



The following documentation is an electronically-submitted vendor response to an advertised solicitation from the *West Virginia Purchasing Bulletin* within the Vendor Self-Service portal at wvOASIS.gov. As part of the State of West Virginia's procurement process, and to maintain the transparency of the bid-opening process, this documentation submitted online is publicly posted by the West Virginia Purchasing Division at WVPurchasing.gov with any other vendor responses to this solicitation submitted to the Purchasing Division in hard copy format.

Header 8

List View

General Information [Contact](#) [Default Values](#) [Discount](#) [Document Information](#) [Clarification Request](#)

Procurement Folder: 807402

Procurement Type: Central Contract - Fixed Amt

Vendor ID: VS0000011232

Legal Name: STEP CG LLC

Alias/DBA:

Total Bid: \$605,597.04

Response Date: 12/10/2020

Response Time: 11:59

Responded By User ID: clintvaughn

First Name: Clint

SO Doc Code: CRFQ

SO Dept: 0803

SO Doc ID: DOT2100000062

Published Date: 12/7/20

Close Date: 12/10/20

Close Time: 13:30

Status: Closed

Solicitation Description: ADDENDUM NO_1 CISCO
ROUTERS & SWITCHES OR EQUAL

Total of Header Attachments: 8

Total of All Attachments: 8



Department of Administration
 Purchasing Division
 2019 Washington Street East
 Post Office Box 50130
 Charleston, WV 25305-0130

**State of West Virginia
 Solicitation Response**

Proc Folder: 807402
Solicitation Description: ADDENDUM NO_1 CISCO ROUTERS & SWITCHES OR EQUAL
Proc Type: Central Contract - Fixed Amt

Solicitation Closes	Solicitation Response	Version
2020-12-10 13:30	SR 0803 ESR12102000000004172	1

VENDOR
 VS0000011232
 STEP CG LLC

Solicitation Number: CRFQ 0803 DOT2100000062
Total Bid: 605597.0400000000372529029846 **Response Date:** 2020-12-10 **Response Time:** 11:59:52
Comments:

FOR INFORMATION CONTACT THE BUYER
 John W Estep
 304-558-2566
 john.w.estep@wv.gov

Vendor Signature X **FEIN#** **DATE**

All offers subject to all terms and conditions contained in this solicitation

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
1	3.1.1 Cisco ISR 4321 Series Chassis Bundle or Equal-Year 1	11.00000	EA	1031.280000	11344.08

Comm Code	Manufacturer	Specification	Model #
43222612			

Commodity Line Comments: Cisco ISR 4321 with 1 Year of SmartNet Coverage.

Extended Description:

3.1.1 CISCO ISR 4321 Series Chassis Bundle or equal with Year 1 Smart Net Coverage

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
2	3.1.1 Cisco ISR 4321 Series Chassis Bundle or Equal-Year 2	11.00000	EA	1236.430000	13600.73

Comm Code	Manufacturer	Specification	Model #
43222612			

Commodity Line Comments: Cisco ISR 4321 with 2 Years of SmartNet Coverage.

Extended Description:

3.1.1 CISCO ISR 4321 Series Chassis Bundle or equal with Year 2 Smart Net Coverage

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
3	3.1.1 Cisco ISR 4321 Series Chassis Bundle or Equal-Year 3	11.00000	EA	1430.430000	15734.73

Comm Code	Manufacturer	Specification	Model #
43222609			

Commodity Line Comments: Cisco ISR 4321 with 3 Years of SmartNet Coverage.

Extended Description:

3.1.1 CISCO ISR 4321 Series Chassis Bundle or equal with Year 3 Smart Net Coverage

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
4	3.1.1 Cisco ISR 4321 Series Chassis Bundle or Equal-Year 4	11.00000	EA	1637.810000	18015.91

Comm Code	Manufacturer	Specification	Model #
43222609			

Commodity Line Comments: Cisco ISR 4321 with 4 Years of SmartNet Coverage.

Extended Description:

3.1.1 CISCO ISR 4321 Series Chassis Bundle or equal with Year 4 Smart Net Coverage

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
5	3.1.2 Cisco ISR 4331 Series Chassis Bundle or Equal-Year 1	7.00000	EA	1622.150000	11355.05

Comm Code	Manufacturer	Specification	Model #
43222609			

Commodity Line Comments: Cisco ISR 4331 with 1 Year of SmartNet Coverage.

Extended Description:

3.1.2 CISCO ISR 4331 Series Chassis Bundle or Equal with Year 1 Smart Net Coverage.

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
6	3.1.2 Cisco ISR 4331 Series Chassis Bundle or Equal-Year 2	7.00000	EA	1910.700000	13374.90

Comm Code	Manufacturer	Specification	Model #
43222609			

Commodity Line Comments: Cisco ISR 4331 with 2 Years of SmartNet Coverage.

Extended Description:

3.1.2 CISCO ISR 4331 Series Chassis Bundle or Equal with Year 2 Smart Net Coverage.

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
7	3.1.2 Cisco ISR 4331 Series Chassis Bundle or Equal-Year 3	7.00000	EA	2183.570000	15284.99

Comm Code	Manufacturer	Specification	Model #
43222612			

Commodity Line Comments: Cisco ISR 4331 with 3 Years of SmartNet Coverage.

Extended Description:

3.1.2 CISCO ISR 4331 Series Chassis Bundle or equal with Year 3 Smart Net coverage

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
8	3.1.2 Cisco ISR 4331 Series Chassis Bundle or Equal-Year 4	7.00000	EA	2475.250000	17326.75

Comm Code	Manufacturer	Specification	Model #
43222612			

Commodity Line Comments: Cisco ISR 4331 with 4 Years of SmartNet Coverage.

Extended Description:

3.1.2 CISCO ISR 4331 Series Chassis Bundle or equal with Year 4 Smart Net coverage

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
9	3.1.3 Cisco ISR 1101 Series Port Router or Equal-Year 1	60.00000	EA	694.540000	41672.40

Comm Code	Manufacturer	Specification	Model #
43222609			

Commodity Line Comments: Cisco ISR 1101 with 1 Year of SmartNet Coverage. Network Essentials License for Cisco IR included.

Extended Description:

3.1.3 Cisco ISR 1101 4 port router or equal with Year 1 Smart Net Coverage

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
10	3.1.3 Cisco ISR 1101 Series Port Router or Equal-Year 2	60.00000	EA	768.510000	46110.60

Comm Code	Manufacturer	Specification	Model #
43222609			

Commodity Line Comments: Cisco ISR 1101 with 2 Years of SmartNet Coverage. Network Essentials License for Cisco IR included.

Extended Description:

3.1.3 Cisco ISR 1101 4 port router or equal with Year 2 Smart Net Coverage

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
11	3.1.3 Cisco ISR 1101 Series Port Router or Equal-Year 3	60.00000	EA	838.460000	50307.60

Comm Code	Manufacturer	Specification	Model #
43222609			

Commodity Line Comments: Cisco ISR 1101 with 3 Years of SmartNet Coverage. Network Essentials License for Cisco IR included.

Extended Description:

3.1.3 Cisco ISR 1101 4 port router or equal with Year 3 Smart Net Coverage

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
12	3.1.3 Cisco ISR 1101 Series Port Router or Equal-Year 4	60.00000	EA	913.230000	54793.80

Comm Code	Manufacturer	Specification	Model #
43222609			

Commodity Line Comments: Cisco ISR 1101 with 4 Years of SmartNet Coverage. Network Essentials License for Cisco IR included.

Extended Description:

3.1.3 Cisco ISR 1101 4 port router or equal with Year 4 Smart Net Coverage

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
13	3.1.4 Extreme Networks 12 Port Switch or Equal	95.00000	EA	1018.020000	96711.90

Comm Code	Manufacturer	Specification	Model #
43222609			

Commodity Line Comments: Extreme Networks X440-G2-12p-10GE4. Power cord included.

Extended Description:

3.1.4 Extreme Networks 12 Port Switch or Equal

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
14	3.1.5 Extreme Networks 48 Port Switch or Equal	75.00000	EA	2281.520000	171114.00

Comm Code	Manufacturer	Specification	Model #
43222609			

Commodity Line Comments: Extreme Networks X440-G2-48p-10GE4. Power cord included.

Extended Description:

3.1.5 Extreme Networks 48 Port Switch or Equal

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
15	3.1.6 Extreme Networks 24 Port Switch or Equal	20.00000	EA	1442.480000	28849.60

Comm Code	Manufacturer	Specification	Model #
43222609			

Commodity Line Comments: Extreme Networks X440-G2-24p-10GE4. Power cord included.

Extended Description:

3.1.6 Extreme Networks 24 Port Switch or Equal



Department of Administration
 Purchasing Division
 2019 Washington Street East
 Post Office Box 50130
 Charleston, WV 25305-0130

State of West Virginia
Centralized Request for Quote
Info Technology

Proc Folder: 807402		Reason for Modification:	
Doc Description: ADDENDUM NO_1		Vendor Questions and responses	
		CISCO ROUTERS & SWITCHES OR EQUAL	
Proc Type: Central Contract - Fixed Amt			
Date Issued	Solicitation Closes	Solicitation No	Version
2020-12-07	2020-12-10 13:30	CRFQ 0803 DOT2100000062	2

BID RECEIVING LOCATION

BID CLERK
 DEPARTMENT OF ADMINISTRATION
 PURCHASING DIVISION
 2019 WASHINGTON ST E
 CHARLESTON WV 25305
 US

VENDOR

Vendor Customer Code:

Vendor Name : STEP CG

Address : 50 E Rivercenter Blvd. #900

Street :

City : Covington

State : KY **Country :** US **Zip :** 41011

Principal Contact : Clint Vaughn

Vendor Contact Phone: 502-550-6852 **Extension:**

FOR INFORMATION CONTACT THE BUYER
 John W Estep
 304-558-2566
 john.w.estep@wv.gov

Vendor Signature X 

FEIN# 30-0836376 **DATE** 12-10-20

All offers subject to all terms and conditions contained in this solicitation

ADDITIONAL INFORMATION

ADDENDUM NO.1

Addendum No.1 issued to publish and distribute the attached information to the Vendor Community

REQUEST FOR QUOTATION:

The West Virginia Department of Transportation (WVDOT) is soliciting bids to establish a contract for the one-time purchase of hardware, software, licensing and support equipment required for the WVDOT network infrastructure. Equipment will be located at WVDOT offices located throughout the state. This equipment is intended to provide data connectivity. Per the Bid Requirements, Specifications, Terms and Conditions attached to this Solicitation.

