supported in the Cisco Catalyst 3750-X and 3560-X Series Switches. The XPS 2200 is fully configurable for setting switch priorities in case of multiple failures.

Please refer to the XPS 2200 Performance Specifications section at the end of this document.

Figure 6. The XPS 2200



Cisco Catalyst 3750-X and 3560-X Series Switches Enable Cisco Borderless Network Experience

Borderless Networks, a Cisco architecture, deliver the new workspace experience, connecting anyone, anywhere, using any device, to any resource securely, reliably, and transparently. Cisco's Borderless Networks architecture addresses primary IT and business challenges to help create a truly borderless experience by bringing interactions closer to the employee and customer.

Borderless experience is only possible with intelligent network elements designed and architected to meet the needs of a global workspace. Cisco Network Access is a primary component of this architecture, enabling various borderless network services such as mobility, security, MediaNet, EnergyWise, and ease of operations for increased productivity and operational efficiency. When network access is intelligent, it knows the identity of the user, as well as where the user is on the network. It knows what is connecting to the network, to automatically provision the network for QoS and delivery. It becomes services-aware to optimize user experience. Only with intelligent access network, your enterprise can go borderless securely and transparently. Your business can save energy, simplify operations with better business efficiency, and have an optimized total cost of ownership.

Cisco Network Access for Borderless solution focuses on the following primary areas:

- Sustainability
- Ease of operations
- Borderless security
- Borderless experience

Sustainability

Cisco Catalyst switching solutions enable greener practices through measurable power efficiency, integrated services, and continuous innovations such as Cisco EnergyWise, an enterprisewide solution that monitors and conserves energy with customized policies. Together, Cisco EnergyWise technology and Cisco Catalyst switches reduce greenhouse gas (GhG) emissions and increase energy cost savings and sustainable business behavior. Sustainability features in the Cisco Catalyst 3750-X and 3560-X Series Switches include the following features sets:

- Cisco EnergyWise technology
- Efficient switch operation
- Intelligent power management
- Energy Efficient Ethernet

Cisco EnergyWise Technology

Cisco EnergyWise is an innovative architecture, added to fixed configuration switches, promoting companywide sustainability by reducing energy consumption across an entire corporate infrastructure and affecting more than 50 percent of global greenhouse gas emissions created by worldwide building infrastructure, a much greater effect than the 2 percent generated by the IT industry. Cisco EnergyWise enables companies to measure the power consumption of network infrastructure and network-attached devices and manage power consumption with specific policies, reducing power consumption to realize increased cost savings, potentially affecting any powered device.

EnergyWise encompasses a highly intelligent network-based approach to communicate messages that measure and control energy between network devices and endpoints. The network discovers Cisco EnergyWise manageable devices, monitors their power consumption, and takes action based on business rules to reduce power consumption. EnergyWise uses a unique domain-naming system to query and summarize information from large sets of devices, making it simpler than traditional network management capabilities. Cisco EnergyWise's management interfaces allow facilities and network management applications to communicate with endpoints and each other using the network as a unifying fabric. The management interface uses standard SNMP or TCP to integrate Cisco and third-party management systems.

Efficient Switch Operation

Cisco Catalyst 3750-X and 3560-X Series Switches, designed and engineered by Cisco, provide optimum power saving, low power operations for industry best-in-class power management, and power consumption capabilities. The Cisco Catalyst 3750-X and 3560-X ports are capable of reduced power modes so that ports not in use can move into a lower power utilization state.

StackPower lets customers to simply add one extra power supply in any switch of the stack and provide either power redundancy for any of the stack members or simply add more power to the shared pool.

Intelligent Power over Ethernet Management

The Cisco Catalyst 3750-X and 3560-X Series PoE models support Cisco IP phones and Cisco Aironet WLAN access points providing up to 30W of power per port, as well as any IEEE 802.3af-compliant end device.

- **Cisco Discovery Protocol Version 2** allows the Cisco Catalyst 3750-X and 3560-X Series Switches to negotiate a more granular power setting when connecting to a Cisco powered device such as IP phones or access points than what is provided by IEEE classification.
- **Per port power consumption** command allows customers to specify maximum power setting on an individual port.
- **Per port PoE power sensing** measures actual power being drawn, enabling more intelligent control of powered devices.
- **The PoE MIB** provides proactive visibility into power usage and allows customers to set different power-level thresholds.

Energy Efficient Ethernet (EEE)

EEE (IEEE 802.3az) provides a mechanism and a standard for reducing the energy usage of an Ethernet port without affecting the vital function of forwarding traffic. During peak work hours, most wired client devices use their network connections with infrequent bursts. The normal EEE operation is well suited to this behavior. During off-peak times the client devices may use sleep or hibernate modes. At this time the network interface can be completely inactive and able to be woken on demand by remote request.

Prior to the EEE standard, it was a common practice for client devices such as personal computers and servers to save power during sleep states by renegotiating the Ethernet link to a lower speed. With EEE capability, PCs and other “sleep oriented” devices can achieve power savings similar to the speed downshift while allowing a much faster transition back to the active state. Faster link wake time improves the user’s experience by allowing a faster transition for the client device from the sleep to active and connected state.

Cisco Catalyst 3750-X/3560-X series switches support EEE on the UPOE models.

Ease of Operations

The Cisco Catalyst 3750-X and 3560-X help reduce the operating costs through:

- Cisco Catalyst Smart Operations
- Easy to use deployment and control features
- Advanced, intelligent network management tools

Cisco Catalyst Smart Operations

Cisco Catalyst Smart Operations is a comprehensive set of capabilities that simplify LAN deployment, configuration, and troubleshooting. In addition to adaptive, always on technologies such as StackWise and StackPower, Cisco Catalyst Smart Operations enable zero touch installation and replacement of switches, fast upgrade, as well as ease of troubleshooting with reduced operational cost. **Cisco Catalyst Smart Operations** is a set of features that includes Smart Install, auto Smartports, Smart Configuration, and Smart Troubleshooting to enhance operational excellence:

- **Cisco Smart Install** is a transparent plug and play technology to configure the Cisco IOS Software image and switch configuration without user intervention. Smart Install utilizes dynamic IP address allocation and the assistance of other switches to facilitate installation providing transparent network plug and play.
- **Cisco Auto Smartports** provide automatic configuration as devices connect to the switch port, allowing auto detection and plug and play of the device onto the network.
- **Cisco Smart Configuration** provides a single point of management for a group of switches and in addition adds the ability to archive and backup configuration files to a file server or switch allowing seamless zero touch switch replacement.
- **Cisco Smart Troubleshooting** is an extensive array of debug diagnostic commands and system health checks within the switch, including Generic Online Diagnostics (GOLD) and Onboard Failure Logging (OBFL).

Easy to Use Deployment and Control Features

- **Embedded Event Manager (EEM)** is a powerful and flexible feature that provides real-time network event detection and onboard automation. Using EEM, customers can adapt the behavior of their network devices to align with their business needs. This feature requires IP Base feature set.
- **IP service-level agreements (SLAs)** enable customers to assure new business-critical IP applications, as well as IP services that utilize data, voice, and video, in an IP network. This feature requires IP Services feature set.
- **Dynamic Host Configuration Protocol (DHCP)** autoconfiguration of multiple switches through a boot server eases switch deployment.

- **Automatic QoS (AutoQoS)** simplifies QoS configuration in voice over IP (VoIP) networks by issuing interface and global switch commands to detect Cisco IP phones, classify traffic, and help enable egress queue configuration.
- **Stacking master configuration management** and Cisco StackWise technology helps ensure that all switches are automatically upgraded when the master switch receives a new software version. Automatic software version checking and updating help ensure that all stack members have the same software version.
- **Autonegotiation** on all ports automatically selects half- or full-duplex transmission mode to optimize bandwidth.
- **Dynamic Trunking Protocol (DTP)** facilitates dynamic trunk configuration across all switch ports.
- **Port Aggregation Protocol (PAgP)** automates the creation of Cisco Fast EtherChannel[®] groups or Gigabit EtherChannel groups to link to another switch, router, or server.
- **Link Aggregation Control Protocol (LACP)** allows the creation of Ethernet channeling with devices that conform to IEEE 802.3ad. This feature is similar to Cisco EtherChannel technology and PAgP.
- **Automatic media-dependent interface crossover (MDIX)** automatically adjusts transmit and receive pairs if an incorrect cable type (crossover or straight-through) is installed.
- **Unidirectional Link Detection Protocol (UDLD)** and Aggressive UDLD allow unidirectional links caused by incorrect fiber-optic wiring or port faults to be detected and disabled on fiber-optic interfaces.
- **Switching Database Manager (SDM)** templates for access, routing, and VLAN deployment allow the administrator to easily maximize memory allocation to the desired features based on deployment-specific requirements.
- **Local Proxy Address Resolution Protocol (ARP)** works in conjunction with Private VLAN Edge to minimize broadcasts and maximize available bandwidth.
- **VLAN1 minimization** allows VLAN1 to be disabled on any individual VLAN trunk.
- **Smart Multicast, with Cisco StackWise Plus technology**, allows the Cisco Catalyst 3750-X Series to offer greater efficiency and support for more multicast data streams such as video by putting each data packet onto the backplane only once.
- **Internet Group Management Protocol (IGMP) Snooping** for IPv4 and IPv6 MLD v1 and v2 Snooping provide fast client joins and leaves of multicast streams and limit bandwidth-intensive video traffic to only the requestors.
- **Multicast VLAN Registration (MVR)** continuously sends multicast streams in a multicast VLAN while isolating the streams from subscriber VLANs for bandwidth and security reasons.
- **Per-port broadcast, multicast, and unicast storm control** prevents faulty end stations from degrading overall systems performance.
- **Voice VLAN** simplifies telephony installations by keeping voice traffic on a separate VLAN for easier administration and troubleshooting.
- **Cisco VLAN Trunking Protocol (VTP)** supports dynamic VLANs and dynamic trunk configuration across all switches.
- **Remote Switch Port Analyzer (RSPAN)** allows administrators to remotely monitor ports in a Layer 2 switch network from any other switch in the same network.

- For enhanced traffic management, monitoring, and analysis, the Embedded **Remote Monitoring (RMON)** software agent supports four RMON groups (history, statistics, alarms, and events).
- **Layer 2 traceroute** eases troubleshooting by identifying the physical path that a packet takes from source to destination.
- **Trivial File Transfer Protocol (TFTP)** reduces the cost of administering software upgrades by downloading from a centralized location.
- **Network Timing Protocol (NTP)** provides an accurate and consistent timestamp to all intranet switches.

Advanced, Intelligent Network Management Tools

The Cisco Catalyst 3750-X and 3560-X Series Switches offer both a superior CLI for detailed configuration and Cisco Network Assistant software, a PC-based tool for quick configuration based on preset templates. In addition, CiscoWorks LAN Management Solution (LMS) supports the Cisco Catalyst 3750-X and 3560-X Series Switches for networkwide management.

Cisco Network Assistant

A PC-based network management application designed for small and medium-sized business (SMB) networks with up to 250 users, Cisco Network Assistant offers centralized network management and configuration capabilities. Cisco Network Assistant uses Cisco Smartports technology to simplify both initial deployment and ongoing maintenance. This application also features an intuitive GUI where users can easily apply common services across Cisco switches, routers, and access points, such as:

- Configuration management
- Troubleshooting advice
- Inventory reports
- Event notification
- Network security settings
- Password synchronization
- Drag-and-drop Cisco IOS Software upgrades
- Secure wireless

For detailed information about Cisco Network Assistant, visit <http://www.cisco.com/go/cna>.

CiscoWorks LAN Management Solution

CiscoWorks LAN Management Solution (LMS) is a comprehensive network lifecycle management solution. It provides an extensive library of easy-to-use features to automate the initial and day-to-day management of your Cisco network infrastructure. CiscoWorks LMS uniquely uses Cisco hardware and software platform knowledge and operational experience into a powerful set of work-flow driven configuration, monitoring, troubleshooting, reporting, and administrative tools. Including:

- Support for new Cisco hardware platforms the day they ship
- Support for new technologies and services from initial deployment to day-to-day administration and management, such as EnergyWise, Identity, Cisco Auto Smartports, Cisco Smart Install, and much more
- Configuration management tools built from Cisco experience and Cisco Validated Design recommendations

- Monitoring and troubleshooting capabilities that incorporates Cisco hardware best practices and diagnostics features
- Automation in managing hardware inventories, security vulnerabilities (PSIRTS) and platform end-of-life and support cycles

For detailed information about CiscoWorks LMS, go to

<http://www.cisco.com/en/US/products/sw/cscowork/ps2425/index.html>.

Borderless Security

The Cisco Catalyst 3750-X and 3560-X Series Switches provide superior Layer 2 threat defense capabilities for mitigating man-in-the-middle attacks (such as MAC, IP, and ARP spoofing). TrustSec, a primary element of Borderless Security Architecture, helps enterprise customers secure their networks, data and resources with policy-based access control, identity and role-aware networking, pervasive integrity, and confidentiality. The borderless security is enabled by the following feature sets in the Cisco Catalyst 3750-X and 3560-X Series Switches:

- Threat defense
- Cisco TrustSec
- Other advanced security features

Threat Defense

Cisco Integrated Security Features is an industry-leading solution available on Cisco Catalyst Switches that proactively protects your critical network infrastructure. Delivering powerful, easy-to-use tools to effectively prevent the most common and potentially damaging Layer 2 security threats, Cisco Integrated Security Features provides robust security throughout the network. Cisco Integrated Security Features include Port Security, DHCP Snooping, Dynamic ARP Inspection, and IP Source guard.

- **Port Security** secures the access to an access or trunk port based on MAC address. It limits the number of learned MAC addresses to deny MAC address-flooding.
- **DHCP Snooping** prevents malicious users from spoofing a DHCP server and sending out bogus addresses. This feature is used by other primary security features to prevent a number of other attacks such as ARP poisoning.
- **Dynamic ARP Inspection (DAI)** helps ensure user integrity by preventing malicious users from exploiting the insecure nature of the ARP protocol.
- **IP source guard** prevents a malicious user from spoofing or taking over another user's IP address by creating a binding table between the client's IP and MAC address, port, and VLAN.