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
1	3.1.1 Cisco ISR 4321 Series Chassis Bundle or Equal-Year 1	11.00000	EA	\$1031.28	\$11,344.08

Comm Code	Manufacturer	Specification	Model #
43222612			

Extended Description:

3.1.1 CISCO ISR 4321 Series Chassis Bundle or equal with Year 1 Smart Net Coverage

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
2	3.1.1 Cisco ISR 4321 Series Chassis Bundle or Equal-Year 2	11.00000	EA	\$1236.43	\$13,600.73

Comm Code	Manufacturer	Specification	Model #
43222612			

Extended Description:

3.1.1 CISCO ISR 4321 Series Chassis Bundle or equal with Year 2 Smart Net Coverage

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
3	3.1.1 Cisco ISR 4321 Series Chassis Bundle or Equal-Year 3	11.00000	EA	\$1430.43	\$15,734.73

Comm Code	Manufacturer	Specification	Model #
43222609			

Extended Description:

3.1.1 CISCO ISR 4321 Series Chassis Bundle or equal with Year 3 Smart Net Coverage

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
4	3.1.1 Cisco ISR 4321 Series Chassis Bundle or Equal-Year 4	11.00000	EA	\$1637.81	\$18,015.91

Comm Code	Manufacturer	Specification	Model #
43222609			

Extended Description:

3.1.1 CISCO ISR 4321 Series Chassis Bundle or equal with Year 4 Smart Net Coverage

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
5	3.1.2 Cisco ISR 4331 Series Chassis Bundle or Equal-Year 1	7.00000	EA	\$1622.15	\$11,355.05

Comm Code	Manufacturer	Specification	Model #
43222609			

Extended Description:

3.1.2 CISCO ISR 4331 Series Chassis Bundle or Equal with Year 1 Smart Net Coverage.

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
6	3.1.2 Cisco ISR 4331 Series Chassis Bundle or Equal-Year 2	7.00000	EA	\$1910.70	\$13,374.90

Comm Code	Manufacturer	Specification	Model #
43222609			

Extended Description:

3.1.2 CISCO ISR 4331 Series Chassis Bundle or Equal with Year 2 Smart Net Coverage.

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
7	3.1.2 Cisco ISR 4331 Series Chassis Bundle or Equal-Year 3	7.00000	EA	\$2183.57	\$15,284.99

Comm Code	Manufacturer	Specification	Model #
43222612			

Extended Description:

3.1.2 CISCO ISR 4331 Series Chassis Bundle or equal with Year 3 Smart Net coverage

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
8	3.1.2 Cisco ISR 4331 Series Chassis Bundle or Equal-Year 4	7.00000	EA	\$2475.25	\$17,326.75

Comm Code	Manufacturer	Specification	Model #
43222612			

Extended Description:

3.1.2 CISCO ISR 4331 Series Chassis Bundle or equal with Year 4 Smart Net coverage

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
9	3.1.3 Cisco ISR 1101 Series Port Router or Equal-Year 1	60.00000	EA	\$694.54	\$41,672.40

Comm Code	Manufacturer	Specification	Model #
43222609			

Extended Description:

3.1.3 Cisco ISR 1101 4 port router or equal with Year 1 Smart Net Coverage

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
10	3.1.3 Cisco ISR 1101 Series Port Router or Equal-Year 2	60.00000	EA	\$768.51	\$46,110.60

Comm Code	Manufacturer	Specification	Model #
43222609			

Extended Description:

3.1.3 Cisco ISR 1101 4 port router or equal with Year 2 Smart Net Coverage

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
11	3.1.3 Cisco ISR 1101 Series Port Router or Equal-Year 3	60.00000	EA	\$838.46	\$50,307.60

Comm Code	Manufacturer	Specification	Model #
43222609			

Extended Description:

3.1.3 Cisco ISR 1101 4 port router or equal with Year 3 Smart Net Coverage

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
12	3.1.3 Cisco ISR 1101 Series Port Router or Equal-Year 4	60.00000	EA	\$913.23	\$54,793.80

Comm Code	Manufacturer	Specification	Model #
43222609			

Extended Description:

3.1.3 Cisco ISR 1101 4 port router or equal with Year 4 Smart Net Coverage

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
13	3.1.4 Extreme Networks 12 Port Switch or Equal	95.00000	EA	\$1018.02	\$96,711.90

Comm Code	Manufacturer	Specification	Model #
43222609			

Extended Description:
3.1.4 Extreme Networks 12 Port Switch or Equal

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
14	3.1.5 Extreme Networks 48 Port Switch or Equal	75.00000	EA	\$2281.52	\$171,114.00

Comm Code	Manufacturer	Specification	Model #
43222609			

Extended Description:
3.1.5 Extreme Networks 48 Port Switch or Equal

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
15	3.1.6 Extreme Networks 24 Port Switch or Equal	20.00000	EA	\$1442.48	\$28,849.60

Comm Code	Manufacturer	Specification	Model #
43222609			

Extended Description:
3.1.6 Extreme Networks 24 Port Switch or Equal

SCHEDULE OF EVENTS

Line	Event	Event Date
1	Tech Questions Due by 10:00am	2020-12-03

	Document Phase	Document Description	Page 10
DOT2100000062	Final	ADDENDUM NO_1 CISCO ROUTERS & SWITCHES OR EQUAL	

ADDITIONAL TERMS AND CONDITIONS

See attached document(s) for additional Terms and Conditions



Department of Administration
 Purchasing Division
 2019 Washington Street East
 Post Office Box 50130
 Charleston, WV 25305-0130

State of West Virginia
 Centralized Request for Quote
 Info Technology

Proc Folder: 807402		Reason for Modification:	
Doc Description: ADDENDUM NO_1		Vendor Questions and responses	
		CISCO ROUTERS & SWITCHES OR EQUAL	
Proc Type: Central Contract - Fixed Amt			
Date Issued	Solicitation Closes	Solicitation No	Version
2020-12-07	2020-12-10 13:30	CRFQ 0803 DOT2100000062	2

BID RECEIVING LOCATION

BID CLERK
 DEPARTMENT OF ADMINISTRATION
 PURCHASING DIVISION
 2019 WASHINGTON ST E
 CHARLESTON WV 25305
 US

VENDOR

Vendor Customer Code:

Vendor Name : STEP CG

Address : 50 E Rivercenter Blvd

Street :

City : Covington

State : KY **Country :** US **Zip :** 41011

Principal Contact : Clint Vaughn

Vendor Contact Phone: 502-550-6852 **Extension:**

FOR INFORMATION CONTACT THE BUYER

John W Estep
 304-558-2566
 john.w.estep@wv.gov

Vendor
 Signature X

FEIN# 30-0836376

DATE 12-10-20

All offers subject to all terms and conditions contained in this solicitation

ADDITIONAL INFORMATION**ADDENDUM NO.1**

Addendum No.1 issued to publish and distribute the attached information to the Vendor Community

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DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
1	3.1.1 Cisco ISR 4321 Series Chassis Bundle or Equal-Year 1	11.00000	EA		

Comm Code	Manufacturer	Specification	Model #
43222612			

Extended Description:

3.1.1 CISCO ISR 4321 Series Chassis Bundle or equal with Year 1 Smart Net Coverage

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
2	3.1.1 Cisco ISR 4321 Series Chassis Bundle or Equal-Year 2	11.00000	EA		***See Final CRFQ Page

Comm Code	Manufacturer	Specification	Model #
43222612			

Extended Description:

3.1.1 CISCO ISR 4321 Series Chassis Bundle or equal with Year 2 Smart Net Coverage

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
3	3.1.1 Cisco ISR 4321 Series Chassis Bundle or Equal-Year 3	11.00000	EA		

Comm Code	Manufacturer	Specification	Model #
43222609			

Extended Description:

3.1.1 CISCO ISR 4321 Series Chassis Bundle or equal with Year 3 Smart Net Coverage

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
4	3.1.1 Cisco ISR 4321 Series Chassis Bundle or Equal-Year 4	11.00000	EA		

Comm Code	Manufacturer	Specification	Model #
43222609			

Extended Description:

3.1.1 CISCO ISR 4321 Series Chassis Bundle or equal with Year 4 Smart Net Coverage

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
5	3.1.2 Cisco ISR 4331 Series Chassis Bundle or Equal-Year 1	7.00000	EA		

Comm Code	Manufacturer	Specification	Model #
43222609			

Extended Description:

3.1.2 CISCO ISR 4331 Series Chassis Bundle or Equal with Year 1 Smart Net Coverage.

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
6	3.1.2 Cisco ISR 4331 Series Chassis Bundle or Equal-Year 2	7.00000	EA		

Comm Code	Manufacturer	Specification	Model #
43222609			

Extended Description:

3.1.2 CISCO ISR 4331 Series Chassis Bundle or Equal with Year 2 Smart Net Coverage.

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
7	3.1.2 Cisco ISR 4331 Series Chassis Bundle or Equal-Year 3	7.00000	EA		

Comm Code	Manufacturer	Specification	Model #
43222612			

Extended Description:

3.1.2 CISCO ISR 4331 Series Chassis Bundle or equal with Year 3 Smart Net coverage

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
8	3.1.2 Cisco ISR 4331 Series Chassis Bundle or Equal-Year 4	7.00000	EA		

Comm Code	Manufacturer	Specification	Model #
43222612			

Extended Description:

3.1.2 CISCO ISR 4331 Series Chassis Bundle or equal with Year 4 Smart Net coverage

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
9	3.1.3 Cisco ISR 1101 Series Port Router or Equal-Year 1	60.00000	EA		

Comm Code	Manufacturer	Specification	Model #
43222609			

Extended Description:

3.1.3 Cisco ISR 1101 4 port router or equal with Year 1 Smart Net Coverage

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
10	3.1.3 Cisco ISR 1101 Series Port Router or Equal-Year 2	60.00000	EA		

Comm Code	Manufacturer	Specification	Model #
43222609			

Extended Description:

3.1.3 Cisco ISR 1101 4 port router or equal with Year 2 Smart Net Coverage

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
11	3.1.3 Cisco ISR 1101 Series Port Router or Equal-Year 3	60.00000	EA		

Comm Code	Manufacturer	Specification	Model #
43222609			

Extended Description:

3.1.3 Cisco ISR 1101 4 port router or equal with Year 3 Smart Net Coverage

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
12	3.1.3 Cisco ISR 1101 Series Port Router or Equal-Year 4	60.00000	EA		

Comm Code	Manufacturer	Specification	Model #
43222609			

Extended Description:

3.1.3 Cisco ISR 1101 4 port router or equal with Year 4 Smart Net Coverage

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
13	3.1.4 Extreme Networks 12 Port Switch or Equal	95.00000	EA		

Comm Code	Manufacturer	Specification	Model #
43222609			

Extended Description:
3.1.4 Extreme Networks 12 Port Switch or Equal

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
14	3.1.5 Extreme Networks 48 Port Switch or Equal	75.00000	EA		

Comm Code	Manufacturer	Specification	Model #
43222609			

Extended Description:
3.1.5 Extreme Networks 48 Port Switch or Equal

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
15	3.1.6 Extreme Networks 24 Port Switch or Equal	20.00000	EA		

Comm Code	Manufacturer	Specification	Model #
43222609			

Extended Description:
3.1.6 Extreme Networks 24 Port Switch or Equal

SCHEDULE OF EVENTS

<u>Line</u>	<u>Event</u>	<u>Event Date</u>
1	Tech Questions Due by 10:00am	2020-12-03

	Document Phase	Document Description	Page
DOT2100000062	Draft	ADDENDUM NO_1 CISCO ROUTERS & SWITCHES OR EQUAL	10

ADDITIONAL TERMS AND CONDITIONS

See attached document(s) for additional Terms and Conditions

SOLICITATION NUMBER: CRFQ DOT2100000062

Addendum Number: 1

The purpose of this addendum is to modify the solicitation identified as CRFQ DOT2100000062 ("Solicitation") to reflect the change(s) identified and described below.

Applicable Addendum Category:

- Modify bid opening date and time
- Modify specifications of product or service being sought
- Attachment of vendor questions and responses
- Attachment of pre-bid sign-in sheet
- Correction of error
- Other-

Additional Documentation:

1. Bid Opening remains 12/10/20 at 1:30pm

Terms and Conditions:

1. All provisions of the Solicitation and other addenda not modified herein shall remain in full force and effect.
2. Vendor should acknowledge receipt of all addenda issued for this Solicitation by completing an Addendum Acknowledgment, a copy of which is included herewith. Failure to acknowledge addenda may result in bid disqualification. The addendum acknowledgement should be submitted with the bid to expedite document processing.

Cisco Routers & Switches or Equal (63210039)
Addendum #1 CRFQ DOT21*62

Question #1

Could you please confirm what level of security firewall do you need on the router side?

The security firewall specifications on equipment that is bid must meet or exceed the specifications of the requested equipment in the RFQ.

Question #2

How much smartnet do you want? The excel sheet says 4 years. It comes in 1, 3, or 5 years. Can the bid be emailed or electronic back via the oasis website?

Please provide pricing for the 1, 3, and 5 years. Please contact the Purchasing Division regarding submission of the bid.

ADDENDUM ACKNOWLEDGEMENT FORM
SOLICITATION NO.: CRFQ DOT2100000062

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:

(Check the box next to each addendum received)

- | | |
|--|--|
| <input checked="" type="checkbox"/> Addendum No. 1 | <input type="checkbox"/> Addendum No. 6 |
| <input type="checkbox"/> Addendum No. 2 | <input type="checkbox"/> Addendum No. 7 |
| <input type="checkbox"/> Addendum No. 3 | <input type="checkbox"/> Addendum No. 8 |
| <input type="checkbox"/> Addendum No. 4 | <input type="checkbox"/> Addendum No. 9 |
| <input type="checkbox"/> Addendum No. 5 | <input type="checkbox"/> Addendum No. 10 |

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

STEP CG

 Company

Authorized Signature

12-10-20

Date

NOTE: This addendum acknowledgement should be submitted with the bid to expedite document processing.

GENERAL TERMS AND CONDITIONS:

1. CONTRACTUAL AGREEMENT: Issuance of a Award Document signed by the Purchasing Division Director, or his designee, and approved as to form by the Attorney General's office constitutes acceptance of this Contract made by and between the State of West Virginia and the Vendor. Vendor's signature on its bid signifies Vendor's agreement to be bound by and accept the terms and conditions contained in this Contract.

2. DEFINITIONS: As used in this Solicitation/Contract, the following terms shall have the meanings attributed to them below. Additional definitions may be found in the specifications included with this Solicitation/Contract.

2.1. "Agency" or "Agencies" means the agency, board, commission, or other entity of the State of West Virginia that is identified on the first page of the Solicitation or any other public entity seeking to procure goods or services under this Contract.

2.2. "Bid" or "Proposal" means the vendors submitted response to this solicitation.

2.3. "Contract" means the binding agreement that is entered into between the State and the Vendor to provide the goods or services requested in the Solicitation.

2.4. "Director" means the Director of the West Virginia Department of Administration, Purchasing Division.

2.5. "Purchasing Division" means the West Virginia Department of Administration, Purchasing Division.

2.6. "Award Document" means the document signed by the Agency and the Purchasing Division, and approved as to form by the Attorney General, that identifies the Vendor as the contract holder.

2.7. "Solicitation" means the official notice of an opportunity to supply the State with goods or services that is published by the Purchasing Division.

2.8. "State" means the State of West Virginia and/or any of its agencies, commissions, boards, etc. as context requires.

2.9. "Vendor" or "Vendors" means any entity submitting a bid in response to the Solicitation, the entity that has been selected as the lowest responsible bidder, or the entity that has been awarded the Contract as context requires.

3. CONTRACT TERM; RENEWAL; EXTENSION: The term of this Contract shall be determined in accordance with the category that has been identified as applicable to this Contract below:

Term Contract

Initial Contract Term: **Initial Contract Term:** This Contract becomes effective on _____ and extends for a period of _____ year(s).

Renewal Term: This Contract may be renewed upon the mutual written consent of the Agency, and the Vendor, with approval of the Purchasing Division and the Attorney General's office (Attorney General approval is as to form only). Any request for renewal should be delivered to the Agency and then submitted to the Purchasing Division thirty (30) days prior to the expiration date of the initial contract term or appropriate renewal term. A Contract renewal shall be in accordance with the terms and conditions of the original contract. Unless otherwise specified below, renewal of this Contract is limited to _____ successive one (1) year periods or multiple renewal periods of less than one year, provided that the multiple renewal periods do not exceed the total number of months available in all renewal years combined. Automatic renewal of this Contract is prohibited. Renewals must be approved by the Vendor, Agency, Purchasing Division and Attorney General's office (Attorney General approval is as to form only)

Alternate Renewal Term – This contract may be renewed for _____ successive _____ year periods or shorter periods provided that they do not exceed the total number of months contained in all available renewals. Automatic renewal of this Contract is prohibited. Renewals must be approved by the Vendor, Agency, Purchasing Division and Attorney General's office (Attorney General approval is as to form only)

Delivery Order Limitations: In the event that this contract permits delivery orders, a delivery order may only be issued during the time this Contract is in effect. Any delivery order issued within one year of the expiration of this Contract shall be effective for one year from the date the delivery order is issued. No delivery order may be extended beyond one year after this Contract has expired.

Fixed Period Contract: This Contract becomes effective upon Vendor's receipt of the notice to proceed and must be completed within _____ days.

Fixed Period Contract with Renewals: This Contract becomes effective upon Vendor's receipt of the notice to proceed and part of the Contract more fully described in the attached specifications must be completed within _____ days. Upon completion of the work covered by the preceding sentence, the vendor agrees that maintenance, monitoring, or warranty services will be provided for _____ year(s) thereafter.

One Time Purchase: The term of this Contract shall run from the issuance of the Award Document until all of the goods contracted for have been delivered, but in no event will this Contract extend for more than one fiscal year.

Other: See attached.

4. NOTICE TO PROCEED: Vendor shall begin performance of this Contract immediately upon receiving notice to proceed unless otherwise instructed by the Agency. Unless otherwise specified, the fully executed Award Document will be considered notice to proceed.

5. QUANTITIES: The quantities required under this Contract shall be determined in accordance with the category that has been identified as applicable to this Contract below.

Open End Contract: Quantities listed in this Solicitation are approximations only, based on estimates supplied by the Agency. It is understood and agreed that the Contract shall cover the quantities actually ordered for delivery during the term of the Contract, whether more or less than the quantities shown.

Service: The scope of the service to be provided will be more clearly defined in the specifications included herewith.

Combined Service and Goods: The scope of the service and deliverable goods to be provided will be more clearly defined in the specifications included herewith.

One Time Purchase: This Contract is for the purchase of a set quantity of goods that are identified in the specifications included herewith. Once those items have been delivered, no additional goods may be procured under this Contract without an appropriate change order approved by the Vendor, Agency, Purchasing Division, and Attorney General's office.

6. EMERGENCY PURCHASES: The Purchasing Division Director may authorize the Agency to purchase goods or services in the open market that Vendor would otherwise provide under this Contract if those goods or services are for immediate or expedited delivery in an emergency. Emergencies shall include, but are not limited to, delays in transportation or an unanticipated increase in the volume of work. An emergency purchase in the open market, approved by the Purchasing Division Director, shall not constitute a breach of this Contract and shall not entitle the Vendor to any form of compensation or damages. This provision does not excuse the State from fulfilling its obligations under a One Time Purchase contract.

7. REQUIRED DOCUMENTS: All of the items checked below must be provided to the Purchasing Division by the Vendor as specified below.

BID BOND (Construction Only): Pursuant to the requirements contained in W. Va. Code § 5-22-1(c), All Vendors submitting a bid on a construction project shall furnish a valid bid bond in the amount of five percent (5%) of the total amount of the bid protecting the State of West Virginia. The bid bond must be submitted with the bid.

PERFORMANCE BOND: The apparent successful Vendor shall provide a performance bond in the amount of 100% of the contract. The performance bond must be received by the Purchasing Division prior to Contract award.

LABOR/MATERIAL PAYMENT BOND: The apparent successful Vendor shall provide a labor/material payment bond in the amount of 100% of the Contract value. The labor/material payment bond must be delivered to the Purchasing Division prior to Contract award.

In lieu of the Bid Bond, Performance Bond, and Labor/Material Payment Bond, the Vendor may provide certified checks, cashier's checks, or irrevocable letters of credit. Any certified check, cashier's check, or irrevocable letter of credit provided in lieu of a bond must be of the same amount and delivered on the same schedule as the bond it replaces. A letter of credit submitted in lieu of a performance and labor/material payment bond will only be allowed for projects under \$100,000. Personal or business checks are not acceptable. Notwithstanding the foregoing, West Virginia Code § 5-22-1 (d) mandates that a vendor provide a performance and labor/material payment bond for construction projects. Accordingly, substitutions for the performance and labor/material payment bonds for construction projects is not permitted.

MAINTENANCE BOND: The apparent successful Vendor shall provide a two (2) year maintenance bond covering the roofing system. The maintenance bond must be issued and delivered to the Purchasing Division prior to Contract award.

LICENSE(S) / CERTIFICATIONS / PERMITS: In addition to anything required under the Section of the General Terms and Conditions entitled Licensing, the apparent successful Vendor shall furnish proof of the following licenses, certifications, and/or permits upon request and in a form acceptable to the State. The request may be prior to or after contract award at the State's sole discretion.

The apparent successful Vendor shall also furnish proof of any additional licenses or certifications contained in the specifications regardless of whether or not that requirement is listed above.

8. INSURANCE: The apparent successful Vendor shall furnish proof of the insurance identified by a checkmark below and must include the State as an additional insured on each policy prior to Contract award. The insurance coverages identified below must be maintained throughout the life of this contract. Thirty (30) days prior to the expiration of the insurance policies, Vendor shall provide the Agency with proof that the insurance mandated herein has been continued. Vendor must also provide Agency with immediate notice of any changes in its insurance policies, including but not limited to, policy cancelation, policy reduction, or change in insurers. The apparent successful Vendor shall also furnish proof of any additional insurance requirements contained in the specifications prior to Contract award regardless of whether or not that insurance requirement is listed in this section.

Vendor must maintain:

Commercial General Liability Insurance in at least an amount of: 1,000,000.00 per occurrence.

Automobile Liability Insurance in at least an amount of: _____ per occurrence.

Professional/Malpractice/Errors and Omission Insurance in at least an amount of: _____ per occurrence. Notwithstanding the forgoing, Vendor's are not required to list the State as an additional insured for this type of policy.

Commercial Crime and Third Party Fidelity Insurance in an amount of: _____ per occurrence.

Cyber Liability Insurance in an amount of: _____ per occurrence.

Builders Risk Insurance in an amount equal to 100% of the amount of the Contract.

Pollution Insurance in an amount of: _____ per occurrence.

Aircraft Liability in an amount of: _____ per occurrence.

**** State of West Virginia must be listed as additional insured on insurance certificate ****

**** Certificate Holder Should Read as follows ****
State of WV
1900 Kanawha Blvd. E., Bldg. 5
Charleston, WV 25305

Notwithstanding anything contained in this section to the contrary, the Director of the Purchasing Division reserves the right to waive the requirement that the State be named as an additional insured on one or more of the Vendor's insurance policies if the Director finds that doing so is in the State's best interest.