Cisco TrustSec

TrustSec secures access to the network, enforces security policies, and delivers standard based security solutions such as 802.1X enabling secure collaboration and policy compliance. TrustSec capabilities reflect Cisco thought leadership, innovations, and commitment to customer success. These new capabilities include:

- **IEEE 802.1AE MACsec** with prestandard 802.1X-REV Key management: industry's first fixed switches with prestandard 802.1X-Rev key management. Available on Cisco Catalyst 3750-X and 3560-X Series Switches, MACsec provides Layer 2, line rate Ethernet data confidentiality and integrity on host facing ports, protecting against man-in-the-middle attacks (snooping, tampering, and replay).

- **FIPS 140-2** validated for devices used in government and sensitive environments for extremely high levels of data security.
- **Flexible authentication** that supports multiple authentication mechanisms including 802.1X, MAC Authentication Bypass and web authentication using a single, consistent configuration.
- **Open mode** that creates a user friendly environment for 802.1X operations.
- **Integration of device profiling technology and guest access** handling with Cisco switching to significantly improve security while reducing deployment and operational challenges.
- **RADIUS Change of Authorization and downloadable Calls** for Comprehensive policy management capabilities.
- **802.1X Supplicant with Network Edge Access Transport (NEAT)** enables extended secure access where compact switches in the conference rooms have the same level of security as switches inside the locked wiring closet.

Other Advanced Security Features

Other Advanced Security features include but are not limited to:

- **Private VLANs** restrict traffic between hosts in a common segment by segregating traffic at Layer 2, turning a broadcast segment into a nonbroadcast multiaccesslike segment.
- **Private VLAN Edge** provides security and isolation between switch ports, which helps ensure that users cannot snoop on other users' traffic.
- **Unicast Reverse Path Forwarding (RPF)** feature helps mitigate problems caused by the introduction of malformed or forged (spoofed) IP source addresses into a network by discarding IP packets that lack a verifiable IP source address.
- **Multidomain Authentication** allows an IP phone and a PC to authenticate on the same switch port while placing them on appropriate voice and data VLAN.
- **Cisco security VLAN ACLs** on all VLANs prevent unauthorized data flows from being bridged within VLANs.
- **Cisco standard and extended IP security router ACLs** define security policies on routed interfaces for control-plane and data-plane traffic. IPv6 ACLs can be applied to filter IPv6 traffic.
- **Port-based ACLs** for Layer 2 interfaces allow security policies to be applied on individual switch ports.
- **Secure Shell (SSH) Protocol, Kerberos, and Simple Network Management Protocol Version 3 (SNMPv3)** provide network security by encrypting administrator traffic during Telnet and SNMP sessions. SSH Protocol, Kerberos, and the cryptographic version of SNMPv3 require a special cryptographic software image because of U.S. export restrictions.
- Bidirectional data support on the **Switched Port Analyzer (SPAN)** port allows Cisco Intrusion Detection System (IDS) to take action when an intruder is detected.
- **TACACS+ and RADIUS authentication** facilitates centralized control of the switch and restricts unauthorized users from altering the configuration.
- **MAC Address Notification** allows administrators to be notified of users added to or removed from the network.
- **Multilevel security on console access** prevents unauthorized users from altering the switch configuration.

- **Bridge protocol data unit (BPDU) Guard** shuts down Spanning Tree PortFast-enabled interfaces when BPDUs are received to avoid accidental topology loops.
- **Spanning Tree Root Guard (STRG)** prevents edge devices not in the network administrator's control from becoming Spanning Tree Protocol root nodes.
- **IGMP filtering** provides multicast authentication by filtering out nonsubscribers and limits the number of concurrent multicast streams available per port.
- **Dynamic VLAN assignment** is supported through implementation of VLAN Membership Policy Server client capability to provide flexibility in assigning ports to VLANs. Dynamic VLAN facilitates the fast assignment of IP addresses.

Borderless Experience

Borderless network enables enterprise mobility and business-grade video services. Industry's first unified network (wired and wireless) location services enable tracking of mobile assets and the users of those assets for both wired and wireless devices. The true borderless experience is enabled by the following feature sets in the Cisco Catalyst 3750-X and 3560-X Series Switches:

- High availability
- High-performance IP routing
- Superior QoS
- Location awareness and mobility

High Availability

The Cisco Catalyst 3750-X Series increases availability for stackable switches. Each switch can operate both as master controller and as forwarding processor. Each switch in the stack can serve as a master, creating a 1:N availability scheme for network control. In the unlikely event of a single unit failure, all other units continue to forward traffic and maintain operation.

Other high-availability features include but are not limited to:

- Cross-Stack EtherChannel provides the ability to configure Cisco EtherChannel technology across different members of the stack for high resiliency.
- Flexlink provides link redundancy with convergence time less than 100 ms.
- IEEE 802.1s/w Rapid Spanning Tree Protocol (RSTP) and Multiple Spanning Tree Protocol (MSTP) provide rapid spanning-tree convergence independent of spanning-tree timers and also offers the benefit of Layer 2 load balancing and distributed processing. Stacked units behave as a single spanning-tree node.
- Per-VLAN Rapid Spanning Tree (PVRST+) allows rapid spanning-tree reconvergence on a per-VLAN spanning-tree basis, without requiring the implementation of spanning-tree instances.
- Cisco Hot Standby Router Protocol (HSRP) is supported to create redundant, failsafe routing topologies.
- Switch-port autorecovery (Errdisable) automatically attempts to reactivate a link that is disabled because of a network error.

High-Performance IP Routing

Cisco Express Forwarding hardware routing architecture delivers extremely high-performance IP routing in the Cisco Catalyst 3750-X and 3560-X Series Switches.

- Static routing (16 routes) with LAN Base feature set.
- IP unicast routing protocols (Static, Routing Information Protocol Version 1 [RIPv1], and RIPv2, RIPv2, RIPv2, EIGRP stub) are supported for small-network routing applications with IP Base feature set.
- Advanced IP unicast routing protocols (OSPF, EIGRP, BGPv4, and IS-ISv4) are supported for load balancing and constructing scalable LANs. IPv6 routing (OSPFv3, EIGRPv6) is supported in hardware for maximum performance. OSPF for routed access is included in the IP Base image. The IP Services feature set is required for full OSPF, EIGRP, BGPv4, and IS-ISv4.
- Equal-cost routing facilitates Layer 3 load balancing and redundancy across the stack.
- Policy-based routing (PBR) allows superior control by facilitating flow redirection regardless of the routing protocol configured. The IP Services feature set is required.
- Hot Standby Routing Protocol (HSRP) provides dynamic load balancing and failover for routed links, up to 32 HSRP links supported per unit or stack.
- Protocol Independent Multicast (PIM) for IP multicast routing is supported, including PIM sparse mode (PIM-SM), PIM dense mode (PIM-DM), PIM sparse-dense mode and Source Specific Multicast (SSM). The IP Services feature set is required.
- Virtual routing and forwarding (VRF)-Lite enables a service provider to support two or more VPNs, with overlapping IP addresses. IP Services feature set is required.

Superior Quality of Service

The Cisco Catalyst 3750-X and 3560-X Series offers GbE speed with intelligent services that keep everything flowing smoothly, even at 10 times the normal network speed. Industry-leading mechanisms for marking, classification, and scheduling deliver superior performance for data, voice, and video traffic, all at wire speed.

Following are some of the QoS features supported in the Cisco Catalyst 3750-X and 3560-X Series Switches:

- Cross-stack QoS allows QoS to be configured across the entire stack (available only on the Catalyst 3750-X).
- 802.1p class of service (CoS) and differentiated services code point (DSCP) field classification are provided, using marking and reclassification on a per-packet basis by source and destination IP address, MAC address, or Layer 4 TCP/UDP port number.
- Cisco control-plane and data-plane QoS ACLs on all ports help ensure proper marking on a per-packet basis.
- Eight egress queues per port help enable differentiated management of different traffic types across the stack. Four queues are user configurable and four are reserved for system use.
- Shaped Round Robin (SRR) scheduling helps ensure differential prioritization of packet flows by intelligently servicing the ingress queues and egress queues.
- Weighted Tail Drop (WTD) provides congestion avoidance at the ingress and egress queues before a disruption occurs.
- Strict priority queuing helps ensure that the highest-priority packets are serviced ahead of all other traffic.

- The Cisco committed information rate (CIR) function provides bandwidth in increments as low as 8 Kbps.
- Rate limiting is provided based on source and destination IP address, source and destination MAC address, Layer 4 TCP/UDP information, or any combination of these fields, using QoS ACLs (IP ACLs or MAC ACLs), class maps, and policy maps.
- Up to 64 aggregate or individual policers are available per Fast Ethernet or GbE port.

Location Awareness and Mobility

In order to provide delivery of a best-in-class network experience to end users, it's critical for network access to be location aware. A wide variety of devices can appear on the network, both wired (switches, routers, IP phones, PCs, access points, controllers, video digital media players, and so on) and wireless (mobile devices, wireless tags, rogues, and so on). In many industries, locating assets is primarily a manual process and is time consuming and error prone. The inability to locate assets in real time and to help ensure their availability when and where they are needed limits reaction time and efficiency.

Location services answer business-critical questions about both mobile assets and the users of those assets regardless of whether those assets are connecting using wired or wireless, and hence directly improve their organization's profitability. Network Location Services also improve security and accelerate client troubleshooting by locating an asset, user, or device on the network.

- Network visibility and control provide centralized visibility into wired and wireless devices on the network and their location.
- Location-assisted client troubleshooting enables tracking of wired or wireless clients for quick problem resolution.
- Asset tracking and improved security provide centralized inventory of wired and wireless devices and asset management for improved business processes.
- Cisco Mobility Service Engine (MSE) Open API provides an open API (based on Simple Object Access Protocol [SOAP] and XML protocol) for any business application that needs the location data.
- Location based policy allows greater control and visibility. With EnergyWise, power policies can be set up (to reduce the power or shut down the power from a port) based on the location.
- Cisco Emergency Responder (CER) enhances emergency calling from Cisco Unified CallManager. It helps assure that Cisco Unified CallManager sends emergency calls to the appropriate Public Safety Answering Point (PSAP) for the caller's location.

Cisco Catalyst 3750-X and 3560-X Series Specifications

Switch Performance

Table 9 shows Cisco Catalyst 3750-X and 3560-X Series Switches performance specifications.

Table 9. Cisco Catalyst 3750-X and 3560-X Performance Specifications

Performance Numbers for All Switch Models	
Switching Fabric	160 Gbps
DRAM	256 MB (512 MB for 3750X-12S and 3750X-24S)
Flash	64 MB (128 MB for 3750X-12S and 3750X-24S)
Total VLANs	1005
VLAN IDs	4K

Performance Numbers for All Switch Models	
Total Switched Virtual Interfaces (SVIs)	1K
Jumbo Frame	9216 Byte
Total Routed Ports per 3750-X Stack	468
Forwarding Rate of the Switch Models (with Two 10GbE Uplinks)	
Forwarding Rate	
3750X-24T	65.5 mpps
3750X-24P	
3750X-24U	
3750X-48T	101.2 mpps
3750X-48P	
3750X-48PF	
3750X-48U	
3750X-12S	35.7 mpps
3750X-24S	65.5 mpps
3560X-24T	65.5 mpps
3560X-24P	
3560X-24U	
3560X-48T	101.2 mpps
3560X-48P	
3560X-48U	
3560X-48PF	
3560X-48PF	

Scalability Numbers

MAC, routing, security, and QoS scalability numbers depend on the type template used in the switch. Routing template is not supported in the LAN Base feature set. Table 10 shows Cisco Catalyst 3750-X and 3560-X Series Switch scalability numbers.

Table 10. Cisco Catalyst 3750-X and 3560-X Series Switch Scalability Numbers

	Access	Default	Routing	VLAN
Unicast MAC addresses	4K	6K	3K	12K
IGMP groups and multicast routes	1K	1K	1K	1K
Unicast routes	6K	8K	11K	0
Directly connected hosts	4K	6K	3K	0
Indirect routes	2K	2K	8K	0
Policy-based routing ACEs	0.5K	0	0.5K	0
QoS classification ACEs	0.5K	0.5K	0.5K	0.5K
Security ACEs	2K	1K	1K	1K
VLANs	1K	1K	1K	1K

Dimensions, Weight, Acoustic, MTBF, and Environmental Range Specifications for Cisco Catalyst 3750-X and 3560-X Series Switches

Table 11 shows dimensions, weight, acoustic, MTBF, and environmental range.

Table 11. Dimensions, Weight, Acoustic, MTBF, and Environmental Range

Dimensions (H x W x D)	Inches	Centimeters
3750X-24T	1.75 x 17.5 x 18.0	4.45 x 44.5 x 46.0
3750X-24P		
3750X-48T		
3750X-48P		
3750X-48PF 3750X-24U 3750X-48U	1.75 x 17.5 x 19.5	4.45 x 44.5 x 49.5
3750X-12S	1.75 x 17.5 x 18.0	4.45 x 44.5 x 46.0
3750X-24S	1.75 x 17.5 x 18.0	4.45 x 44.5 x 46.0
3560X-24T	1.75 x 17.5 x 18.0	4.45 x 44.5 x 46.0
3560X-24P		
3560X-48T		
3560X-48P		
3560X-48PF 3560X-24U 3560X-48U	1.75 x 17.5 x 19.5	4.45 x 44.5 x 49.5
Weight	Pounds	Kilograms
3750X-24T	15.6	7.1
3750X-24P	15.8	7.2
3750X-24U	16.0	7.3
3750X-48T	16.3	7.4
3750X-48P	16.5	7.5
3750X-48PF	16.7	7.6
3750X-48U	16.7	7.6
3750X-12S	15.0	6.8
3750X-24S	15.4	7.0
3560X-24T	15.4	7.0
3560X-24P	15.7	7.1
3560X-24U	15.9	7.2
3560X-48T	16.1	7.3
3560X-48P	16.4	7.4
3560X-48PF	16.6	7.5
3560X-48U	16.7	7.6
Mean Time Between Failure (MTBF) Hours		
3750X-24T	189,704	
3750X-24P	167,198	
3750X-24U	238,070	
3750X-48T	171,846	

3750X-48P	139,913
3750X-48PF	139,913
3750X-48U	184,120
3750X-12S	194,224
3750X-24S	163,707
3560X-24T	208,218
3560X-24P	181,370
3560X-24U	247,580
3560X-48T	186,778
3560X-48P	149,594
3560X-48PF	149,594
3560X-48U	189,710
C3KX-PWR-350WAC	580,710
C3KX-PWR-715WAC	664,055
C3KX-PWR-1100WAC	392,174
C3KX-PWR-440WDC	469,350
C3KX-NM-1G	5,083,574
C3KX-NM-10G	2,468,553
C3KX-NM-10GT	1,411,719
C3KX-SM-10G	396,940
Environmental Ranges	
With AC Power Supply	Normal Operating Temperature and Altitudes: -5°C to +45°C, up to 5,000 feet (1500 m)
Operating Environment and Altitude	-5°C to +40°C, up to 10,000 feet (3000 m) Short-Term [†] Exceptional Conditions: -5°C to +50°C, up to 5,000 feet (1500 m) -5°C to +45°C, up to 10,000 feet (3000 m) -5°C to +45°C, at sea level with single fan failure [†] Not more than following in one year period: 96 consecutive hours, or 360 hours total, or 15 occurrences
With DC Power Supply	Normal Operating Temperature and Altitudes: -5°C to +45°C, up to 6,000 feet (1800 m)
Operating Environment and Altitude (NEBS)	-5°C to +40°C, up to 10,000 feet (3000 m) -5°C to +35°C, up to 13,000 feet (4000 m) Short-Term [†] Exceptional Conditions: -5°C to +55°C, up to 6,000 feet (1800 m) -5°C to +50°C, up to 10,000 feet (3000 m) -5°C to +45°C, up to 10,000 feet (4000 m) -5°C to +45°C, at sea level with single fan failure [†] Not more than following in one year period: 96 consecutive hours, or 360 hours total, or 15 occurrences
Acoustic Noise Measured per ISO 7779 & Declared per ISO 9296 Bystander positions operating to an ambient temperature of 25°C	With AC Power Supply (with 16PoE+ ports loaded): LpA: 43 dbA Typical, 46 dbA Maximum LwA: 5.2 Bel Typical, 5.5 Bel Maximum For GE SFP port models: LpA: 31 dbA Typical, 34 dbA Maximum LwA: 4.2 Bel Typical, 4.5 Bel Maximum Typical: Noise emission for a typical configuration

	Maximum: Statistical maximum to account for variation in production
Relative Humidity	5% to 95%, noncondensing
Storage Environment	Temperature: -40 C' to 70 C' Altitude: 15,000 ft
Vibration	Operating: 0.41Grms from 3 to 500Hz with spectral break points of 0.0005 G2/Hz at 10Hz and 200Hz 5dB/octave roll off at each end.
	Nonoperating: 1.12Grms from 3 to 500Hz with spectral break points of 0.0065 G2/Hz at 10Hz and 100Hz 5dB/octave roll off at each end.
Shock	Operating: 30G, 2ms Half sine
	Nonoperating: 55G, 10ms Trapezoid

Note: GLC-GE-100FX and GLC-T SFPs are not supported for NEBS short-term operation.

Connectors and LED Indicators for Cisco Catalyst 3750-X and 3560X Series

Table 12 shows connectors and LED indicators.

Table 12. Connectors and LED Indicators

Connectors and Cabling	<ul style="list-style-type: none"> • 1000BASE-T ports: RJ-45 connectors, 2-pair Cat-5E UTP cabling • 1000BASE-T SFP-based ports: RJ-45 connectors, 2-pair Cat-5E UTP cabling • 100BASE-FX, 1000BASE-SX, -LX/LH, -ZX, -BX10, DWDM and CWDM SFP Transceivers: LC fiber connectors (single-mode or multimode fiber) • 10GBASE-SR, LR, LRM, CX1 (v02 or higher) SFP+ Transceivers: LC fiber connectors (single-mode or multimode fiber) • Cisco StackWise stacking ports: copper-based Cisco StackWise cabling • Cisco StackPower: Cisco Proprietary Power Stacking cables • Ethernet Management port: RJ-45 connectors, 2-pair Cat-5 UTP cabling • Management console port: RJ-45-to-DB9 cable for PC connections
Power Connectors	<ul style="list-style-type: none"> • Customers can provide power to a switch by using either the internal power supply or the Cisco XPS 2200. The connectors are located at the back of the switch • Internal power supply connector: The internal power supply is an autoranging unit. The internal power supply supports input voltages between 100 and 240VAC. Use the supplied AC power cord to connect the AC power connector to an AC power outlet

Management and Standards Support for Cisco Catalyst 3750-X and 3560-X Series Switches

Table 13 shows management and standards support for the Cisco Catalyst 3750-X and 3560-X Series.

Table 13. Management and Standards Support for the Cisco Catalyst 3750-X and 3560-X Series

Description	Specification	
Management	BRIDGE-MIB	CISCO-VTP-MIB
	CISCO-CDP-MIB	ENTITY-MIB
	CISCO-CLUSTER-MIB	ETHERLIKE-MIB
	CISCO-CONFIG-MAN-MIB	IF-MIB
	CISCO-ENTITY-FRU-CONTROL-MIB	IGMP-MIB
	CISCO-ENVMON-MIB	IPMROUTE-MIB
	CISCO-FLASH-MIB	OLD-CISCO-CHASSIS-MIB
	CISCO-FTP-CLIENT-MIB	OLD-CISCO-FLASH-MIB
	CISCO-HSRP-MIB	OLD-CISCO-INTERFACES-MIB
	CISCO-HSRP-EXT-MIB	OLD-CISCO-IP-MIB
	CISCO-IGMP-FILTER-MIB	OLD-CISCO-SYS-MIB
	CISCO-IMAGE-MIB	OLD-CISCO-TCP-MIB
	CISCO-IP-STAT-MIB	OLD-CISCO-TS-MIB
	CISCO-L2L3-INTERFACE-CONFIG-MIB	OSPF-MIB (RFC 1253)
	CISCO-POE-EXTENSIONS-MIB	PIM-MIB
	CISCO-MAC-NOTIFICATION-MIB	RFC1213-MIB

Description	Specification	
	CISCO-MEMORY-POOL-MIB CISCO-PAGP-MIB CISCO-PING-MIB CISCO-PROCESS-MIB CISCO-RTTMON-MIB CISCO-STP-EXTENSIONS-MIB CISCO-SYSLOG-MIB CISCO-TCP-MIB CISCO-VLAN-IFTABLE-RELATIONSHIP-MIB CISCO-VLAN-MEMBERSHIP-MIB	RFC1253-MIB RMON-MIB RMON2-MIB SNMP-FRAMEWORK-MIB SNMP-MPD-MIB SNMP-NOTIFICATION-MIB SNMP-TARGET-MIB SNMPv2-MIB TCP-MIB UDP-MIB
Standards	IEEE 802.1s IEEE 802.1w IEEE 802.1x IEEE 802.1x-Rev IEEE 802.3ad IEEE 802.1ae IEEE 802.3af IEEE 802.3at IEEE 802.3x full duplex on 10BASE-T, 100BASE-TX, and 1000BASE-T ports IEEE 802.1D Spanning Tree Protocol IEEE 802.1p CoS Prioritization IEEE 802.1Q VLAN IEEE 802.3 10BASE-T specification IEEE 802.3u 100BASE-TX specification IEEE 802.3ab 1000BASE-T specification IEEE 802.3z 1000BASE-X specification	RMON I and II standards SNMPv1, SNMPv2c, and SNMPv3

Power Supply Specifications

Table 14 lists the power specifications for the Cisco Catalyst 3750-X and 3560-X Series based on the kind of power supply used.

Table 14. Power Specifications for Cisco Catalyst 3750-X and 3560-X Series

Description	Specification			
	C3KX-PWR-1100WAC	C3KX-PWR-715WAC	C3KX-PWR-350WAC	C3KX-PWR-440WDC
Power Supply Rated Maximum	1100W	715W	350W	440W
Total Output BTU (Note: 1000 BTU/hr = 293W)	3793 BTU/hr, 1100W	2465 BTU/hr, 715W	1207 BTU/hr, 350W	1517 BTU/hr, 440W
Input-Voltage Range and Frequency	115-240VAC, 50-60 Hz	100-240VAC, 50-60 Hz	100-240VAC, 50-60 Hz	-36VDC to -72VDC
Input Current	12-6A	10-5A	4-2A	<8A@-72VDC <16A@-36VDC
Output Ratings	-56V@19.64A	-56V@12.8A	-56V@6.25A	-56V@7.86A
Output Holdup Time	10 ms minimum @ 102.5VAC	16.7 ms minimum @ 100VAC	16.7 ms minimum @ 100VAC	> 2ms@-48VDC
Power-Supply Input Receptacles	IEC 320-C16 (IEC60320-C16)	IEC 320-C16 (IEC60320-C16)	IEC 320-C16 (IEC60320-C16)	Terminal Strip
Power Cord Rating	13A	13A	10A	20A @ 100VDC
Physical Specifications	(H x W x D): 1.58 X 3.25 X 13.25 in Weight: 3.5 lb (1.6 kg)	(H x W x D): 1.58 X 3.25 X 11.75 in Weight: 2.78 lb (1.26 kg)	(H x W x D): 1.58 X 3.25 X 11.75 in Weight: 2.76 lb (1.25 kg)	(H x W x D): 1.58 X 3.25 X 11.75 in Weight: 2.65 lb (1.2 kg)

Description	Specification
Operating Temperature	23 to 113°F (-5 to 45°C)
Storage Temperature	-40 to 158°F (-40 to 70°C)
Relative Humidity Operating, and Nonoperating Noncondensing	5 to 90% noncondensing
Altitude	10,000 ft. (3000 meters), up to 45°C
MTBF	Calculated MTBF must be greater than 300,000 using Telcordia SR-332, Method 1, Case 3. Demonstrated MTBF is 500,000 hr (with 90% confidence level).
EMI and EMC Compliance	FCC Part 15 (CFR 47) Class A ICES-003 Class A EN 55022 Class A CISPR 22 Class A AS/NZS 3548 Class A BSMI Class A (AC input models only) VCCI Class A EN 55024, EN300386, EN 50082-1, EN 61000-3-2, EN 61000-3-3 EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6, EN 61000-6-1
Safety Compliance	UL 60950-1, CAN/CSA-C22.2 No. 60950-1, EN 60950-1, IEC 60950-1, CCC
LED Indicators	"AC OK": Input power to the power supply is OK. "PS OK": Output power from the power supply is OK.

Power Consumptions of Standalone Cisco Catalyst 3750-X and 3560-X Series Switches

Table 15 shows power consumptions of standalone Cisco Catalyst 3750-X and 3560-X Series Switches based on Alliance for Telecommunications Industry Solutions (ATIS) testing using IMIX distribution stream traffic, with input voltage of 115V AC @ 60 Hz and no PoE loading.

Table 15. Power Consumptions of Standalone Cisco Catalyst 3750-X and 3560-X Series

Models	Uplink Module	Power Consumption, W			
		0% Traffic	10% Traffic	100% Traffic	Weighted Average
3750X-24T & 3560X-24T	C3KX-NM-1G	93.6	92.8	93.5	93.0
3750X-24P & 3560X-24P		99.4	98.7	99.3	98.9
3750X-48T & 3560X-48T		121.3	119.7	120.4	120.0
3750X-48P & 3560X-48P		134.9	133.3	133.9	133.6
3750X-48PF & 3560X-48PF		137.4	135.8	137.2	136.2
3750X-12S		86.1	86.1	87.1	86.4
3750X-24S		107.5	107.5	108.9	107.9
3560X-24U		97.82	97.27	98.01	97.43
3560X-48U		122.55	121.33	122.06	121.59
3750X-24U		95.59	95.17	96.10	95.33
3750X-48U		126.39	125.29	125.87	125.51
3750X-24T & 3560X-24T	C3KX-NM-10G	95.8	95.4	98.7	95.8
3750X-24P & 3560X-24P		101.7	101.5	104.6	101.8
3750X-48T & 3560X-48T		124.2	122.7	126.0	123.3
3750X-48P & 3560X-48P		137.2	136.0	139.3	136.5
3750X-48PF & 3560X-48PF		140.9	139.6	142.9	140.1
3750X-12S		87.6	87.9	91.9	88.6

Models	Uplink Module	Power Consumption, W				
		0% Traffic	10% Traffic	100% Traffic	Weighted Average	
3750X-24S		109.7	110.1	114.1	110.7	
3560X-24U		99.23	99.10	102.63	99.48	
3560X-48U		123.54	122.73	125.99	123.17	
3750X-24U		99.34	99.16	102.69	99.54	
3750X-48U		127.17	126.33	129.48	126.77	
3750X-24T & 3560X-24T	C3KX-NM-10GT	111.7	110.6	114.1	111.1	
3750X-24P & 3560X-24P		119	116.9	122.4	117.7	
3750X-48T & 3560X-48T		142.8	141.9	145.4	142.4	
3750X-48P & 3560X-48P		151.6	150.7	154.2	151.2	
3750X-48PF & 3560X-48PF		156.3	155.1	158.5	155.6	
3750X-12S		109.3	109.1	111.2	109.3	
3750X-24S		139.4	139	142.7	139.5	
3560X-24U		116.16	115.92	119.27	116.29	
3560X-48U		139.25	138.42	141.83	138.88	
3750X-24U		114.92	114.64	118.09	115.03	
3750X-48U		141.22	140.37	143.78	140.84	
3750X-24T & 3560X-24T		C3KX-SM-10G	125.80	125.63	130.45	126.14
3750X-24P & 3560X-24P			132.15	132.31	137.00	132.75
3750X-48T & 3560X-48T			157.46	156.72	161.61	157.32
3750X-48P & 3560X-48P	166.26		165.57	170.36	166.15	
3750X-48PF & 3560X-48PF	169.75		169.35	173.69	169.85	
3750X-12S	127.4		127.3	130.3	127.6	
3750X-24S	151.7		151.7	156.8	152.2	
3560X-24U	131.14		131.05	135.41	131.50	
3560X-48U	155.00		154.24	158.86	154.82	
3750X-24U	132.43		132.45	137.21	132.92	
3750X-48U	156.94	156.33	160.92	156.88		

Safety and Compliance

Table 16 lists the safety and compliance information for the Cisco Catalyst 3750-X and 3560-X Series.