9. WORKERS' COMPENSATION INSURANCE: The apparent successful Vendor shall comply with laws relating to workers compensation, shall maintain workers' compensation insurance when required, and shall furnish proof of workers' compensation insurance upon request.

10. [Reserved]

11. LIQUIDATED DAMAGES: This clause shall in no way be considered exclusive and shall not limit the State or Agency's right to pursue any other available remedy. Vendor shall pay liquidated damages in the amount specified below or as described in the specifications:

_____ for _____

Liquidated Damages Contained in the Specifications

12. ACCEPTANCE: Vendor's signature on its bid, or on the certification and signature page, constitutes an offer to the State that cannot be unilaterally withdrawn, signifies that the product or service proposed by vendor meets the mandatory requirements contained in the Solicitation for that product or service, unless otherwise indicated, and signifies acceptance of the terms and conditions contained in the Solicitation unless otherwise indicated.

13. PRICING: The pricing set forth herein is firm for the life of the Contract, unless specified elsewhere within this Solicitation/Contract by the State. A Vendor's inclusion of price adjustment provisions in its bid, without an express authorization from the State in the Solicitation to do so, may result in bid disqualification. Notwithstanding the foregoing, Vendor must extend any publicly advertised sale price to the State and invoice at the lower of the contract price or the publicly advertised sale price.

14. PAYMENT IN ARREARS: Payment in advance is prohibited under this Contract. Payment may only be made after the delivery and acceptance of goods or services. The Vendor shall submit invoices, in arrears.

15. PAYMENT METHODS: Vendor must accept payment by electronic funds transfer and P-Card. (The State of West Virginia's Purchasing Card program, administered under contract by a banking institution, processes payment for goods and services through state designated credit cards.)

16. TAXES: The Vendor shall pay any applicable sales, use, personal property or any other taxes arising out of this Contract and the transactions contemplated thereby. The State of West Virginia is exempt from federal and state taxes and will not pay or reimburse such taxes.

17. ADDITIONAL FEES: Vendor is not permitted to charge additional fees or assess additional charges that were not either expressly provided for in the solicitation published by the State of West Virginia or included in the unit price or lump sum bid amount that Vendor is required by the solicitation to provide. Including such fees or charges as notes to the solicitation may result in rejection of vendor's bid. Requesting such fees or charges be paid after the contract has been awarded may result in cancellation of the contract.

18. FUNDING: This Contract shall continue for the term stated herein, contingent upon funds being appropriated by the Legislature or otherwise being made available. In the event funds are not appropriated or otherwise made available, this Contract becomes void and of no effect beginning on July 1 of the fiscal year for which funding has not been appropriated or otherwise made available.

19. CANCELLATION: The Purchasing Division Director reserves the right to cancel this Contract immediately upon written notice to the vendor if the materials or workmanship supplied do not conform to the specifications contained in the Contract. The Purchasing Division Director may also cancel any purchase or Contract upon 30 days written notice to the Vendor in accordance with West Virginia Code of State Rules § 148-1-5.2.b.

20. TIME: Time is of the essence with regard to all matters of time and performance in this Contract.

21. APPLICABLE LAW: This Contract is governed by and interpreted under West Virginia law without giving effect to its choice of law principles. Any information provided in specification manuals, or any other source, verbal or written, which contradicts or violates the West Virginia Constitution, West Virginia Code or West Virginia Code of State Rules is void and of no effect.

22. COMPLIANCE WITH LAWS: Vendor shall comply with all applicable federal, state, and local laws, regulations and ordinances. By submitting a bid, Vendor acknowledges that it has reviewed, understands, and will comply with all applicable laws, regulations, and ordinances.

SUBCONTRACTOR COMPLIANCE: Vendor shall notify all subcontractors providing commodities or services related to this Contract that as subcontractors, they too are required to comply with all applicable laws, regulations, and ordinances. Notification under this provision must occur prior to the performance of any work under the contract by the subcontractor.

23. ARBITRATION: Any references made to arbitration contained in this Contract, Vendor's bid, or in any American Institute of Architects documents pertaining to this Contract are hereby deleted, void, and of no effect.

24. MODIFICATIONS: This writing is the parties' final expression of intent. Notwithstanding anything contained in this Contract to the contrary no modification of this Contract shall be binding without mutual written consent of the Agency, and the Vendor, with approval of the Purchasing Division and the Attorney General's office (Attorney General approval is as to form only). Any change to existing contracts that adds work or changes contract cost, and were not included in the original contract, must be approved by the Purchasing Division and the Attorney General's Office (as to form) prior to the implementation of the change or commencement of work affected by the change.

25. WAIVER: The failure of either party to insist upon a strict performance of any of the terms or provision of this Contract, or to exercise any option, right, or remedy herein contained, shall not be construed as a waiver or a relinquishment for the future of such term, provision, option, right, or remedy, but the same shall continue in full force and effect. Any waiver must be expressly stated in writing and signed by the waiving party.

26. SUBSEQUENT FORMS: The terms and conditions contained in this Contract shall supersede any and all subsequent terms and conditions which may appear on any form documents submitted by Vendor to the Agency or Purchasing Division such as price lists, order forms, invoices, sales agreements, or maintenance agreements, and includes internet websites or other electronic documents. Acceptance or use of Vendor's forms does not constitute acceptance of the terms and conditions contained thereon.

27. ASSIGNMENT: Neither this Contract nor any monies due, or to become due hereunder, may be assigned by the Vendor without the express written consent of the Agency, the Purchasing Division, the Attorney General's office (as to form only), and any other government agency or office that may be required to approve such assignments.

28. WARRANTY: The Vendor expressly warrants that the goods and/or services covered by this Contract will: (a) conform to the specifications, drawings, samples, or other description furnished or specified by the Agency; (b) be merchantable and fit for the purpose intended; and (c) be free from defect in material and workmanship.

29. STATE EMPLOYEES: State employees are not permitted to utilize this Contract for personal use and the Vendor is prohibited from permitting or facilitating the same.

30. PRIVACY, SECURITY, AND CONFIDENTIALITY: The Vendor agrees that it will not disclose to anyone, directly or indirectly, any such personally identifiable information or other confidential information gained from the Agency, unless the individual who is the subject of the information consents to the disclosure in writing or the disclosure is made pursuant to the Agency's policies, procedures, and rules. Vendor further agrees to comply with the Confidentiality Policies and Information Security Accountability Requirements, set forth in <http://www.state.wv.us/admin/purchase/privacy/default.html>.

31. YOUR SUBMISSION IS A PUBLIC DOCUMENT: Vendor's entire response to the Solicitation and the resulting Contract are public documents. As public documents, they will be disclosed to the public following the bid/proposal opening or award of the contract, as required by the competitive bidding laws of West Virginia Code §§ 5A-3-1 et seq., 5-22-1 et seq., and 5G-1-1 et seq. and the Freedom of Information Act West Virginia Code §§ 29B-1-1 et seq.

DO NOT SUBMIT MATERIAL YOU CONSIDER TO BE CONFIDENTIAL, A TRADE SECRET, OR OTHERWISE NOT SUBJECT TO PUBLIC DISCLOSURE.

Submission of any bid, proposal, or other document to the Purchasing Division constitutes your explicit consent to the subsequent public disclosure of the bid, proposal, or document. The Purchasing Division will disclose any document labeled "confidential," "proprietary," "trade secret," "private," or labeled with any other claim against public disclosure of the documents, to include any "trade secrets" as defined by West Virginia Code § 47-22-1 et seq. All submissions are subject to public disclosure without notice.

32. LICENSING: In accordance with West Virginia Code of State Rules § 148-1-6.1.e, Vendor must be licensed and in good standing in accordance with any and all state and local laws and requirements by any state or local agency of West Virginia, including, but not limited to, the West Virginia Secretary of State's Office, the West Virginia Tax Department, West Virginia Insurance Commission, or any other state agency or political subdivision. Obligations related to political subdivisions may include, but are not limited to, business licensing, business and occupation taxes, inspection compliance, permitting, etc. Upon request, the Vendor must provide all necessary releases to obtain information to enable the Purchasing Division Director or the Agency to verify that the Vendor is licensed and in good standing with the above entities.

SUBCONTRACTOR COMPLIANCE: Vendor shall notify all subcontractors providing commodities or services related to this Contract that as subcontractors, they too are required to be licensed, in good standing, and up-to-date on all state and local obligations as described in this section. Obligations related to political subdivisions may include, but are not limited to, business licensing, business and occupation taxes, inspection compliance, permitting, etc. Notification under this provision must occur prior to the performance of any work under the contract by the subcontractor.

33. ANTITRUST: In submitting a bid to, signing a contract with, or accepting a Award Document from any agency of the State of West Virginia, the Vendor agrees to convey, sell, assign, or transfer to the State of West Virginia all rights, title, and interest in and to all causes of action it may now or hereafter acquire under the antitrust laws of the United States and the State of West Virginia for price fixing and/or unreasonable restraints of trade relating to the particular commodities or services purchased or acquired by the State of West Virginia. Such assignment shall be made and become effective at the time the purchasing agency tenders the initial payment to Vendor.

34. VENDOR CERTIFICATIONS: By signing its bid or entering into this Contract, Vendor certifies (1) that its bid or offer was made without prior understanding, agreement, or connection with any corporation, firm, limited liability company, partnership, person or entity submitting a bid or offer for the same material, supplies, equipment or services; (2) that its bid or offer is in all respects fair and without collusion or fraud; (3) that this Contract is accepted or entered into without any prior understanding, agreement, or connection to any other entity that could be considered a violation of law; and (4) that it has reviewed this Solicitation in its entirety; understands the requirements, terms and conditions, and other information contained herein.

Vendor's signature on its bid or offer also affirms that neither it nor its representatives have any interest, nor shall acquire any interest, direct or indirect, which would compromise the performance of its services hereunder. Any such interests shall be promptly presented in detail to the Agency. The individual signing this bid or offer on behalf of Vendor certifies that he or she is authorized by the Vendor to execute this bid or offer or any documents related thereto on Vendor's behalf; that he or she is authorized to bind the Vendor in a contractual relationship; and that, to the best of his or her knowledge, the Vendor has properly registered with any State agency that may require registration.

35. VENDOR RELATIONSHIP: The relationship of the Vendor to the State shall be that of an independent contractor and no principal-agent relationship or employer-employee relationship is contemplated or created by this Contract. The Vendor as an independent contractor is solely liable for the acts and omissions of its employees and agents. Vendor shall be responsible for selecting, supervising, and compensating any and all individuals employed pursuant to the terms of this Solicitation and resulting contract. Neither the Vendor, nor any employees or subcontractors of the Vendor, shall be deemed to be employees of the State for any purpose whatsoever. Vendor shall be exclusively responsible for payment of employees and contractors for all wages and salaries, taxes, withholding payments, penalties, fees, fringe benefits, professional liability insurance premiums, contributions to insurance and pension, or other deferred compensation plans, including but not limited to, Workers' Compensation and Social Security obligations, licensing fees, etc. and the filing of all necessary documents, forms, and returns pertinent to all of the foregoing.