Table 16. Safety and Compliance Information for Cisco Catalyst 3750-X and 3560-X Series

Description	Specification
Safety Certifications	UL60950-1 C-UL to CAN/CSA 22.2 No.60950-1 TUV/GS to EN 60950-1 CB to IEC 60950-1 with all country deviations AS/NZS 60950-1 CE Marking NOM (through partners and distributors) GOST (Russia Safety Mark)

Description	Specification
Electromagnetic Emissions Certifications	FCC Part 15 Class A EN 55022B Class A (CISPR22 Class A) VCCI Class A AS/NZS 3548 Class A or AS/NZS CISPR22 Class A KCC CE Marking GOST (Russian mark - Post FCS through partners) CCC for PS FRU Redundant
Environmental	Reduction of Hazardous Substances (ROHS) 5
Noise Specifications	Office Product Spec: 48dBA at 30°C (refer to ISO 7779)
Telco	CLEI code

NEBS

The Cisco Catalyst 3750-X and 3560-X Series Switches are NEBS Level 3 compliant according to NEBS Criteria Levels SR-3580.

Cisco Enhanced Limited Lifetime Hardware Warranty

The Cisco Catalyst 3750-X and 3560-X Series Switches come with an enhanced limited lifetime hardware warranty (E-LLW) that includes next business day delivery of replacement hardware where available and 90 days of 8x5 Cisco Technical Assistance Center (TAC) support.

Your formal warranty statement, including the warranty applicable to Cisco software, appears in the Cisco information packet that accompanies your Cisco product. We encourage you to review carefully the warranty statement shipped with your specific product before use.

Cisco reserves the right to refund the purchase price as its exclusive warranty remedy.

For further information on warranty terms, visit <http://www.cisco.com/go/warranty>. Table 17 provides information about the enhanced limited lifetime hardware warranty.

Table 17. Enhanced Limited Lifetime Hardware Warranty

	Cisco Enhanced Limited Lifetime Hardware Warranty
Device Covered	Applies to Cisco Catalyst 3750-X and 3560-X Series Switches.
Warranty Duration	Lifetime. As long as the original customer owns the product.
EoL Policy	In the event of discontinuance of product manufacture, Cisco warranty support is limited to 5 years from the announcement of discontinuance.
Hardware Replacement	Cisco or its service center will use commercially reasonable efforts to ship a replacement for next business day delivery, where available. Otherwise, a replacement will be shipped within ten (10) working days after receipt of the RMA request. Actual delivery times might vary depending on customer location.
Effective Date	Hardware warranty commences from the date of shipment to customer (and in case of resale by a Cisco reseller, not more than 90 days after original shipment by Cisco).
TAC Support	Cisco will provide during business hours, 8 hours per day, 5 days per week basic configuration, diagnosis, and troubleshooting of device-level problems for up to a 90-day period from the date of shipment of the originally purchased Cisco Catalyst 3750-X or 3560-X product. This support does not include solution or network-level support beyond the specific device under consideration.
Cisco.com Access	Warranty allows guest access only to Cisco.com

Software Policy for Cisco Catalyst 3750-X and 3560-X Series Switches

Customers with Cisco Catalyst LAN Base and IP Base software feature sets will be provided with maintenance updates and bug fixes designed to maintain the compliance of the software with published specifications, release notes, and industry standards compliance as long as the original end user continues to own or use the product or up to one year from the end-of-sale date for this product, whichever occurs earlier. Customers with licenses for our premium software images require a service support contract such as Cisco SMARTnet[®] Service to download updates.

This policy supersedes any previous warranty or software statement and is subject to change without notice.

Cisco and Partner Services for Next-Generation Cisco Catalyst Fixed Switches

Enable the innovative, secure, intelligent edge in the Borderless Network Architecture using personalized services from Cisco and our partners. Through a discovery process that begins with understanding your business objectives, we help you integrate the next-generation Cisco Catalyst fixed switches into your architecture and incorporate network services onto that platform. Sharing knowledge and leading practices, we support your success every step of the way as you deploy, absorb, manage, and scale new technology. Choose from a flexible suite of support services designed to meet your business needs and help you maintain high-quality network performance while controlling operational costs. (See Table 18.)

Table 18. Technical Services Available for Cisco Catalyst 3750-X and 3560-X Switches

Technical Services
Cisco SMARTnet Service <ul style="list-style-type: none">• Around-the-clock, global access to the Cisco Technical Assistance Center (TAC)• Unrestricted access to the extensive Cisco.com knowledge base and tools• Next-business-day, 8x5x4, 24x7x4, and 24x7x2 advance hardware replacement and onsite parts replacement and installation available• Ongoing operating system software updates within the licensed feature set• Proactive diagnostics and real-time alerts on Smart Call Home enabled devices
Cisco Smart Foundation Service <ul style="list-style-type: none">• Next business day advance hardware replacement as available• Business hours access to SMB TAC (access levels vary by region)• Access to Cisco.com SMB knowledge base• Online technical resources through Smart Foundation Portal• Operating system software bug fixes and patches
Cisco SP Base Service <ul style="list-style-type: none">• Around-the-clock, global access to the Cisco TAC• Registered access to Cisco.com• Next business day, 8x5x4, 24x7x4, and 24x7x2 advance hardware replacement. Return to factory option available²• Ongoing operating system software updates¹
Cisco Focused Technical Support Services <ul style="list-style-type: none">• 3 levels of premium, high-touch services are available:<ul style="list-style-type: none">• Cisco High-Touch Operations Management Service• Cisco High-Touch Technical Support Service• Cisco High-Touch Engineering Service• Valid Cisco SMARTnet or SP Base contracts on all network equipment are required

Notes:

¹. Cisco operating system updates include the following: maintenance releases, minor updates, and major updates within the licensed feature set.

². Advance hardware replacement is available in various service-level combinations. For example, 8x5xNBD indicates that shipment will be initiated during the standard 8-hour business day, 5 days a week (the generally accepted business days within the relevant region), with next business day (NBD) delivery. Where NBD is not available, same day ship is provided. Restrictions apply; for details, review the appropriate service descriptions.

Ordering Information

Table 19 lists ordering information for the Cisco Catalyst 3750-X and 3560-X Series. To place an order, visit the Cisco Ordering homepage at

http://www.cisco.com/en/US/ordering/or13/or8/order_customer_help_how_to_order_listing.html.

Table 19. Cisco Catalyst 3750-X and 3560-X Series Ordering Information

Product Number	Product Description
Cisco Catalyst 3750-X Series	
WS-C3750X-24T-L	Stackable 24 10/100/1000 Ethernet ports, with 350W AC power supply 1 RU, LAN Base feature set (Stackpower cables need to be purchased separately)
WS-C3750X-48T-L	Stackable 48 10/100/1000 Ethernet ports, with 350W AC power supply 1 RU, LAN Base feature set (Stackpower cables need to be purchased separately)
WS-C3750X-24P-L	Stackable 24 10/100/1000 Ethernet PoE+ ports, with 715W AC power supply 1 RU, LAN Base feature set (Stackpower cables need to be purchased separately)
WS-C3750X-24U-L	Stackable 24 10/100/1000 Ethernet UPOE ports, with 1100W AC power supply 1 RU, LAN Base feature set (Stackpower cables need to be purchased separately)
WS-C3750X-48P-L	Stackable 48 10/100/1000 Ethernet PoE+ ports, with 715W AC power supply 1 RU, LAN Base feature set (Stackpower cables need to be purchased separately)
WS-C3750X-48PF-L	Stackable 48 10/100/1000 Ethernet PoE+ ports, with 1100W AC power supply 1 RU, LAN Base feature set (Stackpower cables need to be purchased separately)
WS-C3750X-48U-L	Stackable 48 10/100/1000 Ethernet UPOE ports, with 1100W AC power supply 1 RU, LAN Base feature set (Stackpower cables need to be purchased separately)
WS-C3750X-24T-S	Stackable 24 10/100/1000 Ethernet ports, with 350W AC power supply 1 RU, IP Base feature set
WS-C3750X-48T-S	Stackable 48 10/100/1000 Ethernet ports, with 350W AC power supply 1 RU, IP Base feature set
WS-C3750X-24P-S	Stackable 24 10/100/1000 Ethernet PoE+ ports, with 715W AC Power Supply 1 RU, IP Base feature set
WS-C3750X-24U-S	Stackable 24 10/100/1000 Ethernet UPOE ports, with 1100W AC power supply 1 RU, IP Base feature set
WS-C3750X-48P-S	Stackable 48 10/100/1000 Ethernet PoE+ ports, with 715W AC Power Supply 1 RU, IP Base feature set
WS-C3750X-48PF-S	Stackable 48 10/100/1000 Ethernet PoE+ ports, with 1100W AC power supply 1 RU, IP Base feature set
WS-C3750X-48U-S	Stackable 48 10/100/1000 Ethernet UPOE ports, with 1100W AC power supply 1 RU, IP Base feature set
WS-C3750X-12S-S	Stackable 12 GE SFP Ethernet ports, with 350W AC power supply 1 RU, IP Base feature set
WS-C3750X-24S-S	Stackable 24 GE SFP Ethernet ports, with 350W AC power supply 1 RU, IP Base feature set
WS-C3750X-24T-E	Stackable 24 10/100/1000 Ethernet ports, with 350W AC power supply 1 RU, IP Services feature set
WS-C3750X-48T-E	Stackable 48 10/100/1000 Ethernet ports, with 350W AC power supply 1 RU, IP Services feature set
WS-C3750X-24P-E	Stackable 24 10/100/1000 Ethernet PoE+ ports, with 715W AC Power Supply 1 RU, IP Services feature set
WS-C3750X-24U-E	Stackable 24 10/100/1000 Ethernet UPOE ports, with 1100W AC power supply 1 RU, IP Services feature set
WS-C3750X-48P-E	Stackable 48 10/100/1000 Ethernet PoE+ ports, with 715W AC Power Supply 1 RU, IP Services feature set
WS-C3750X-48PF-E	Stackable 48 10/100/1000 Ethernet PoE+ ports, with 1100W AC power supply 1 RU, IP Services feature set
WS-C3750X-48U-E	Stackable 48 10/100/1000 Ethernet UPOE ports, with 1100W AC power supply 1 RU, IP Services feature set
WS-C3750X-12S-E	Stackable 12 GE SFP Ethernet ports, with 350W AC power supply 1 RU, IP Services feature set
WS-C3750X-24S-E	Stackable 24 GE SFP Ethernet ports, with 350W AC power supply 1 RU, IP Services feature set
Cisco Catalyst 3560-X Series	
WS-C3560X-24T-L	Standalone 24 10/100/1000 Ethernet ports, with 350W AC power supply 1 RU, LAN Base feature set
WS-C3560X-48T-L	Standalone 48 10/100/1000 Ethernet ports, with 350W AC power supply 1 RU, LAN Base feature set
WS-C3560X-24P-L	Standalone 24 10/100/1000 Ethernet PoE+ ports, with 715W AC power supply 1 RU, LAN Base feature set
WS-C3560X-24U-L	Standalone 24 10/100/1000 Ethernet UPOE ports, with 1100W AC power supply 1 RU, LAN Base feature set

Product Number	Product Description
WS-C3560X-48P-L	Standalone 48 10/100/1000 Ethernet PoE+ ports, with 715W AC power supply 1 RU, LAN Base feature set
WS-C3560X-48P-L	Standalone 48 10/100/1000 Ethernet PoE+ ports, with 715W AC power supply 1 RU, LAN Base feature set
WS-C3560X-48PF-L	Standalone 48 10/100/1000 Ethernet PoE+ ports, with 1100W AC power supply 1 RU, LAN Base feature set
WS-C3560X-48U-L	Standalone 48 10/100/1000 Ethernet UPOE ports, with 1100W AC power supply 1 RU, LAN Base feature set
WS-C3560X-24T-S	Standalone 24 10/100/1000 Ethernet ports, with 350W AC power supply 1 RU, IP Base feature set
WS-C3560X-48T-S	Standalone 48 10/100/1000 Ethernet ports, with 350W AC power supply 1 RU, IP Base feature set
WS-C3560X-24P-S	Standalone 24 10/100/1000 Ethernet PoE+ ports, with 715W AC power supply 1 RU, IP Base feature set
WS-C3560X-24U-S	Standalone 24 10/100/1000 Ethernet UPOE ports, with 1100W AC power supply 1 RU, IP Base feature set
WS-C3560X-48P-S	Standalone 48 10/100/1000 Ethernet PoE+ ports, with 715W AC power supply 1 RU, IP Base feature set
WS-C3560X-48PF-S	Standalone 48 10/100/1000 Ethernet PoE+ ports, with 1100W AC power supply 1 RU, IP Base feature set
WS-C3560X-48U-S	Standalone 48 10/100/1000 Ethernet UPOE ports, with 1100W AC power supply 1 RU, IP Base feature set
WS-C3560X-24T-E	Standalone 24 10/100/1000 Ethernet ports, with 350W AC power supply 1 RU, IP Services feature set
WS-C3560X-48T-E	Standalone 48 10/100/1000 Ethernet ports, with 350W AC power supply 1 RU, IP Services feature set
WS-C3560X-24P-E	Standalone 24 10/100/1000 Ethernet PoE+ ports, with 715W AC power supply 1 RU, IP Services feature set
WS-C3560X-24U-E	Standalone 24 10/100/1000 Ethernet UPOE ports, with 1100W AC power supply 1 RU, IP Services feature set
WS-C3560X-48P-E	Standalone 48 10/100/1000 Ethernet PoE+ ports, with 715W AC power supply 1 RU, IP Services feature set
WS-C3560X-48PF-E	Standalone 48 10/100/1000 Ethernet PoE+ ports, with 1100W AC power supply 1 RU, IP Services feature set
WS-C3560X-48U-E	Standalone 48 10/100/1000 Ethernet UPOE ports, with 1100W AC power supply 1 RU, IP Services feature set
Network Modules for the Cisco Catalyst 3750-X and 3560-X Series	
C3KX-NM-1G=	1G network module spare
C3KX-NM-10G=	10G network module spare
C3KX-NM-10GT=	10G-T network module spare
C3KX-NM-BLANK=	Network module blank spare
C3KX-SM-10G=	10G Service Module Spare
Power Supplies and Fan for the Cisco Catalyst 3750-X and 3560-X Series	
C3KX-PWR-350WAC=	350W AC power supply
C3KX-PWR-715WAC=	715W AC power supply
C3KX-PWR-1100WAC=	1100W AC power supply
C3KX-PWR-440WDC=	440W DC power supply
C3KX-PS-BLANK=	Power supply blank spare
C3KX-FAN-23CFM=	Fan module spare
eXpandable Power System (XPS) for the Cisco Catalyst 3750-X and 3560-X Series	
XPS-2200	eXpandable Power System 2200
CAB-XPS-58CM=	XPS cable 58 cm spare
CAB-XPS-150CM=	XPS cable 150 cm spare
XPS-2200-FAN=	XPS 2200 fan module spare
StackWise and StackPower Cables for the Cisco Catalyst 3750-X Series	
CAB-STACK-50CM=	Cisco StackWise 50 cm stacking cable
CAB-STACK-1M=	Cisco StackWise 1 m stacking cable
CAB-STACK-3M=	Cisco StackWise 3 m stacking cable
CAB-STACK-50CM-NH=	Cisco StackWise 50 cm nonhalogen lead-free stacking cable
CAB-STACK-1M-NH=	Cisco StackWise 1 m nonhalogen lead-free stacking cable
CAB-STACK-3M-NH=	Cisco StackWise 3 m nonhalogen lead-free stacking cable

Product Number	Product Description
CAB-SPWR-30CM=	Cisco Catalyst 3750-X StackPower cable 30 cm spare
CAB-SPWR-150CM=	Cisco Catalyst 3750-X StackPower cable 150 cm spare
Spare Power Cords for the Cisco Catalyst 3750-X and 3560-X Series	
CAB-3KX-AC=	AC Power Cord for Cisco Catalyst 3K-X (North America)
CAB-3KX-AC-AP=	AC Power Cord for Cisco Catalyst 3K-X (Australia)
CAB-3KX-AC-AR=	AC Power Cord for Cisco Catalyst 3K-X (Argentina)
CAB-3KX-AC-SW=	AC Power Cord for Cisco Catalyst 3K-X (Switzerland)
CAB-3KX-AC-UK=	AC Power Cord for Cisco Catalyst 3K-X (United Kingdom)
CAB-3KX-AC-JP=	AC Power Cord for Cisco Catalyst 3K-X (Japan)
CAB-3KX-250VAC-JP=	Japan 250V AC Power Cord for Cisco Catalyst 3K-X (Japan)
CAB-3KX-AC-EU=	AC Power Cord for Cisco Catalyst 3K-X (Europe)
CAB-3KX-AC-IT=	AC Power Cord for Cisco Catalyst 3K-X (Italy)
CAB-3KX-AC-IN=	AC Power Cord for Cisco Catalyst 3K-X (India)
CAB-3KX-AC-CN=	AC Power Cord for Cisco Catalyst 3K-X (China)
CAB-3KX-AC-DN=	AC Power Cord for Cisco Catalyst 3K-X (Denmark)
CAB-3KX-AC-IS=	AC Power Cord for Cisco Catalyst 3K-X (Israel)
CAB-C15-CBN	Cabinet Jumper Power Cord, 250 VAC 13A, C14-C15 Connectors
Spare Accessory and Rack Mount Kits for the Cisco Catalyst 3750-X and 3560-X Series	
C3KX-ACC-KIT=	Accessory kit for Cisco Catalyst 3750-X and 3560-X Series
C3KX-RACK-KIT=	Rack mount kit for Cisco Catalyst 3750-X and 3560-X Series
C3KX-4PT-KIT=	Extension rails and brackets for four-point mounting for Cisco Catalyst 3750-X and 3560-X Series
FIPS Accessory Kit for the Cisco Catalyst 3750-X and 3560-X Series	
C3KX-FIPS-KIT	FIPS Opacity Shield for Catalyst 3750-X and 3560-X Series

¹ Not supported for NEBS

² DOM = digital optical monitoring

³ These SFPs will not operate in the SFP+ module slots for the C3KX-NM-10G and C3KX-SM-10G Network Modules

Optics compatibility information

The Cisco Catalyst 3750-X and 3560-X Series support a wide range of optics. Since the list of supported optics is updated on a regular basis, please consult the tables available here for the latest SFP compatibility information:

http://www.cisco.com/en/US/products/hw/modules/ps5455/products_device_support_tables_list.html

Cisco Catalyst 3750-X and 3560-X Series Product Activation Process

The Cisco Catalyst 3750-X and 3560-X Series product activation process has two steps, described in Table 20.

The first step shows the product activation key, and the second step shows the various upgrade licenses.

Table 20. Cisco Catalyst 3750-X and 3560-X Series Product Activation Process

Step One: Product Activation Keys Product Number and Description	Step Two: Upgrade License	
	Product Number	Product Description
C3750X-LIC= (Product activation keys for 3750-X Series)	3750-X LAN Base to IP Base Upgrade License	
	C3750X-24-L-S	C3750X-24 LAN Base to IP Base Paper License
	C3750X-48-L-S	C3750X-48 LAN Base to IP Base Paper License
	L-C3750X-24-L-S	C3750X-24 LAN Base to IP Base E-License
	L-C3750X-48-L-S	C3750X-48 LAN Base to IP Base E-License

Step One: Product Activation Keys	Step Two: Upgrade License	
Product Number and Description	Product Number	Product Description
	3750-X IP Base to IP Services Upgrade	
	C3750X-24-IOS-S-E	C3750X-24 IP Base to IP Services factory IOS Upgrade
	C3750X-48-IOS-S-E	C3750X-48 IP Base to IP Services factory IOS Upgrade
	C3750X-24-S-E	C3750X-24 IP Base to IP Services Paper License
	C3750X-48-S-E	C3750X-48 IP Base to IP Services Paper License
	C3750X-12S-S-E	C3750X-12S IP Base to IP Services Paper License
	C3750X-24S-S-E	C3750X-24S IP Base to IP Services Paper License
	L-C3750X-24-S-E	C3750X-24 IP Base to IP Services E-License
	L-C3750X-48-S-E	C3750X-48 IP Base to IP Services E-License
	L-C3750X-12S-S-E	C3750X-12S IP Base to IP Services E-License
	L-C3750X-24S-S-E	C3750X-24S IP Base to IP Services E-License
	3750-X LAN Base to IP Services Upgrade	
	C3750X-24-L-E	C3750X-24 LAN Base to IP Services Paper License
	C3750X-48-L-E	C3750X-48 LAN Base to IP Services Paper License
	L-C3750X-24-L-E	C3750X-24 LAN Base to IP Services E-License
	L-C3750X-48-L-E	C3750X-48 LAN Base to IP Services E-License
C3560X-LIC= (Product activation keys for 3560-X Series)	3560-X LAN Base to IP Base Upgrade License	
	C3560X-24-L-S	C3560X-24 LAN Base to IP Base Paper License
	C3560X-48-L-S	C3560X-48 LAN Base to IP Base Paper License
	L-C3560X-24-L-S	C3560X-24 LAN Base to IP Base E-License
	L-C3560X-48-L-S	C3560X-48 LAN Base to IP Base E-License
	3560-X IP Base to IP Services Upgrade	
	C3560X-24-IOS-S-E	C3560X-24 IP Base to IP Services factory IOS Upgrade
	C3560X-48-IOS-S-E	C3560X-48 IP Base to IP Services factory IOS Upgrade
	C3560X-24-S-E	C3560X-24 IP Base to IP Services Paper License
	C3560X-48-S-E	C3560X-48 IP Base to IP Services Paper License
	L-C3560X-24-S-E	C3560X-24 IP Base to IP Services E-License
	L-C3560X-48-S-E	C3560X-48 IP Base to IP Services E-License
	3560-X LAN Base to IP Services Upgrade	
	C3560X-24-L-E	C3560X-24 LAN Base to IP Services Paper License
	C3560X-48-L-E	C3560X-48 LAN Base to IP Services Paper License
	L-C3560X-24-L-E	C3560X-24 LAN Base to IP Services E-License
L-C3560X-48-L-E	C3560X-48 LAN Base to IP Services E-License	

XPS 2200 Performance Specifications

Table 21 lists the performance specifications for the power supplies.

Please note that the same power supplies used in the 3750-X and 3560-X are all usable in the XPS-2200 (please refer to Table 12).

Table 21. XPS 2200 Performance Specifications

Performance Numbers for XPS 2200	
Total Power Sharing Capability (Stack Power Mode, 9 Switches and 20 total 1100W power supplies)	22kW
Maximum Power Back-up Capability (RPS Mode, 2x1100W power supplies in XPS 2200)	2200W
Nominal Voltage	56V
Nominal Maximum Current per Port (input or output)	40A
Flash	8MB

Heat Dissipation

Table 22 provides heat dissipation information for the Cisco XPS 2200.

Table 22. Heat Dissipation

Cisco XPS 2200 Power Supply Configuration	Heat Dissipation	
	No Load (BTU/hr)	Full Load (BTU/hr)
1 x 350WAC	120	480
2 x 350WAC	160	665
1 x 715WAC	155	610
2 x 715WAC	205	920
1 x 1100WAC	155	825
2 x 1100WAC	205	1350
1 x 440WDC	115	645
2 x 440WDC	155	990

Physical and Environmental Specifications

Table 23 lists the physical and environmental specifications for XPS-2200.

Table 23. Physical and Environmental Specifications

Description	Specification
Physical specifications	H x W x D: 1.73 x 17.5 x 20.5 in. (4.4 x 44.5 x 52.1 cm) Weight: 19.8 lb (9.0 kg)
Total input BTU (1000 BTU/Hr = 290W)	8525 BTU/Hr
Operating temperature	-5 to 45°C up to 5000ft elevation, -5 to 40°C up to 10000ft elevation
Storage temperature	-40 to 70°C
Relative humidity operating, non-condensing	5 to 95% non-condensing
Relative humidity non-operating, non-condensing	5 to 95% non-condensing
Operating altitude	10,000 ft. (3000m)

Description	Specification
Storage altitude	15,000 ft. (4750 m)
Mean Time Between Failure (MTBF)	222,000 hours
Electromagnetic compatibility certifications	FCC Class A for North America: 47 CFR Part 15 VCCI Class A for Japan: V-3/2007.04 CCC EMC for China on Spare Power Supplies: EN61000-3-2 (GB17625.1-1998) BSMI Class A for Taiwan: CNS13438 KCC (formerly MIC) GB17625.1-1998 Class A for Korea: KN24/KN22 AS/NZS Class A for Australia: CISPR22:2004 or EN55022 Brazil, ANATEL In-Country approval CE Class A for European Union: EN55022, EN300386, EN55024 (CISPR24)
Safety certifications	UL 60950-1 CAN/CSA 22.2 No.60950-1 EN 60950-1CB to IEC 60950-1 GB 4943

Acoustic Specifications

Table 24 lists the acoustic specifications of the Cisco XPS 2200.

The following numbers represent the range of values for Idle, 50% and 100%:

Table 24. Cisco XPS 2200 Acoustic Specifications

Cisco XPS 2200 Power Supply Configuration	Sound Pressure		Sound Power	
	LpA (Typical)	LpAD (Maximum)	LwA (Typical)	LwAD (Maximum)
2 x 1100WAC	43 dB	63 dB	5.3 B	7.3 B
2 x 715WAC	42 dB	61 dB	5.3 B	6.6 B

Dimensions and Weight Options

Table 25 describes various XPS2200 dimensions and weight options (All have a 1 RU height).

Table 25. Cisco XPS 2200 Dimensions and Weight Options

XPS2200 dimensions and weight options	Dimensions (H x W x D)		Weight	
	Inches	Centimeters	Pounds	Kilograms
XPS2200 including 3 fan FRUs	1.73 x 17.5 x 17.46	4.4 x 44.5 x 44.4	12.8	5.8
With two C3K-PWR-1100WAC power supplies	1.73 x 17.5 x 20.5	4.4 x 44.5 x 52.1	19.0	8.6
With two C3K-PWR-715WAC power supplies	1.73 x 17.5 x 19.0	4.4 x 44.5 x 48.3	18.5	8.4
With two C3K-PWR-350WAC power supplies	1.73 x 17.5 x 19.0	4.4 x 44.5 x 48.3	18.5	8.4
With two C3K-PWR-440WDC power supplies	1.73 x 17.5 x 19.0	4.4 x 44.5 x 48.3	18.4	8.3

Connectors and Cabling

Table 26 describes the connectors and cabling for the XPS2200.

Table 26. Cisco XPS 2200 Connectors and Cabling

Connectors and Cabling	<ul style="list-style-type: none"> • Cisco StackPower: Cisco Proprietary Power Stacking cables • Service port: RJ-45-to-DB9 cable for PC connections
Power Connectors	<ul style="list-style-type: none"> • Customers can provide power to a XPS-2200 by using either the internal power supply or via one or more 3750-X/3560-X Switches. The connectors are located at the back of the switch. (9 StackPower/XPS ports and up to two AC Power Inlet Connections). • Internal power supply connector: The internal power supply is an autoranging unit. The internal power supply supports input voltages between 100 and 240VAC. Use the supplied AC power cord to connect the AC power connector to an AC power outlet.

Fans

The Cisco XPS 2200 has 3 field-replaceable fan modules (XPS-2200-FAN).

Table 27 describes the fan module for the XPS2200.

Table 27. Cisco XPS 2200 Fan Module Dimensions and Weight

	Dimensions (H x W x D)		Weight	
	Inches	Centimeters	Pounds	Kilograms
XPS2200 Fan Module	1.59 x 1.59 x 4.24	4.04 x 4.04 x 10.77	.13	.06

- System fan modules offer up to 24 cubic feet per minute (CFM) under full load at ambient temperature of 45°C and altitude of 3000 meters.

Indicators

Table 28 describes the indicator options for the XPS2200.