Vendor shall hold harmless the State, and shall provide the State and Agency with a defense against any and all claims including, but not limited to, the foregoing payments, withholdings, contributions, taxes, Social Security taxes, and employer income tax returns.

36. INDEMNIFICATION: The Vendor agrees to indemnify, defend, and hold harmless the State and the Agency, their officers, and employees from and against: (1) Any claims or losses for services rendered by any subcontractor, person, or firm performing or supplying services, materials, or supplies in connection with the performance of the Contract; (2) Any claims or losses resulting to any person or entity injured or damaged by the Vendor, its officers, employees, or subcontractors by the publication, translation, reproduction, delivery, performance, use, or disposition of any data used under the Contract in a manner not authorized by the Contract, or by Federal or State statutes or regulations; and (3) Any failure of the Vendor, its officers, employees, or subcontractors to observe State and Federal laws including, but not limited to, labor and wage and hour laws.

37. PURCHASING AFFIDAVIT: In accordance with West Virginia Code §§ 5A-3-10a and 5-22-1(i), the State is prohibited from awarding a contract to any bidder that owes a debt to the State or a political subdivision of the State, Vendors are required to sign, notarize, and submit the Purchasing Affidavit to the Purchasing Division affirming under oath that it is not in default on any monetary obligation owed to the state or a political subdivision of the state.

38. ADDITIONAL AGENCY AND LOCAL GOVERNMENT USE: This Contract may be utilized by other agencies, spending units, and political subdivisions of the State of West Virginia; county, municipal, and other local government bodies; and school districts (“Other Government Entities”), provided that both the Other Government Entity and the Vendor agree. Any extension of this Contract to the aforementioned Other Government Entities must be on the same prices, terms, and conditions as those offered and agreed to in this Contract, provided that such extension is in compliance with the applicable laws, rules, and ordinances of the Other Government Entity. A refusal to extend this Contract to the Other Government Entities shall not impact or influence the award of this Contract in any manner.

39. CONFLICT OF INTEREST: Vendor, its officers or members or employees, shall not presently have or acquire an interest, direct or indirect, which would conflict with or compromise the performance of its obligations hereunder. Vendor shall periodically inquire of its officers, members and employees to ensure that a conflict of interest does not arise. Any conflict of interest discovered shall be promptly presented in detail to the Agency.

40. REPORTS: Vendor shall provide the Agency and/or the Purchasing Division with the following reports identified by a checked box below:

Such reports as the Agency and/or the Purchasing Division may request. Requested reports may include, but are not limited to, quantities purchased, agencies utilizing the contract, total contract expenditures by agency, etc.

Quarterly reports detailing the total quantity of purchases in units and dollars, along with a listing of purchases by agency. Quarterly reports should be delivered to the Purchasing Division via email at purchasing.requisitions@wv.gov.

41. BACKGROUND CHECK: In accordance with W. Va. Code § 15-2D-3, the Director of the Division of Protective Services shall require any service provider whose employees are regularly employed on the grounds or in the buildings of the Capitol complex or who have access to sensitive or critical information to submit to a fingerprint-based state and federal background inquiry through the state repository. The service provider is responsible for any costs associated with the fingerprint-based state and federal background inquiry.

After the contract for such services has been approved, but before any such employees are permitted to be on the grounds or in the buildings of the Capitol complex or have access to sensitive or critical information, the service provider shall submit a list of all persons who will be physically present and working at the Capitol complex to the Director of the Division of Protective Services for purposes of verifying compliance with this provision. The State reserves the right to prohibit a service provider’s employees from accessing sensitive or critical information or to be present at the Capitol complex based upon results addressed from a criminal background check.

Revised 01/09/2020

Service providers should contact the West Virginia Division of Protective Services by phone at (304) 558-9911 for more information.

42. PREFERENCE FOR USE OF DOMESTIC STEEL PRODUCTS: Except when authorized by the Director of the Purchasing Division pursuant to W. Va. Code § 5A-3-56, no contractor may use or supply steel products for a State Contract Project other than those steel products made in the United States. A contractor who uses steel products in violation of this section may be subject to civil penalties pursuant to W. Va. Code § 5A-3-56. As used in this section:

- a. "State Contract Project" means any erection or construction of, or any addition to, alteration of or other improvement to any building or structure, including, but not limited to, roads or highways, or the installation of any heating or cooling or ventilating plants or other equipment, or the supply of and materials for such projects, pursuant to a contract with the State of West Virginia for which bids were solicited on or after June 6, 2001.
- b. "Steel Products" means products rolled, formed, shaped, drawn, extruded, forged, cast, fabricated or otherwise similarly processed, or processed by a combination of two or more or such operations, from steel made by the open heath, basic oxygen, electric furnace, Bessemer or other steel making process. The Purchasing Division Director may, in writing, authorize the use of foreign steel products if:
- c. The cost for each contract item used does not exceed one tenth of one percent (.1%) of the total contract cost or two thousand five hundred dollars (\$2,500.00), whichever is greater. For the purposes of this section, the cost is the value of the steel product as delivered to the project; or
- d. The Director of the Purchasing Division determines that specified steel materials are not produced in the United States in sufficient quantity or otherwise are not reasonably available to meet contract requirements.

43. PREFERENCE FOR USE OF DOMESTIC ALUMINUM, GLASS, AND STEEL: In Accordance with W. Va. Code § 5-19-1 et seq., and W. Va. CSR § 148-10-1 et seq., for every contract or subcontract, subject to the limitations contained herein, for the construction, reconstruction, alteration, repair, improvement or maintenance of public works or for the purchase of any item of machinery or equipment to be used at sites of public works, only domestic aluminum, glass or steel products shall be supplied unless the spending officer determines, in writing, after the receipt of offers or bids, (1) that the cost of domestic aluminum, glass or steel products is unreasonable or inconsistent with the public interest of the State of West Virginia, (2) that domestic aluminum, glass or steel products are not produced in sufficient quantities to meet the contract requirements, or (3) the available domestic aluminum, glass, or steel do not meet the contract specifications. This provision only applies to public works contracts awarded in an amount more than fifty thousand dollars (\$50,000) or public works contracts that require more than ten thousand pounds of steel products.

The cost of domestic aluminum, glass, or steel products may be unreasonable if the cost is more than twenty percent (20%) of the bid or offered price for foreign made aluminum, glass, or steel products. If the domestic aluminum, glass or steel products to be supplied or produced in a

“substantial labor surplus area”, as defined by the United States Department of Labor, the cost of domestic aluminum, glass, or steel products may be unreasonable if the cost is more than thirty percent (30%) of the bid or offered price for foreign made aluminum, glass, or steel products. This preference shall be applied to an item of machinery or equipment, as indicated above, when the item is a single unit of equipment or machinery manufactured primarily of aluminum, glass or steel, is part of a public works contract and has the sole purpose or of being a permanent part of a single public works project. This provision does not apply to equipment or machinery purchased by a spending unit for use by that spending unit and not as part of a single public works project.

All bids and offers including domestic aluminum, glass or steel products that exceed bid or offer prices including foreign aluminum, glass or steel products after application of the preferences provided in this provision may be reduced to a price equal to or lower than the lowest bid or offer price for foreign aluminum, glass or steel products plus the applicable preference. If the reduced bid or offer prices are made in writing and supersede the prior bid or offer prices, all bids or offers, including the reduced bid or offer prices, will be reevaluated in accordance with this rule.

44. INTERESTED PARTY SUPPLEMENTAL DISCLOSURE: W. Va. Code § 6D-1-2 requires that for contracts with an actual or estimated value of at least \$1 million, the vendor must submit to the Agency a supplemental disclosure of interested parties reflecting any new or differing interested parties to the contract, which were not included in the original pre-award interested party disclosure, within 30 days following the completion or termination of the contract. A copy of that form is included with this solicitation or can be obtained from the WV Ethics Commission. This requirement does not apply to publicly traded companies listed on a national or international stock exchange. A more detailed definition of interested parties can be obtained from the form referenced above.

45. PROHIBITION AGAINST USED OR REFURBISHED: Unless expressly permitted in the solicitation published by the State, Vendor must provide new, unused commodities, and is prohibited from supplying used or refurbished commodities, in fulfilling its responsibilities under this Contract.

DESIGNATED CONTACT: Vendor appoints the individual identified in this Section as the Contract Administrator and the initial point of contact for matters relating to this Contract.

 Regional Sales Executive

(Name, Title)
Clint Vaughn - Regional Sales Executive

(Printed Name and Title)
50 E Rivercenter Blvd. #900 Covington, KY 41011

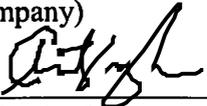
(Address)
502-550-6852 / 859-261-4018

(Phone Number) / (Fax Number)
cvaughn@stepcg.com

(email address)

CERTIFICATION AND SIGNATURE: By signing below, or submitting documentation through wvOASIS, I certify that I have reviewed this Solicitation in its entirety; that I understand the requirements, terms and conditions, and other information contained herein; that this bid, offer or proposal constitutes an offer to the State that cannot be unilaterally withdrawn; that the product or service proposed meets the mandatory requirements contained in the Solicitation for that product or service, unless otherwise stated herein; that the Vendor accepts the terms and conditions contained in the Solicitation, unless otherwise stated herein; that I am submitting this bid, offer or proposal for review and consideration; that I am authorized by the vendor to execute and submit this bid, offer, or proposal, or any documents related thereto on vendor's behalf; that I am authorized to bind the vendor in a contractual relationship; and that to the best of my knowledge, the vendor has properly registered with any State agency that may require registration.

STEP CG

(Company)


(Authorized Signature) (Representative Name, Title)
Clint Vaughn - Regional Sales Executive

(Printed Name and Title of Authorized Representative)
12-10-20

(Date)
502-550-6852 / 859-261-4018

(Phone Number) (Fax Number)

STATE OF WEST VIRGINIA
Purchasing Division

PURCHASING AFFIDAVIT

CONSTRUCTION CONTRACTS: Under W. Va. Code § 5-22-1(i), the contracting public entity shall not award a construction contract to any bidder that is known to be in default on any monetary obligation owed to the state or a political subdivision of the state, including, but not limited to, obligations related to payroll taxes, property taxes, sales and use taxes, fire service fees, or other fines or fees.

ALL CONTRACTS: Under W. Va. Code §5A-3-10a, no contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and: (1) the debt owed is an amount greater than one thousand dollars in the aggregate; or (2) the debtor is in employer default.

EXCEPTION: The prohibition listed above does not apply where a vendor has contested any tax administered pursuant to chapter eleven of the W. Va. Code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

DEFINITIONS:

"Debt" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"Employer default" means having an outstanding balance or liability to the old fund or to the uninsured employers' fund or being in policy default, as defined in W. Va. Code § 23-2c-2, failure to maintain mandatory workers' compensation coverage, or failure to fully meet its obligations as a workers' compensation self-insured employer. An employer is not in employer default if it has entered into a repayment agreement with the Insurance Commissioner and remains in compliance with the obligations under the repayment agreement.

"Related party" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceeds five percent of the total contract amount.

AFFIRMATION: By signing this form, the vendor's authorized signer affirms and acknowledges under penalty of law for false swearing (W. Va. Code §61-5-3) that: (1) for construction contracts, the vendor is not in default on any monetary obligation owed to the state or a political subdivision of the state, and (2) for all other contracts, that neither vendor nor any related party owe a debt as defined above and that neither vendor nor any related party are in employer default as defined above, unless the debt or employer default is permitted under the exception above.