Table 28. Cisco XPS 2200 Indicators

RPS Mode- 9 port associated LEDs	<ul style="list-style-type: none"> • Solid Green when in RPS mode and able to backup this Port • Blinking Green when actively backing up Port • Solid Amber indicates backup not available for this Port • Blinking Amber for any port faults
SP Mode- 9 port associated LEDs	<ul style="list-style-type: none"> • Solid Green when in SP mode and there are no issues • Blinking Green not defined • Solid Amber indicates that SP port off-line (No Power Output) • Blinking Amber for any port faults
Combined function (SP and RPS) LEDs	<ul style="list-style-type: none"> • Blinking Amber on both RPS and SP LEDs indicates cable fault (short, etc.) • Both RPS and SP ports alternate Green/Amber when selected via push button • 18 Port LEDs for new features with more comprehensive single look status assessment
System LEDs - Front of System	<ul style="list-style-type: none"> • System <ul style="list-style-type: none"> ◦ Solid Green - Normal operation with no faults ◦ Blinking Green during boot ◦ Solid Amber - Temperature faults, cable faults, port faults, power supply faults, fan faults ◦ Blinking Amber during software updates • Fan <ul style="list-style-type: none"> ◦ Use one Fan LED, amber when any one fan fails, green when all OK ◦ Each FRU Fan (3) will have an associated Status LED (green=working, amber=failed), but no silkscreen on front panel • Temp <ul style="list-style-type: none"> ◦ Green - No Problems. Amber - Over Temperature

	<ul style="list-style-type: none"> • FEP (PS1 & PS2) <ul style="list-style-type: none"> ◦ Solid Green - Stack Power Mode OK ◦ Blinking Green - RPS Mode OK ◦ Solid Amber - Stack Power Mode Faulty
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Power Supply Specifications

The XPS 2200 uses the same power supplies as the Cisco Catalyst 3750-X and 3560-X Series Switches. Refer to Table 12 for the power specifications for each type of power supply that is usable in the XPS 2200 as well as the Cisco Catalyst 3750-X and 3560-X Series Switches.

Cisco XPS2200 Ordering information

Table 29 shows Cisco XPS2200 ordering information.

Table 29. Ordering Information

Product Number	Product Description
XPS-2200	eXpandable Power System 2200
CAB-XPS-58CM=	XPS cable 58 cm spare Cable to connect XPS-2200 StackPower/XPS ports to 3750-X or 3560-X Switch SKUs
CAB-XPS-150CM=	XPS cable 150 cm spare Cable to connect XPS-2200 StackPower/XPS ports to 3750-X or 3560-X Switch SKUs
XPS-2200-FAN=	XPS 2200 fan module spare
C3KX-RACK-KIT=	Rack mount kit for Cisco Catalyst 3750-X and 3560-X Series
C3KX-ACC-KIT=	Accessory kit for Catalyst 3750-X and 3560-X Series
C3KX-4PT-KIT=	Extension rails and brackets for four-point mounting for Cisco Catalyst 3750-X and 3560-X Series



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Cisco 1941 Series Integrated Services Routers

Product Names: CISCO1941/K9, CISCO1941W-A/K9, CISCO1941W-P/K9, CISCO1941W-N/K9, CISCO1941W-C/K9, CISCO1941W-I/K9, and CISCO 1941W-T/K9

Cisco® 1900 Series Integrated Services Routers build on 25 years of Cisco innovation and product leadership. The new platforms are architected to enable the next phase of branch-office evolution, providing rich media collaboration and virtualization to the branch while maximizing operational cost savings. The Integrated Services Routers Generation 2 platforms are future-enabled with multi-core CPUs, Gigabit Ethernet switching with enhanced POE, and new energy monitoring and control capabilities while enhancing overall system performance. Additionally, a new Cisco IOS® Software Universal image and Services Ready Engine module enable you to decouple the deployment of hardware and software, providing a stable technology foundation which can quickly adapt to evolving network requirements. Overall, the Cisco 1900 Series offer unparalleled total cost of ownership savings and network agility through the intelligent integration of market leading security, unified communications, wireless, and application services.

Product Overview

Cisco® 1941 builds on the best-in-class offering of the existing Cisco 1841 Integrated Services Routers by offering 2 models - Cisco 1941 and Cisco 1941W. In addition to the support of a wide range of wireless and wired connectivity options supported on Cisco 1941 Series, Cisco 1941W offers integration of IEEE 802.11n access point which is backwards compatible with IEEE 802.11a/b/g access points.

All Cisco 1900 Series Integrated Services Routers offer embedded hardware encryption acceleration, optional firewall, intrusion prevention, and application services. In addition, the platforms support the industries widest range of wired and wireless connectivity options such as T1/E1, xDSL, 3G, 4G LTE, and GE.

Figure 1. Cisco 1941 Integrated Services Router



Key Business Benefits

The Integrated Services Routers Generation 2 (ISR G2) routers provide superior services integration and agility. Designed for scalability, the modular architecture of these platforms enables you to grow and adapt with your business needs.

Table 1 lists the business benefits of the Cisco 1900.

Table 1. Key Features and Benefits of the Cisco 1941 Integrated Services Router Series

Benefits	Description
Service Integration	<ul style="list-style-type: none"> The Cisco 1941 Series offer increased levels of services integration with data, security, wireless, and mobility services enabling greater efficiencies cost savings.
Services on Demand	<ul style="list-style-type: none"> A single Cisco IOS® Software Universal image is installed on each ISR G2. The Universal image contains all of the Cisco IOS technology sets which can be activated with a software license. This allows your business to quickly deploy advanced features without downloading a new IOS image. Additionally, larger default memory is included to support the new capabilities. The Cisco Services Ready Engine (SRE) enables a new operational model which allows you to reduce capital expenditures (CapEx) and deploy a variety of application services as needed on a single integrated compute services module.
High Performance with Integrated Services	<ul style="list-style-type: none"> The Cisco 1900 Series enables deployment in high speed WAN environments with concurrent services enabled up to 25 Mbps. Multi-Gigabit Fabric enables high bandwidth module to module communication without compromising routing performance.
Network Agility	<ul style="list-style-type: none"> Designed to address customer business requirements, Cisco 1941 Series with the modular architecture, offers performance range of modular interfaces and services as your network needs grow. Modular interfaces offer increased bandwidth, a diversity of connection options, and network resiliency.
Energy Efficiency	<ul style="list-style-type: none"> The Cisco 1941 Series architecture provides energy savings features that include the following: <ul style="list-style-type: none"> The Cisco 1900 Series offers intelligent power management and allows the customer to control power to the modules based on the time of day. Cisco EnergyWise technology will be supported in the future. Services integration and modularity on a single platform performing multiple functions, optimizes raw materials consumption and energy usage. Platform flexibility and ongoing development of both hardware and software capabilities lead to a longer product lifecycle, lowering all aspects of the total cost of ownership, including materials and energy use. High efficiency power supplies are provided with each platform.
Investment Protection	<ul style="list-style-type: none"> The Cisco 1941 Series maximizes investment protection by supporting: <ul style="list-style-type: none"> Reuse of a broad array of existing modules supported on the original Integrated Services Routers provides a lower cost of ownership. Rich set of Cisco IOS Software features carried forward from the original Integrated Services Routers and delivered in the universal image. Flexibility to grow as your business needs evolve.

Architecture and Modularity

The Cisco 1941 Series is architected to meet the application demands of today's branch offices with design flexibility for future applications. The modular architecture is designed to support expanding customer requirements, increased bandwidth, and fully integrated power distribution to modules supporting 802.3af Power over Ethernet (PoE) and Cisco Enhanced PoE (ePoE). Table 2 lists the architectural features and benefits of the Cisco 1941 Series.

Table 2. Architectural Features and Benefits

Architectural Feature	Benefits
Modular Platform	<ul style="list-style-type: none"> The Cisco 1941 Series ISR are highly modular platforms with multiple module slots to provide connectivity and services for varied branch network requirements. The ISRs offer an industry-leading breadth of LAN and WAN connectivity options through modules to accommodate field upgrades to future technologies without requiring replacement of the platform.
Processors	<ul style="list-style-type: none"> The Cisco 1941 Series is powered by high-performance multi-core processors that support growing demands of branch office networks by supporting high throughput WAN requirements.
MultiGigabit Fabric	<ul style="list-style-type: none"> The Cisco 1941 introduces an innovative MultiGigabit Fabric (MGF) which allows for efficient module to module communication, enabling direct services interactions across modules while reducing the overhead on the router processor.
Embedded IPsec VPN Hardware Acceleration	<ul style="list-style-type: none"> Embedded hardware encryption acceleration is enhanced to provide higher scalability, which, combined with an optional Cisco IOS Security license, enables WAN link security and VPN services (IPsec acceleration). The onboard encryption hardware out-performs the Advanced Integration Modules of previous generations.

Architectural Feature	Benefits
Integrated Gigabit Ethernet Ports	<ul style="list-style-type: none"> All onboard WAN ports are 10/100/1000 Gigabit Ethernet WAN routed ports.
Innovative universal-serial-bus (USB)-based console access	<ul style="list-style-type: none"> A new, innovative, mini-B USB console port supports management connectivity when traditional serial ports are not available. The traditional console and auxiliary ports are also available. Either the USB-based console or the RJ-45-based console port can be used to configure the router.
Optional Integrated Power Supply for Distribution of Power Over Ethernet (PoE)	<ul style="list-style-type: none"> An optional upgrade to the internal power supply provides in-line power (802.3af-compliant Power-over-Ethernet [PoE] and Cisco standard inline power) to optional integrated switch modules.
Integrated Wireless LAN	<ul style="list-style-type: none"> The Cisco 1941 offers a secure integrated access point in a single device. Integrated access point is based on the IEEE 802.11n draft 2.0 standard that uses MIMO (Multi-Input, Multiple-output) to improve coverage for existing 802.11a/b/g clients and new 802.11n clients. The Cisco 1941 supports dual radios - 802.11 b/g/n and 802.11a/n and is capable of operating in both autonomous and unified modes.

Modularity Features and Benefits

The Cisco 1941 provides significantly enhanced modular capabilities (refer to Table 2) offering investment protection for customers. Most of the modules available on previous generations of Cisco routers, such as the Cisco 1841 ISR, are supported on the Cisco 1941. Additionally, modules used on the Cisco 1941 can easily be interchanged with other Cisco routers to provide maximum investment protection. Taking advantage of common interface cards across a network greatly reduces the complexity of managing inventory requirements, implementing large network rollouts, and maintaining configurations across a variety of branch-office sizes.

A complete list of supported modules is available at <http://www.cisco.com/go/1941>.

Table 3. Modularity - Features and Benefits

Feature	Benefits
Cisco Enhanced High Speed WAN Interface Card (EHWIC) 	<ul style="list-style-type: none"> The EHWIC slot replaces the high-speed WAN interface card (HWIC) slot and can natively support HWICs, WAN interface cards (WICs), wireless WAN 3G/4G LTE, voice interface cards (VICs), and voice/WAN interface cards (VWICs). Two integrated EHWIC slots are available on the Cisco 1941 for flexible configurations for support of two modules: One double wide HWIC-D or single wide EHWIC/HWIC module and a second single wide E-HIC/HWIC module are supported. Each HWIC Slot offers high data throughput capability. <ul style="list-style-type: none"> Up to 1.6 Gbps aggregate towards the router processor. Up to 2 Gbps aggregate to other module slots over MultiGigabit Fabric (MGF).
Cisco Internal Services Module (ISM) 	<ul style="list-style-type: none"> A single ISM Slot provides flexibility to integrate intelligent services modules that do not require interface ports. ISM replaces the Advanced Integration Module (AIM) slot; existing AIM modules are not supported in the ISM slot. Each ISM Slot offers high data throughput capability. <ul style="list-style-type: none"> Up to 4 Gbps aggregate towards the router processor. Up to 2 Gbps aggregate to other module slots over MultiGigabit Fabric (MGF). Power to ISM slots can be managed by extensions similar to the Cisco EnergyWise framework, allowing organizations to reduce energy consumption in their network infrastructure. Full EnergyWise support will be available in future software releases. <p>Note: The Cisco 1941 cannot have ISM and WLAN on the same chassis. Please refer to ordering information for WLAN SKUs.</p>
Compact Flash Slots	<ul style="list-style-type: none"> Two external Compact Flash slots are available on the Cisco 1941. Each slot can support high-speed storage densities upgradeable to 4GB in density.
USB 2.0 Ports	<ul style="list-style-type: none"> Two high-speed USB 2.0 ports are supported. The USB ports enable another mechanism secure token capabilities and storage.

Cisco IOS Software

The Cisco 1941 Series Integrated Services Routers deliver innovative technologies running on industry-leading Cisco IOS Software. Developed for wide deployment in the world's most demanding enterprise, access, and service provider networks, Cisco IOS Software Release 15 M & T provides support for a comprehensive portfolio of Cisco technologies, including new functionality and features delivered in Releases 12.4 and 12.4T, and new innovations that span multiple technology areas, including security, voice, high availability, IP Routing and Multicast, quality of service (QoS), IP Mobility, Multiprotocol Label Switching (MPLS), VPNs, and embedded management.

Cisco IOS Software Licensing and Packaging

A single Cisco IOS Universal image encompassing all functions is delivered with the platforms. You can enable advanced features by activating a software license on the Universal image. In previous generations of access routers, these feature sets required you to download a new software image. Technology packages and feature licenses, enabled through the Cisco software licensing infrastructure, simplify software delivery and decrease the operational costs of deploying new features.

Four major technology licenses are available on the Cisco 1941 Series Integrated Services Routers; you can activate the licenses through the Cisco software activation process identified at <http://www.cisco.com/go/sa>.

- IP Base: This technology package is available as default
- Security (SEC) or Security with No Payload Encryption (SEC-NPE)
- AppX: This license includes the DATA license feature set, Application Visibility and Control (AVC), and Cisco Wide Area Application Services (WAAS).

For additional information and details about Cisco IOS Software licensing and packaging on Cisco 1941 Series Integrated Services Routers, please visit <http://www.cisco.com/go/g2licensing>.

Key Branch Office Services

The Cisco Integrated Services Routers are industry-leading routers that offer unprecedented levels of services integration. Designed to meet the requirements of the branch office, these platforms provide a complete solution with voice, security, mobility, and data services. Businesses enjoy the benefit by deploying a single device that meets all their needs and save on capital and operational expenses.

Integrated Network Security for Data and Mobility

Security is essential to protect a business' intellectual property while also ensuring business continuity and providing the ability to extend the corporate workplace to employees who need anytime, anywhere access to company resources. As part of the Cisco' SAFE architectural framework that allows organizations to identify, prevent, and adapt to network security threats - the Cisco 1900 Series Integrated Services Routers facilitate secure business transactions and collaboration.

The Cisco IOS Software Security technology package license for the Cisco 1900 Series offers a wide array of common security features such as advanced application inspection and control, threat protection, and encryption architectures for enabling more scalable and manageable VPN networks in one solution set. The Cisco 1941 Series offers native hardware-based encryption acceleration to provide greater IPSec throughput with less overhead for the router processor when compared with software-based encryption solutions.