WITNESS THE FOLLOWING SIGNATURE:

Vendor's Name: STEP CG

Authorized Signature:  Date: 11-16-20

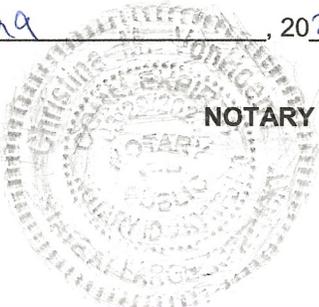
State of Kentucky

County of Boone, to-wit:

Taken, subscribed, and sworn to before me this 16th day of November, 2020.

My Commission expires March 29, 2024.

AFFIX SEAL HERE



NOTARY PUBLIC Christina M. ConHoene



The bridge to possible

[Data sheet](#)
Cisco public

Cisco IR1101 Integrated Services Router Rugged

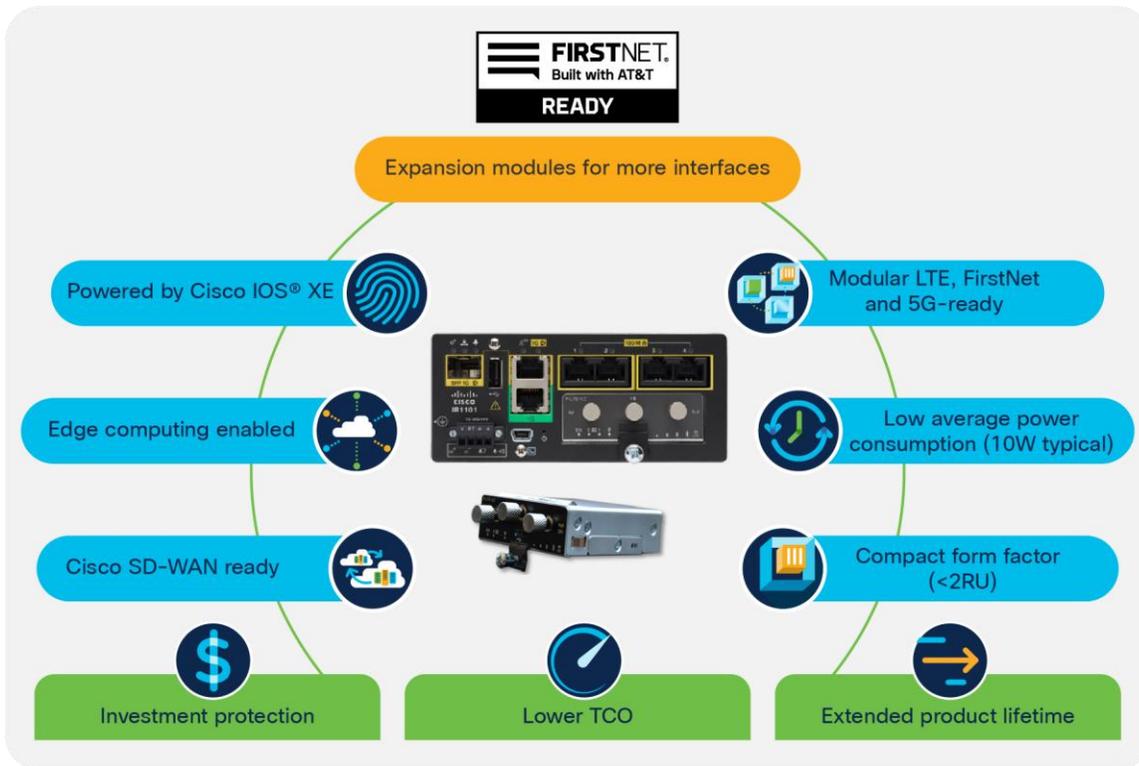
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The Cisco® IR1101 Integrated Services Router Rugged, or IR1101, is Cisco’s most compact, FirstNet Ready™ industrial router. Designed in a highly modular form factor makes it an ideal solution for remote asset management across multiple industrial vertical markets.

The IR1101 has an integrated 9.6 to 60V DC power input and is designed to withstand hostile environments, including shock, vibration, dust, humidity and Electrostatic Discharge (ESD). The IR1101 also supports a wide temperature range: -40 to 60° C standard operation, -40 to 75° C in a forced air enclosure with 200 LFM of air, and type-tested at 85° C for 16 hours. This durability makes it ideal for harsh industrial and distributed IoT deployments such as transportation, oil and gas, distribution substations, industrial automation, and financial institutions.

Product highlights



Figures 1, 2, and 3 offer visual views of product components and expansion modules.

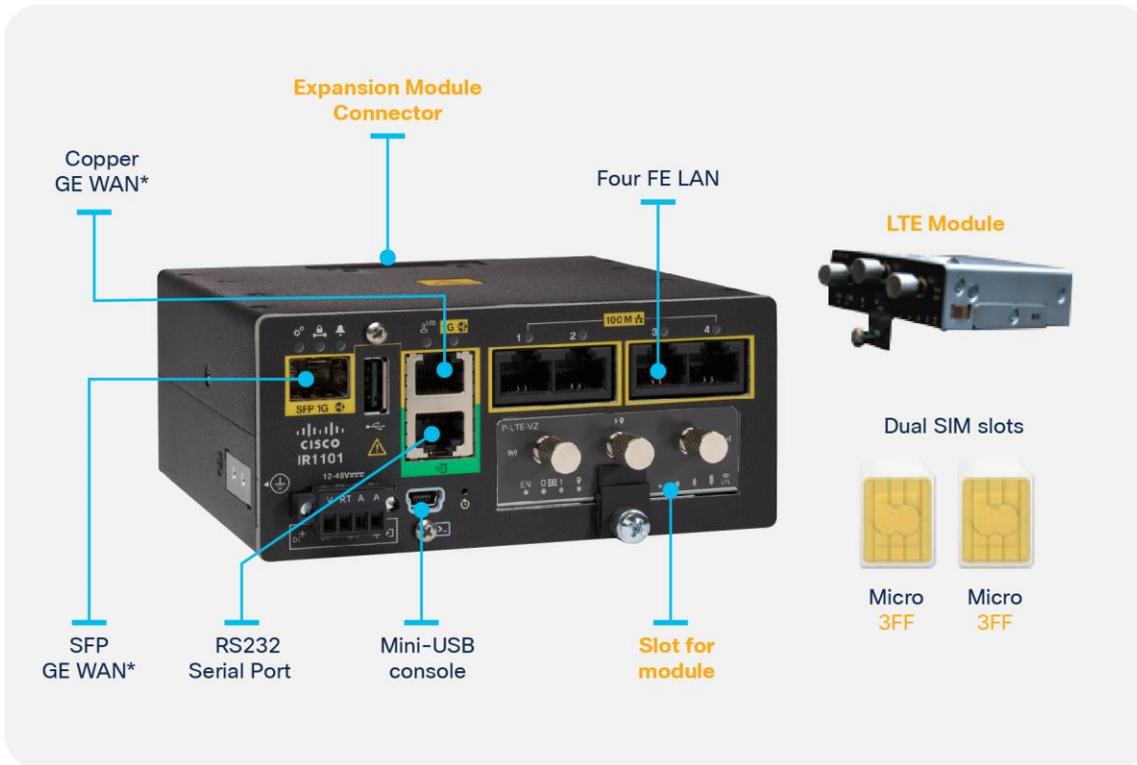


Figure 1.
Cisco IR1101 base platform front view

The IR1101 offers even more flexibility to add or upgrade WAN and storage components through an expansion module.

Expansion modules



Figure 2.
Expansion Modules

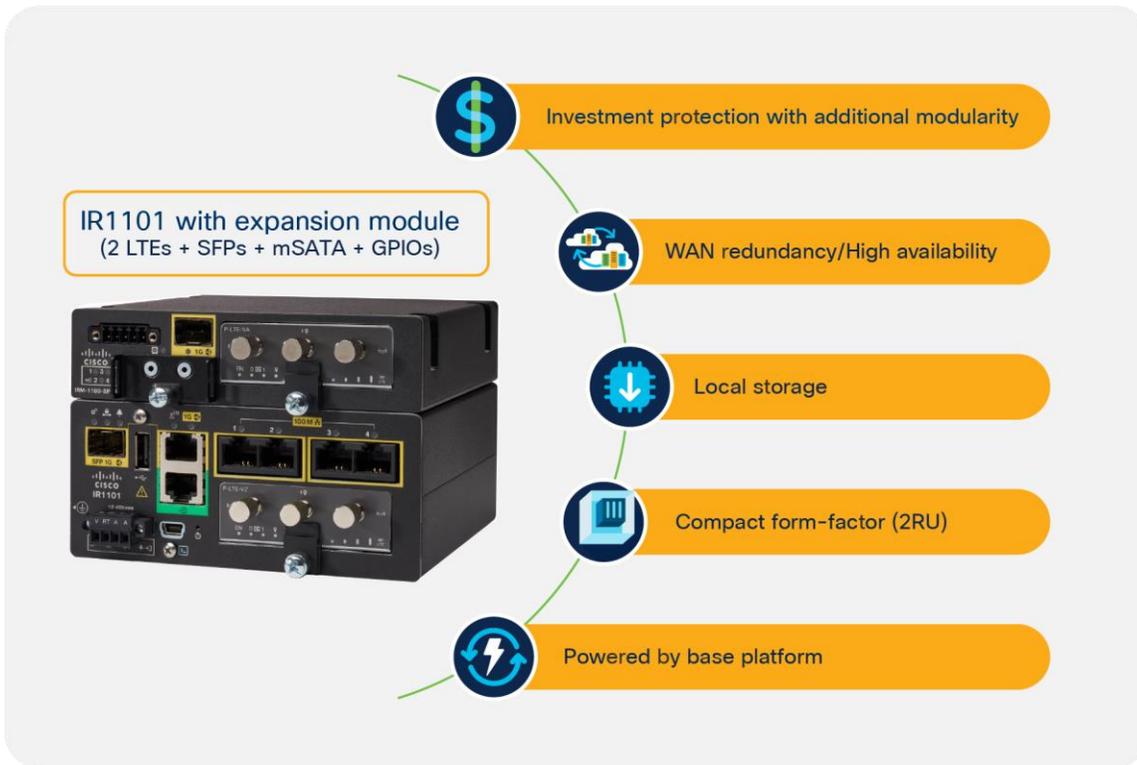


Figure 3. IR1101 with expansion module offering more flexibility

Product overview

The Cisco IR1101 Integrated Services Router Rugged offers a broad range of features for the Internet of Things (IoT).

Table 1. Key features and benefits

Feature	Benefit
	Modularity and investment protection. A single form factor with multiple WAN (LTE, LTE-Advanced, SFP Ethernet) and storage options enable flexibility to add or upgrade modules as technologies evolve.
	Dual active LTE-capable With two LTE modules (LTE and LTE-Advanced with carrier aggregation), the IR1101 enables concurrent connectivity to two cellular networks for WAN redundancy, enhanced data throughputs, load balancing, and differentiated services, making it a highly reliable and high-performance platform.
	Cisco IOS XE Software. IOS XE is a highly secure, standards-based and flexible operating system for a new era of IoT deployment. It's an enterprise-class OS with advanced routing and security.