Cisco Integrated Services Routers offer a comprehensive and adaptable security solution for branch-office routers that include features such as:

- **Secure connectivity:** Secure collaborative communications with Group Encrypted Transport VPN (GETVPN), Dynamic Multipoint VPN (DMVPN), or Enhanced Easy VPN.
- **Integrated threat control:** Respond to sophisticated network attacks and threats using Cisco IOS Firewall, Cisco IOS Zone-Based Firewall, IOS IPS, IOS Content Filtering and Flexible Packet Matching (FPM).
- **Identity Management:** Intelligently protecting endpoints using technologies such as authentication, authorization, and accounting (AAA) and public key infrastructure (PKI).

Detailed information on the security features and solutions supported on the Cisco 1900 Series routers can be found at <http://www.cisco.com/go/routersecurity>.

Wireless and Mobility Services

Wireless LAN

The Cisco Integrated Services Routers supporting the Cisco Unified Wireless Network enable deployment of secure, manageable WLANs optimized for remote sites and branch offices, including fast secure mobility, survivable authentication, and simplified management. The Cisco Unified Wireless Network addresses critical points of potential failure and helps enable resiliency and survivability for WLANs at remote locations and branch offices. This solution protects the WLAN by providing fast recovery from a variety of faults that may occur. With Cisco's high availability for remote WLANs, hardware and software work together to enable rapid recovery from disruptions and help ensure fault transparency to users and network applications.

The new Cisco 1941W with IEEE 802.11n integrated access point support both unified and autonomous deployments. This integrated Wi-Fi access point offers IEEE 802.11n draft 2.0 standard support for mobile access to high-bandwidth data, voice, and video applications through the use of multiple-input, multiple-output (MIMO) technology that provides increased throughput, reliability, and predictability. IEEE 802.11n wireless networks create a cohesive working environment by combining the mobility of wireless with the performance of wired networks. Cisco has innovative, next-generation wireless solutions that offer greater performance and extended reach for pervasive wireless connectivity. IEEE 802.11n technology delivers outstanding reliability and up to nine times the throughput of current IEEE 802.11 a/b/g networks. It makes wireless networks an integral part of every type of organization by offering the following benefits:

- Data rates of up to 600 Mbps support more users, devices, and mission-critical, bandwidth-intensive applications.
- New MIMO technology provides predictable WLAN coverage and reliable connectivity.
- Next-generation wireless technology provides superior investment protection to support emerging mobile applications.

These routers help extend corporate networks to secure remote sites while giving users access to the same applications found in corporate offices for both data and voice applications. When users require WLAN access, visibility and control of network security are even more critical at the remote site. The new fixed Cisco Integrated Services Routers meet this need with a single device that combines integrated IEEE 802.11a/b/g/n capabilities with security features such as Wi-Fi Protected Access (WPA), including authentication with IEEE 802.1X with the Cisco Light Extensible Authentication Protocol (LEAP) and Protected EAP (PEAP) and encryption with the WPA Temporal Key Integrity Protocol (TKIP).

Wireless WAN

Cisco third- and fourth-generation (3G and 4G, respectively) LTE wireless WAN (WWAN) modules combine traditional enterprise router functions, such as remote management, advanced IP services such as voice over IP (VoIP), and security, with mobility capabilities of 3G and 4G LTE WAN access. Using high-speed 3G or 4G LTE wireless networks, routers can replace or complement existing landline infrastructure, such as dialup, Frame Relay, and ISDN. Cisco 3G and 4G LTE solutions support 3G and 4G LTE standards High-Speed Packet Access (HSPA), Evolution Data Only/Evolution Data Optimized (EVDO), and 4G LTE, providing you with a true multipath WAN backup and the ability to rapidly deploy primary WAN connectivity. For more information about 3G solutions on Cisco Integrated Services Routers, please refer to <http://www.cisco.com/go/3g> or <http://www.cisco.com/go/4g>.

Integrated LAN Switching

The Cisco 1941 Integrated Services Router Series will support the EHWIC LAN modules when they become available in future. The Cisco 1941 Series support the existing single wide EtherSwitch HWIC and the double wide HWIC-D modules, which greatly expand the router's capabilities by integrating industry leading Layer 2 or Layer 3 switching.

Application Services

As organizations continue to centralize and consolidate their branch IT infrastructure in an effort to reduce cost and complexity in the branch office, they are challenged to provide adequate user experience, ensure continuous service availability, and deliver business-relevant applications when and where they are needed. To address these challenges, the Cisco 1941 Series provides the ability to host Cisco, 3rd party, and custom applications on Cisco Services Ready Engine (SRE) module that seamlessly integrate into the router. The module has its own processor, network interface, and memory that operate independently of the host router resources, helping to ensure maximum concurrent routing and application performance while reducing physical space requirements, lowering power consumption, and consolidating management.

Cisco Services Ready Engine

The Cisco Services Ready Engine solution is available in a Internal Service Module (ISM) form-factor. The Internal Service Module hardware offers up to a seven times performance improvement over the previous-generation Advanced Integration Modules and provides a x86 processor. The Cisco SRE module enables on-demand provisioning of branch-office applications on the Cisco 1900 Series platforms so that you can deploy the right application, at the right time, in the right place. The hardware and software decoupling provided by the service-ready deployment model enables applications to be provisioned on the module at the time of its installation or remotely anytime thereafter. Supported solutions include Cisco Application Extension Platform (AXP), Cisco Wireless LAN Controller (WLC), and other applications under development. The Service Ready Engine enables organizations of various sizes to future-proof their network by allowing them to quickly deploy new branch-office applications without deploying new hardware, reducing the cost of rolling out branch-office services.

WAAS Express

Organizations today face several unique wide area network (WAN) challenges: the need to provide employees with constant access to centrally located information, the requirement to continuously back up and replicate mission-critical data to centrally managed data centers, the desire to provide satisfactory experience for IP phone and video communication, and the mandate to control bandwidth costs without sacrificing application availability and performance.

Cisco WAAS Express is designed to help organizations address these challenges. Cisco WAAS Express extends the [Cisco WAAS product portfolio](#), with a small-footprint, cost-effective Cisco IOS Software-based software solution integrated into the ISR G2 to offer bandwidth optimization and application acceleration capabilities. Cisco WAAS Express increases remote user productivity, reduces WAN bandwidth costs, and offers investment protection by interoperating with existing Cisco WAAS infrastructure. Cisco WAAS Express is unique in providing network transparency, improving deployment flexibility with on-demand service enablement, and integrating with native Cisco IOS Software-based services such as security, Netflow, and QoS.

Cisco WAAS Express is fully interoperable with WAAS on SM-SRE modules, WAAS appliances and can be managed by a common WAAS Central Manager.

Cisco WAAS Express is available in Cisco IOS Software from Release 15.1(2)T1.

Further information on Cisco WAAS Express can be found at <http://www.in.cisco.com/artg/products/waas/>.

Managing Your Integrated Services Routers

Network Management applications are instrumental in lowering Operating Expenditures (OPEX) while improving network availability by simplifying and automating many of the day-to-day tasks associated with managing an end-to-end network. “Day-one-device-support” provides immediate manageability support for the Integrated Services Router enabling quick and easy deployment, monitoring and troubleshooting from Cisco and third party applications.

Organizations rely on Cisco, third-party and in-house developed network management applications to achieve their Opex and productivity goals. Underpinning those applications are the embedded management features available in every ISR. The new ISRs continue a tradition of broad and deep manageability features within the devices. Features such as IPSLA, EEM, Netflow, allow you to know what's going on in your network at all times. These features along with SNMP and SYSLOG support enable your organization's management applications.

Refer to Tables 4, 5 and 6 for details on IOS, Network Management and Manageability support on Cisco 1941 Series Integrated Services Routers.

Table 4. Cisco 1941 with Cisco IOS Software Feature and Protocol High-Level Support

Protocols	IPv4, IPv6, static routes, Open Shortest Path First (OSPF), Enhanced IGRP (EIGRP), Border Gateway Protocol (BGP), BGP Router Reflector, Intermediate System-to-Intermediate System (IS-IS), Multicast Internet Group Management Protocol (IGMPv3) Protocol Independent Multicast sparse mode (PIM SM), PIM Source Specific Multicast (SSM), Distance Vector Multicast Routing Protocol (DVMRP), IPSec, Generic Routing Encapsulation (GRE), Bi-Directional Forwarding Detection (BFD), IPv4-to-IPv6 Multicast, MPLS, L2TPv3, 802.1ag, 802.3ah, L2 and L3 VPN.
Encapsulations	Ethernet, 802.1q VLAN, Point-to-Point Protocol (PPP), Multilink Point-to-Point Protocol (MLPPP), Frame Relay, Multilink Frame Relay (MLFR) (FR.15 and FR.16), High-Level Data Link Control (HDLC), Serial (RS-232, RS-449, X.21, V.35, and EIA-530), Point-to-Point Protocol over Ethernet (PPPoE), and ATM.
Traffic management	QoS, Class-Based Weighted Fair Queuing (CBWFQ), Weighted Random Early Detection (WRED), Hierarchical QoS, Policy-Based Routing (PBR), Performance Routing (PFR), and Network-Based Advanced Routing (NBAR).

Note: For a more comprehensive list of features supported in Cisco IOS software refer to the Feature Navigator tool at: <http://www.cisco.com/go/fn>.

Table 5 highlights several integrated services router management capabilities that are available within Cisco IOS Software.

Table 5. Cisco IOS Software Management Capabilities

Feature	Description of Feature Supported by Cisco Integrated Services Routers
WSMA	The Web Services Management Agent (WSMA) defines a mechanism through which you can manage a network device, retrieve configuration data information, and upload and manipulate new configuration data. WSMA uses XML-based data encoding that is transported by the Simple Object Access Protocol (SOAP) for the configuration data and protocol messages.
EEM	Cisco IOS Embedded Event Manager (EEM) is a distributed and customized approach to event detection and recovery offered directly in a Cisco IOS Software device. It offers the ability to monitor events and take informational, corrective, or any desired EEM action when the monitored events occur or when a threshold is reached.
IPSLA	Cisco IOS IP Service-Level Agreements (SLAs) enable you to assure new business-critical IP applications, as well as IP services that use data, voice, and video, in an IP network.
SNMP, RMON, Syslog, NetFlow, TR-069	Cisco 1900 Series Integrated Services Routers also support SNMP, Remote Monitoring (RMON), syslog, NetFlow, and TR-069 in addition to the embedded management features previously mentioned.

Cisco Network Management Applications

The applications listed in Table 6 are standalone products that you can purchase or download to manage your Cisco network devices. The applications are built for the different operational phases; you can select the ones that best fit your needs.

Table 6. Network Management Solutions

Operational Phase	Application	Description
Device staging and configuration	Cisco Configuration Professional	<ul style="list-style-type: none"> Cisco Configuration Professional is a GUI device-management tool for Cisco IOS Software-based access routers. This tool simplifies routing, firewall, IPS, VPN, unified communications, and WAN and LAN configuration through GUI-based easy-to-use wizards.
Networkwide deployment, configuration, monitoring, and troubleshooting	CiscoWorks LMS	<ul style="list-style-type: none"> CiscoWorks LAN Management Solution (LMS) is a suite of integrated applications for simplifying day-to-day management of a Cisco end-to-end network, lowering OpEx while increasing network availability. CiscoWorks LMS offers network managers an easy-to-use web-based interface for configuring, administering, and troubleshooting the Cisco integrated services routers, using new instrumentation such as Cisco IOS EEM. In addition to supporting basic platform services of the integrated services router, CiscoWorks also provides added-value support for the Cisco Service Ready Engine, enabling the management and distribution of software images to the SRE, thereby reducing the time and complexities associated with image management.
Networkwide staging, configuration, and compliance	CiscoWorks NCM	<ul style="list-style-type: none"> CiscoWorks Network Compliance Manager (NCM) tracks and regulates configuration and software changes throughout a multivendor network infrastructure. It provides superior visibility into network changes and can track compliance with a broad variety of regulatory, IT, corporate governance, and technology requirements.
Security staging, configuration, and monitoring	Cisco Security Manager	<ul style="list-style-type: none"> Cisco Security Manager is a leading enterprise-class application for managing security. It delivers provisioning of firewall, VPN, and intrusion-prevention-system (IPS) services across Cisco routers, security appliances, and switch service modules. The suite also includes the Cisco Security Monitoring, Analysis and Response System (Cisco Security MARS) for monitoring and mitigation.
Configuration and provisioning	Cisco Unified Provisioning Manager	<ul style="list-style-type: none"> Cisco Unified Provisioning Manager provides a reliable and scalable web-based solution for managing a company's crucial next-generation communications services. It manages unified communications services in an integrated IP telephony, voicemail, and messaging environment.
Staging, deployment, and changes of licenses	Cisco License Manager	<ul style="list-style-type: none"> Easily manage Cisco IOS Software activation and license management for a wide range of Cisco platforms running Cisco IOS Software as well as other operating systems with the secure client-server application Cisco License Manager.
Staging, deployment, and changes to configuration and image files	Cisco Configuration Engine	<ul style="list-style-type: none"> Cisco Configuration Engine is a secure network management product that provides zero-touch image and configuration distribution through centralized, template-based management.

Summary and Conclusion

As businesses strive to lower the total cost of ownership in running their network and increase their overall employee productivity with more centralized and collaborative network applications, more intelligent branch office solutions are required. The Cisco 1941 Series offers these solutions by providing enhanced performance and increased modular density to support multiple services. The Cisco 1941 Series is designed to consolidate the functions of separate devices into a single, compact system that can be remotely managed.