Feature	Benefit
	<p>Software Defined WAN (SDWAN) capable. For high WAN availability and simplicity for large-scale distributed networks.</p>
	<p>Industrial security. With Cisco Trust Anchor Technology ensuring authenticity of hardware and software, hardware-accelerated Next Generation Encryption and Quantum Computer Resistant algorithms, firewall and VPN services, and alerts and notifications enabling physical and cyber security, the IR1101 offers a multi-layer security for mission-critical deployments.</p>
	<p>Edge computing. Speed up awareness and response to events and conserve network bandwidth by analyzing the most time-sensitive data at the network edge, close to where it is generated. A highly secure, extensible environment for hosting applications ensures authenticity of applications. An optional mSATA SSD field-replaceable unit on the expansion module enables storage of application data for recording and analysis.</p>
	<p>Supervisory Control and Data Acquisition (SCADA). Supports migration of data from legacy control systems in an industrial environment to an IP-based network using DNP3 serial-to-DNP3/IP and IEC 60870 T101-to-T104 protocol translations.</p>
	<p>Smart grid-compliant. Designed for installation in harsh secondary substation environments. Complies with IEEE 1613 and IEC 61850-3 for distribution automation.</p>
	<p>GPS. Location-based services for tracking assets and protecting from theft and intrusion.</p>
	<p>Ease of management. On-premises and cloud-based network management solutions cater to businesses across multiple industry verticals. Tools such as Cisco DNA Center1, Cisco IoT Operations Dashboard, Cisco IoT Field Network Director (FND), Cisco Plug and Play (PnP), and Cisco Prime® simplify deployment and offer the breadth of cross-network management and the depth of multi-layer visibility.</p>
	<p>Multiple Packet Data Network (PDN). Gain connectivity to different Access Point Names (APNs) for traffic segregation over a cellular link. For example, public Internet traffic can be kept separate from mission-critical traffic emerging from the sensors and devices connected to the router.</p>

Feature	Benefit
	<p>4G LTE multiple-bearer QoS. Differentiated treatment of traffic with multiple simultaneous bearers as per 3GPP standards for an enhanced user experience.</p> <p>Multi-bearer QoS depends on the cellular carrier's ability to support the service in their network.</p>
	<p>Network Segmentation. Multi-VRF, VLAN, and VPN enable businesses to configure and maintain more than one instance of a routing and forwarding table within the same customer edge device, enabling dynamic changes in the network with a minimal maintenance window. Service providers can enable this feature to support two or more VPNs with IP addresses that overlap across the VPNs.</p>

¹ Available in the first quarter of calendar year 2020.

Business benefits and application examples

Industrial customers are looking for real-time monitoring and control of industrial assets to help increase operation efficiency.

Utilities

Utilities are seeking the capability to monitor tens of thousands of miles of electric distribution lines or water infrastructure often located in harsh environments over cellular networks to provide remote assets monitoring and reliable and secure SCADA traffic backhauling. In many cases, these are power-constrained and space-constrained environments. Devices that enable this connectivity need to be highly reliable and able to be remotely monitored and configured. They also need to support traditional serial interfaces to interconnect with existing monitoring devices and fiber overlay for long-distance, intra-network connectivity. Needless to say, the device is expected to have a long lifetime to support such a massive scale of deployment.

Oil and gas

Oil and gas companies need to monitor pipeline infrastructure across wide geographic areas and remote locations using 3G and 4G cellular networks to collect data from remote terminal units and securely transport SCADA traffic to a Network Operations Center (NOC).

Transportation

Highways and transportation agencies require reliable, always-on communication between speed cameras, monitoring cameras, ticket terminals, and so on. Wireless devices to support such continuous communication need to support 3G and 4G networks to help ensure good, wide coverage; continuous operation in very harsh environments; compact form factor for deployment in roadside cabinets and ticketing machines; local decision-making for a rapid response time; and serial interfaces to existing traditional devices.

Additional features and benefits

Table 2. Additional features and benefits of the Cisco IR1101

Features	Benefits
IoT enablement	
Lightweight, compact, modular, and ruggedized form factor	Designed for tight installation inside cabinets. All the Input/Output (I/O) ports and connectors are located on the front panel for easy wiring inside cabinets.
No additional power supply for the expansion module	Easily add an expansion module without requiring an additional power input.
Raw socket transport and SCADA	The raw socket can be used to transport SCADA data from RTUs. This method is an alternative to the Block Serial Tunnel (BSTUN) protocol. The Cisco IR1101 also supports DNP3 serial-to-DNP3/IP and IEC 60870 T101-to-IEC 60870 T104 protocol translations, serving as a SCADA gateway.
Multiple mounting options	Floor or wall mounting and DIN rail mounting in horizontal or vertical orientations.
Increased performance to run concurrent services	The multi-core processor architecture allows businesses to take advantage of network-supported speeds.
Multiple WAN and LAN connections	
Four fast Ethernet interfaces	<ul style="list-style-type: none"> • Allows multiple Ethernet devices (sensors, Remote Terminal Unit [RTU], PLCs) in an industrial environment to connect for visibility and management of assets • IEEE 802.1Q VLANs • Layer 3 support through VLAN interfaces • 4KV isolation for Electrostatic Discharge (ESD) protection
WAN diversity	<ul style="list-style-type: none"> • Multiple WAN links for high reliability: Gigabit Ethernet layer 3 SFP (copper and fiber) and 4G LTE provides WAN diversity and business continuity • Gigabit Ethernet WAN interface can be configured for layer 3 routing or layer 2 switching
Dual active LTE interfaces	Concurrent connectivity to two cellular networks for high reliability, load balancing, and differentiated services.
Serial interface	A RS-232 asynchronous serial interface (RJ45 DTE) can be used with raw socket, protocol translation, and connections to locate Remote Terminal Unit (RTU), sensors, and PLCs for SCADA transport and management.
Transparent roaming between wireless networks	
Dual Subscriber-Identity-Module (SIM) over cellular	Provides active and backup connectivity for high reliability over LTE and HSPA networks.
Cisco IOS® mobile IP	<ul style="list-style-type: none"> • Transparent roaming for mobile networks, enabling mission-critical applications to stay connected, even when moving between networks • The assigned IP addresses to the home network are maintained in private and public networks • Supports Proxy Mobile IP (PMIPv6) and Network Mobility (NEMO)
Cellular fallback	Multiple technologies (4G LTE, 3G, and 2G) are available to support connectivity to the best one available. 2G fallback is not supported in North America.

Features	Benefits
Software	
Cisco IOS XE	<p>Designed to enable businesses to deploy services more quickly with lower TCO and complexity.</p> <ul style="list-style-type: none"> • Openness and programmability: Standards-based programmable interfaces enable process and workflow automation. NETCONF, RESTCONF, IETF YANG, Python scripting, and custom libraries enable automation of event-based workflows • Secure: Multi-level, end-to-end security and trust are built in. The built-in Cisco Next Generation Encryption and Quantum Computing Resistant algorithms are expected to meet security and scalability requirements for the next two decades • Modular: Enables patching of software bug fixes and graceful insertion and removal of software modules for ease of maintenance • Common software stack: Reduces business and network complexity while managing an array of Cisco devices

Table 3. Network management solutions

Operational phase	Application	Description
Device staging and configuration for a few routers	Cisco WebUI	A GUI-based device-management tool that simplifies provisioning of devices for a small-scale deployment through easy-to-use wizards.
Deploy, manage, monitor, and maintain IoT gateways and assets at scale	Cisco IoT Field Network Director (FND) for hosting on premises Cisco IoT Operations Dashboard	<ul style="list-style-type: none"> • Rapid scaling - zero-touch deployment and secure enrollment for tens of thousands of gateways • Enhanced security - role-based access and user audit trail and secure communications for data transport across networks, VPN tunnels, geo-fencing, alerts, and notifications for data and physical security • Increased reliability - reliable communications over cellular or Ethernet networks, lifecycle management, and 24/7 real-time monitoring and alerts
Extend your enterprise network to configure, monitor, and manage industrial assets	Cisco Digital Network Architecture (Cisco DNA¹) with APIC-EM Cisco Digital Network Architecture (Cisco DNA) with SDWAN	<ul style="list-style-type: none"> • Cisco DNA offers a network infrastructure that is not only fully programmable and open to third-party innovation, but can also fully and seamlessly integrate the cloud as an infrastructure component • Simplifies and automates processes and workflow by bringing the notion of user-aware and application-aware policies into the foreground of network operations • With Cisco DNA, the network can provide continuous feedback to simplify and optimize network operations • Enables automation of network configuration and APIC-EM is a central part of Cisco Digital Network Architecture. It delivers software-defined networking to extend the enterprise network to harsh industrial and outdoor environments • Single management dashboard for configuration and management of WAN. • Cisco SD-WAN automates application flexibility over multiple connections, such as the Internet, MPLS, and wireless 4G LTE.
Manage devices over a cellular network	Cisco IoT Control Center	Cisco IoT Control Center minimizes the complexity and cost of managing connected devices on a cellular network by taking control with actionable insights. For instance, tracking and managing data usage overages can result in a significant reduction in operational expenses.

Table 4. Embedded management capabilities

Feature	Description
Cisco IOS Embedded Event Manager (EEM)	A distributed and customized approach to event detection and recovery. Provides the ability to monitor events and take corrective or any other desired action when the monitored events, such as a high or low threshold, occur.
Cisco IOS XE IP Service-Level Agreements (IP SLA)	Helps assure the performance of new, business-critical IP applications as well as IP services by actively monitoring and reliably reporting traffic statistics such as jitter, response time, packet loss, and connectivity.
Simple Network Management Protocol (SNMP), Syslog, NetFlow	Open-standards-based network monitoring and accounting tools, such as SNMP for 3G and 4G MIB, provide a common management platform for many different devices.
LTE network management and diagnostics	A dedicated diagnostic port on a cellular module enables logging of data during debugging sessions that can be analyzed by industry-standard tools such as Qualcomm CDMA Air Interface Tester (CAIT) and Spirent Universal Diagnostic Monitor (UDM).