Product Specifications

Table 7. Product Specifications of Cisco 1941 Integrated Services Router

	Cisco1941, Cisco1941W
Services and Slot Density	
Embedded hardware-based crypto acceleration (IPSec)	Yes
Total Onboard Gigabit Ethernet 10/100/1000 WAN ports	2
RJ-45-Based Ports	2
SFP-Based Ports	0
SM Slots	0
Double-Wide SM Slots	0
EHWIC Slots	2
Double-wide EHWIC slots (use of a double-wide EHWIC slot will consume two EHWIC slots)	1
ISM Slots	1 (0 on the Cisco 1941W)
Memory (DDR2 Error Correction Code [ECC] ECC DRAM) - Default	512 MB
Memory (DDR2 ECC DRAM) - Maximum	2.0 GB
Compact Flash (external) - Default	slot 0: 256 MB slot 1: none
Compact Flash (external) - Maximum	slot 0: 4 GB slot 1: 4 GB
External USB flash memory slots (Type A)	2
USB Console Port (Type B) (up to 115.2 kbps)	1
Serial Console Port (up to 115.2 kbps)	1
Serial Auxiliary Port (up to 115.2 kbps)	1
Power Supply Options	AC, POE
Redundant Power Supply Support	No
Power Specifications	
AC Input Voltage	100-240 V ~
AC Input Frequency	47-63 Hz
AC Input Current range AC Power Supply (Max) (Amps)	1.5-0.6
AC Input Surge Current	<50 A
Typical Power (No Modules)	35 W
Maximum Power capacity with AC power supply	110 W
Maximum Power capacity with PoE power supply (platform only)	110 W
Maximum PoE device power capacity with PoE power supply	80 W

Cisco1941, Cisco1941W	
Physical Specifications	
Dimensions (H x W x D)	3.5 in x 13.5 in x 11.5 in
Rack Height	2 RU
Rack-mount 19in. (48.3 cm) EIA	Included
Wall-mount (refer to installation guide for approved orientation)	Yes
Weight - with AC power supply (no modules)	12 lbs
Weight - with POE power supply (no modules)	12.8 lbs
Maximum Weight - Fully Configured	14 lbs
Airflow	Front to Side
Environmental Specifications	
Operating Condition	
Temperature - 5906 feet (1800 m) max. altitude	0-40° C (32-104° F)
Temperature - 9843 feet (3000 m) max. altitude	0-25° C (32-77° F)
Altitude	3000 m (10000 ft)
Humidity	10 to 85% RH
Acoustic: Sound Pressure (Typ/Max)	26/46 dBA
Acoustic: Sound Power (Typ/Max)	36/55 dBA
Transporation/Storage Condition	
Temperature	-40-70° C (-40-158° F)
Humidity	5 to 95%RH
Altitude	4570m (15000 ft)
Regulatory Compliance	
Safety	UL 60950-1 CAN/CSA C22.2 No. 60950-1 EN 60950-1 AS/NZS 60950-1 IEC 60950-1
EMC	47 CFR, Part 15 ICES-003 Class A EN55022 Class A CISPR22 Class A AS/NZS 3548 Class A VCCI V-3 CNS 13438 EN 300-386 EN 61000 (Immunity) EN 55024, CISPR 24 EN50082-1
Telecom	TIA/EIA/IS-968 CS-03 ANSI T1.101 ITU-T G.823, G.824 IEEE 802.3 RTTE Directive

WLAN Specifications

Table 8. WLAN Specifications of the Cisco 1941W

Feature	Description
WLAN hardware	<ul style="list-style-type: none"> • IEEE 802.11n draft 2.0 standards-based access point with 802.11a/b/g compatibility • Automatic rate selection for 802.11g/n • Dual Radios for 802.11b/g/n and 802.11a/n modes • RP-TNC connectors for field-replaceable external antennas • 2-dBi default antenna gain • 2 x 3 multiple input, multiple output (MIMO) radio operation • Wi-Fi 802.11n Draft v2.0 certified
WLAN software features	<ul style="list-style-type: none"> • Autonomous or unified access point • Cisco WCS support for monitoring of autonomous-mode access points • Option to maximize throughput or maximize range • Software-configurable transmit power • Radio roles, including access point, root bridge, non-root bridge, and workgroup bridge • Wi-Fi Multimedia (WMM) certification • Traffic specifications (TSPEC) Call Admission Control (CAC) to ensure voice quality is maintained • Unscheduled Automatic Power Save Delivery (UPSD) to reduce latency
Unified WLAN management	<ul style="list-style-type: none"> • Unified access point features • Supported by wireless LAN controller and Cisco WCS • Configurable local or central switching for HREAP mode • Radio management through Cisco WCS • Transparent roaming with mobility groups
WLAN security features	<ul style="list-style-type: none"> • Standard 802.11i • Wi-Fi Protected Access (WPA) and AES (WPA2) • EAP authentication: Cisco LEAP, PEAP, Extensible Authentication Protocol Transport Layer Security (EAP-TLS), Extensible Authentication Protocol-Flexible Authentication via Secure Tunneling (EAP-FAST), Extensible Authentication Protocol-Subscriber Information Module (EAP-SIM), Extensible Authentication Protocol-Message Digest Algorithm 5 (EAP-MD5), and Extensible Authentication Protocol-Tunneled TLS (EAP-TTLS) • Static and dynamic Wired Equivalent Privacy (WEP) • Temporal Key Integrity Protocol/Simple Security Network (TKIP/SSN) encryption • MAC authentication and filter • User database for survivable local authentication using LEAP and EAP-FAST • Configurable limit to the number of wireless clients • Configurable RADIUS accounting for wireless clients • Pre-Shared Keys (PSKs) (WPA-small office or home office [WPA-SOHO])
Certifications	
Service Set Identifiers (SSIDs)	16
Wireless VLANs	16
Encrypted wireless VLANs	16
Multiple Broadcast Service Set Identifiers (MBSSIDs)	16

Supported Modules

Cisco 1941 Series support a wide range of modules that span industry leading breadth of services at the branch. Please refer to the link below for the list of modules supported on the Cisco 1900.

http://www.cisco.com/en/US/products/ps10538/products_relevant_interfaces_and_modules.html

Ordering Information

The Cisco 1941 is orderable at the [Cisco Ordering Home Page](#).

For more information about the Cisco 1900 Series, visit <http://www.cisco.com/go/1900>.

Table 9 gives ordering information for the Cisco 1941 Router. For information about how to order the Cisco 1900 Series, please visit the Cisco 1900 Series Ordering Guide. To place an order, visit the [Cisco Ordering Home Page](#) and refer to Table 9, which provides basic ordering information. For additional product numbers, including the Cisco 1900 Series bundle offerings, please check the [Cisco 1900 Series Integrated Services Router Price List](#) or contact your local Cisco account representative.

Table 9. Cisco 1941 Series Basic Ordering Information

Product Number	Product Description
CISCO1941/K9	Cisco 1941 with 2 onboard GE, 2 EHWIC slots, 1 ISM slot, 256MB CF default, 512MB DRAM default, IP Base.
CISCO1941W-A/K9	Cisco 1941 Router w/802.11 a/b/g/n FCC Compliant, 2 onboard GE, 2 EHWIC slots, 256MB CF default, 512MB DRAM default, IP Base.
CISCO1941W-P/K9	Cisco 1941 Router w/802.11 a/b/g/n Japan Compliant, 2 onboard GE, 2 EHWIC slots, 256MB CF default, 512MB DRAM default, IP Base.
CISCO1941W-N/K9	Cisco 1941 Router w/802.11 a/b/g/n Australia, New Zealand & Singapore Compliant, 2 onboard GE, 2 EHWIC slots, 256MB CF default, 512MB DRAM default, IP Base.
CISCO1941W-C/K9	Cisco 1941 Router w/802.11 a/b/g/n China Compliant, 2 onboard GE, 2 EHWIC slots, 256MB CF default, 512MB DRAM default, IP Base.
CISCO1941W-I/K9	Cisco 1941 Router w/802.11 a/b/g/n Israel Compliant, 2 onboard GE, 2 EHWIC slots, 256MB CF default, 512MB DRAM default, IP Base.
CISCO1941W-T/K9	Cisco 1941 Router w/802.11 a/b/g/n Brazil & Taiwan Compliant, 2 onboard GE, 2 EHWIC slots, 256MB CF default, 512MB DRAM default, IP Base.

To download the Cisco ISR 1941 Cisco IOS Software release go to [Download Software](#), click "Router Software," and go to Cisco ISR 1941 Integrated Services Router.

ISR Migration Options

Cisco ISR 1900 Series Routers are included in the standard Cisco Technology Migration Program (TMP). Refer to <http://www.cisco.com/go/tmp> and contact your local Cisco account representative for program details.

Warranty Information

The Cisco 1900 Series Integrated Services Routers have a 1-year limited liability warranty.

For More Information

For more information about the Cisco ISR 1900 Series, visit <http://www.cisco.com/go/1900> or contact your local Cisco account representative.

Cisco and Partner Services for the Branch Office

Services from Cisco and our certified partners can help you transform the branch-office experience and accelerate business innovation and growth in the Borderless Network. We have the depth and breadth of expertise to create a clear, replicable, optimized branch footprint across technologies. Planning and design services align technology with business goals and can increase the accuracy, speed, and efficiency of deployment. Technical services help improve operational efficiency, save money, and mitigate risk. Optimization services are designed to continuously improve performance and help your team succeed with new technologies. For more information, please visit <http://www.cisco.com/go/services>.

Cisco SMARTnet® technical support for the Cisco 1900 Series is available on a one-time or annual contract basis. Support options range from help-desk assistance to proactive, onsite consultation. All support contracts include:

- Major Cisco IOS Software updates in protocol, security, bandwidth, and feature improvements
- Full access rights to Cisco.com technical libraries for technical assistance, electronic commerce, and product information
- 24-hour access to the industry's largest dedicated technical support staff

For More Information

For more information about the Cisco 1900 Series, visit <http://www.cisco.com/go/1900> or contact your local Cisco account representative.



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Camera License: Target Application:	Aimetis Symphony™ Video Surveillance Software		
	STANDARD "Recording"	PROFESSIONAL "Management"	ENTERPRISE "Intelligent Management"
AIMETIS SYMPHONY™ SERVER (see reverse for Client Features)			
Core Features			
Supported Operating System	Windows XP, Vista, 7, 8, Server 2003, Server 2008 (32 or 64 bit versions supported)		
Number of Cameras per Server*	unlimited	unlimited	unlimited
Number of Concurrent Client Connections**	unlimited	unlimited	unlimited
Multi-server (Server Farm)		unlimited	unlimited
Automatic Server Failover		■	■
Server Virtualization***	■	■	■
2-way Audio	■	■	■
Unicast, Multicast & Multistream support	■	■	■
Network Video support**** (MJPEG / MPEG-4 / H.264)	■	■	■
Device Packs	■	■	■
Mobile Bridge Server	■	■	■
Record locally or to network storage	■	■	■
Record on Schedule, Alarm and Continuous	■	■	■
Local camera storage support	■	■	■
Multilanguage	■	■	■
Customizable User Access Levels	■	■	■
Web and Mobile Clients	■	■	■
Video Wall		■	■
Storage and Archiving			
Record on Motion (Video motion detection from camera)	■	■	■
Failover Recording		■	■
Redundant Recording		■	■
Edge Storage	■	■	■
Management			
Automatic Camera Detection	■	■	■
Centralized Device Management	■	■	■
Automatic Configuration Backups	■	■	■
Uninterrupted Configuration Changes	■	■	■
Remote Diagnostics	■	■	■
SNMP Health Monitoring		■	■
CPU Overload Protection		■	■
Video Analytic Applications (Aimetis VE Series™)			
Camera Loss Detection (e.g. Cord Cut)	■	■	■
Camera Obstructed/Moved (Scene Change Detection)	■	■	■
Basic Video Motion Detection (VMD)	■	■	■
Motion Tracking			■
Object Classification (3D Model)			■
Tripwire			■
Wrong Direction			■
Automatic PTZ Tracking			■
Left/Removed Item Detection			■
People counting			■
Loitering			■
Automatic License Plate Recognition			■
Face Finding			■
Integration			
External I/O Devices	■	■	■
Generic events via TCP / IP	■	■	■
Access Control / Alarm Panel		■	■
Server API / SDK		■	■
OPC data access support		■	■
Alerting and Notification			
Android & Apple smartphones or tablets	■	■	■
I/O Devices	■	■	■
E-mail Notification	■	■	■
FTP	■	■	■
TCP	■	■	■

* Actual limitations only constrained by PC hardware, no license limitation invoked. Visit Aimetis Xnet for hardware benchmarks.

** 500 concurrent connections tested.

*** VMware and Microsoft Virtual Server.

**** Please check www.aimetis.com for updated supported device list.

	Aimetis Symphony™ Video Surveillance Software		
	Camera License: Target Application:	STANDARD "Recording"	PROFESSIONAL "Management"
AIMETIS SYMPHONY™ CLIENT (see reverse for Server Features)			
Core Features			
Supported Operating System	Windows XP, Vista, 7, 8, Server 2003, Server 2008 (32 or 64 bit versions supported)		
Number of Concurrent Server Connections	unlimited	unlimited	unlimited
Customizable User Interface	■	■	■
Graphical Timeline	■	■	■
View Multiple Timelines	■	■	■
Hierarchical Site Map Navigation	■	■	■
Camera List Navigation	■	■	■
Cameras from Multiple Servers and Sites	■	■	■
Multi-Monitor Support	■	■	■
Camera Sequence	■	■	■
Panoramic (360-degree) Support	■	■	■
Manually Trigger Outputs	■	■	■
Advanced Video Analytic Search	by motion	by motion	by Aimetis VE Series™ algorithm
Integrated Messenger	■	■	■
Alarm Console	■	■	■
Video Export	■	■	■
Bookmark Events	■	■	■
Integrated Alarm Log	■	■	■
Integrated Remote Support Module	■	■	■
Multilanguage	■	■	■
PTZ Support			
Manual Movement Control	■	■	■
Point and Click Control	■	■	■
Zoom on Marked Area	■	■	■
Go to Preset Positions	■	■	■
Joystick Support	■	■	■
Virtual Matrix			
Customizable Multi-Camera Layouts	■	■	■
Configurable Display Options (fixed)	■	■	■
Configurable Display Options (motion)	■	■	■
Configurable Display Options (alarm)	■	■	■
User Access			
Microsoft Active Directory Integrated		■	■
User Monitoring	■	■	■
Permissions Per User	■	■	■
Permissions Per User Group	■	■	■
Security Profiles	■	■	■
Support for Cross Domain Authentication		■	■
Restrict Simultaneous Logins		■	■
Supervisor Logins		■	■
Reports			
Login Report	■	■	■
Alarm Counts and Statistics	■	■	■
Object Count Reports (e.g. people, vehicles)			■
Heat Map			■
Licensing			
Mix/Match Different Licenses on Same Server	■	■	■
Interchangeable Licenses between Cameras	■	■	■
License Fee per Camera	■	■	■
License Fee per Server	none	none	none
License Fee per Client	none	none	none

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