Product specifications

Table 5. Cisco IOS XE Software Features on the IR1101

Feature	Description
Cisco IOS Software requirements	<ul style="list-style-type: none"> • Cisco IOS XE Software: Universal Cisco IOS Software image • Cisco IOS XE Software Release 16.10.1 or later
IPv4 and IPv6 services features	<ul style="list-style-type: none"> • Routing Information Protocol Versions 1 and 2 (RIPv1 and RIPv2) • Generic Routing Encapsulation (GRE) and Multipoint GRE (MGRE) • Standard 802.1d Spanning Tree Protocol (STP) • Network Address Translation (NAT) • Dynamic Host Configuration Protocol (DHCP) server, relay, and client • Dynamic DNS (DDNS) • DNS proxy • DNS spoofing • Access Control Lists (ACLs) • IPv4 and IPv6 multicast • IP Service-Level Agreement (IP SLA) • Open Shortest Path First (OSPFv2 and OSPFv3) • Border Gateway Protocol (BGP) • Enhanced Interior Gateway Routing Protocol (EIGRP) • Virtual Route Forwarding (VRF) Lite • Next-Hop Resolution Protocol (NHRP) • Serial data encapsulation and relay • L2TPv3 over sub-interfaces and VLAN

Feature	Description
Security features	<p>Secure connectivity</p> <ul style="list-style-type: none"> • Secure Sockets Layer (SSL) VPN for secure remote access • Hardware-accelerated encryption with minimal impact to system performance • Next Generation Encryption (NGE) and Quantum Computing Resistant (QCR) algorithms such as AES-256, SHA-384, and SHA-512 • Public-Key-Infrastructure (PKI) support • 20 IPsec tunnels • Cisco Easy VPN Solution client and server • NAT transparency • Dynamic Multipoint VPN (DMVPN) • Tunnel-less Group Encrypted Transport VPN • Flex VPN • IPsec stateful failover • VRF-aware IPsec • IPsec over IPv6 <p>Cisco IOS Firewall</p> <ul style="list-style-type: none"> • Zone-based policy firewall • VRF-aware stateful inspection routing firewall • Stateful inspection transparent firewall • Advanced application inspection and control • Secure HTTP (HTTPS), FTP, and Telnet Authentication Proxy • Dynamic and static port security • Firewall stateful failover • VRF-aware firewall <p>Integrated Threat Control</p> <ul style="list-style-type: none"> • Control-Plane Policing (CoPP) • Flexible packet matching • Network foundation protection
QoS features	<ul style="list-style-type: none"> • Provides LTE QoS with support for up to 8 concurrent bearers on each cellular WAN interface for traffic classification and prioritization • Provides traffic precedence to delay-sensitive and mission-critical services • Facilitates low-latency routing of delay-sensitive industrial applications • Supported on all LAN and WAN interfaces, including cellular • Low Latency Queuing (LLQ) • Weighted Fair Queuing (WFQ) • Class-Based WFQ (CBWFQ) • Class-Based Traffic Shaping (CBTS) • Class-Based Traffic Policing (CBTP) • Policy-Based Routing (PBR) • Class-Based QoS MIB • Class of Service (CoS) to Differentiated Services Code Point (DSCP) mapping • Class-Based Weighted Random Early Detection (CBWRED) • Resource Reservation Protocol (RSVP) • Real-Time Transport Protocol (RTP) header compression (cRTP) • Differentiated Services (DiffServ)

Feature	Description
	<ul style="list-style-type: none"> • QoS pre-classify and pre-fragmentation • Hierarchical QoS (HQoS)
High-availability features	<ul style="list-style-type: none"> • Dual active LTE backhaul with expansion module • Virtual Router Redundancy Protocol (VRRP) (RFC 2338) • Hot Standby Router Protocol (HSRP) • Dual SIM support on the LTE module for cellular failover
IPv6 features	<ul style="list-style-type: none"> • IPv6 addressing architecture • IPv6 unicast and multicast forwarding • IPv6 ACLs • IPv6 over cellular • IPv6 routing • IPv6 domain name resolution

Software licensing

The IR1101 offers two technology packages – Network Essentials and Network Advantage. The Network Essential license offers the essential elements of routing and security necessary for typical IoT deployments. The Network Advantage license enables advanced features, including Multiprotocol Label Switching (MPLS) for a highly scalable and cost-effective solution; mobile IP for seamless migration between networks; and application-aware QoS policies for built-in intelligence.

A single Cisco IOS XE universal image encompassing all functions gets delivered with the product. Software feature licenses are pre-installed in the factory depending on the selection made at the time of purchase, thereby simplifying software delivery and decreasing operational costs of the deployment. Licenses can be upgraded after deployment by going through the Cisco [Smart License activation process](#).

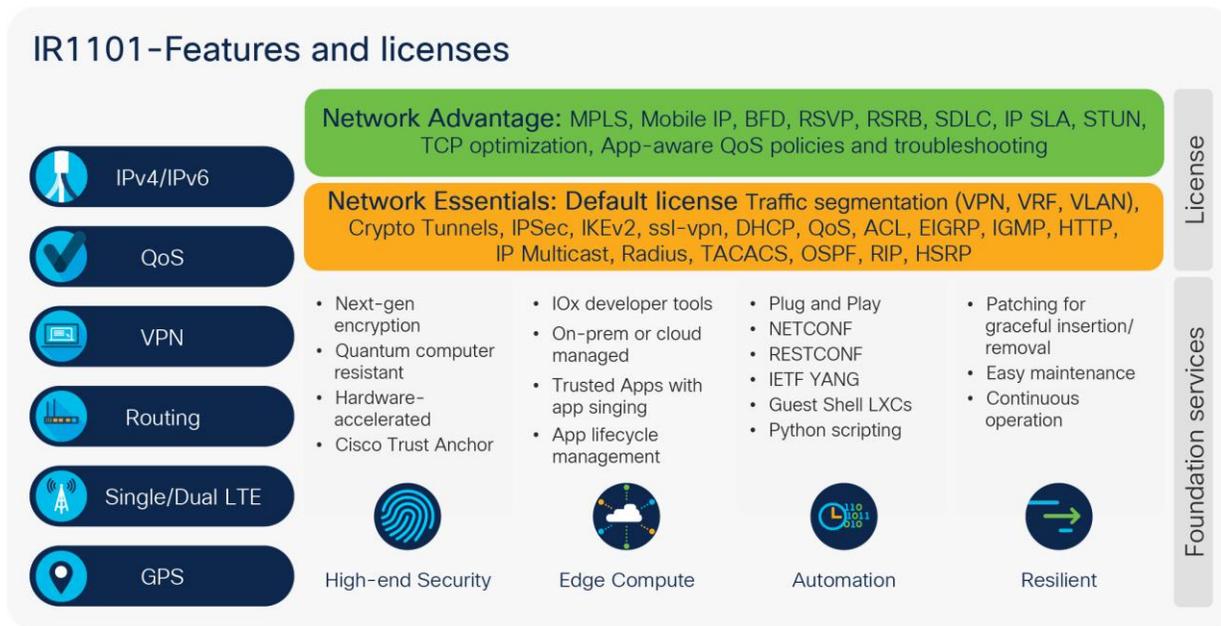


Figure 4. Cisco IOS XE software features and benefits

Table 6. System specifications for Cisco IR1101 Integrated Services Router Rugged

Feature	Specification
Memory	
Default and maximum DRAM	4 GB
Default and maximum Flash memory	8 GB (physical) / 4 GB (usable)
Ingress protection rating	IP30
Physical characteristics	
Physical dimensions (H x W x D)	2.36 in. x 5.22 in. x 4.92 in. (60 x 132.5 x 124.9 mm)
Chassis	1.3 in. x 5.2 in. x 4.9 in. (33 x 132 x 124 mm)
Expansion Module	
Weight	2.25 lbs (1.02 kg)
Chassis	1.65 lbs (0.75 kg)
Expansion Module	1.45 lbs (0.66 kg)
IRM-1100-SPMI:	
IRM-1100-SP:	
Mounting options	Panel, wall, and din rail (vertical and horizontal) mount
Power specifications	Nominal voltage: +/-12V to +/-48V DC Minimum and maximum input voltage: 9.6-60V DC Maximum and minimum input current: 1.24A (9.6V DC) and 0.26A (60V DC)
Power consumption	At idle: 6.6W Typical: 9.8W Maximum: 12W Additional 10W (typical) with expansion module and 2 nd cellular
Interfaces on the base platform	
Console	Mini type-B USB
WAN interfaces	<ul style="list-style-type: none"> • Combo 10/100/1000 Gigabit Ethernet port (RJ45 and SFP) on the base platform • An additional 10/100/1000 Gigabit Ethernet SFP on the expansion module. Refer to Table 8 for supported SFPs • LTE: Modular with options for single and dual active LTE and LTE-Advanced
LAN interfaces	<ul style="list-style-type: none"> • Four 10/100BASE-T Fast Ethernet ports
Input and output	<ul style="list-style-type: none"> • ALARM input port

Feature	Specification
LEDs	<ul style="list-style-type: none"> • System OK • Link for Ethernet WAN ports • VPN • Tricolor user-configurable LED • ALARM
Serial interface	<ul style="list-style-type: none"> • Isolated RS-232 RJ45 DTE port • Support for asynchronous mode with speeds up to 115,200 baud
Serial protocols	SCADA, DNP3, T101-104, Raw Socket TCP, and UDP
Environmental characteristics	
Environmental operating temperature range	<p>-40 to 140° F (-40 to 60° C) in a sealed NEMA cabinet with no airflow</p> <p>-40 to 158° F (-40 to 70° C) in a vented cabinet with 40 Linear Feet per Minute (LFM) of air</p> <p>-40 to 167° F (-40 to 75° C) in a forced air enclosure with 200 LFM of air</p> <p>Type tested at 85° C for 16 hours</p>
Operating altitude	40° C up to 13,800 ft (operating) per IEC 68-2-41
Non-operating shock and vibration	<ul style="list-style-type: none"> • 50-60G (3.76 m/s minimum) • 3-500Hz at 1.12 GRMS (BP at 10 and 100 Hz)
Standard safety certifications	<ul style="list-style-type: none"> • UL 60950-1, 2nd edition • CAN/CSA C22.2 No. 60950-1, 2nd edition • EN 60950-1, 2nd edition • CB to IEC 60950-1, 2nd edition with all group differences and national deviations
Hazardous locations standards	<ul style="list-style-type: none"> • ANSI/ISA 12.12.01 (Class 1, Div 2 A-D) • CSA 213 (Class 1, Div 2 A-D) • IEC 60079-0 and -15 IECEx test report (Class I, Zone 2, gas groups IIC) • EN 60079-0 and -15 ATEX certification (Class I, Zone 2, gas groups IIC)
Industry standards	<p>Public Safety:</p> <ul style="list-style-type: none"> • FirstNet Ready™ <p>Smart Grid:</p> <ul style="list-style-type: none"> • IEC 61850-3 • IEEE 1613 <p>Security:</p> <ul style="list-style-type: none"> • FIPS 140-2 • Common Criteria <p>Department of Defense</p> <ul style="list-style-type: none"> • DoDIN APL <p>IPv6</p> <ul style="list-style-type: none"> • USGv6

Feature	Specification
EMC emissions CLASS A	<ul style="list-style-type: none"> • 47 CFR Part 15 B • EN 55032:2015 • CISPR 32 Edition 2 • CNS13438: 2006 • EN 300 386 V1.6.1 • ICES-003 Issue 6: 2016 • KN 32: 2015 • TCVN 7189: 2009 • V-2/2015.04 • V-3/2015.04 • AS/NZ CISPR32
EMC immunity	<ul style="list-style-type: none"> • EN 61000-4-2, 3, 4, 5, 6, 8, 9, 16, 17, 18, and 29 • CISPR24: 2010 + A1: 2015 • EN 300 386 V1.6.1 • EN 55024: 2010 + A1: 2015 • EN 55035:2017 • KN35: 2015 • TCVN 7317:2003 • QCVN 18:2014

Cellular modules

Table 7. LTE (3GPP Category 4) modules available with the IR1101

Region theaters	P-LTE-MNA	P-LTE-VZ	P-LTE-US	P-LTE-GB
LTE bands	LTE bands 2,4,5,12,13,14,17,66 FDD LTE 1700 MHz and 2100 MHz (band 66 Ext AWS), 700 Mhz (band 17, 14, 13,12), 850 Mhz (band 5 CLR), 1700 MHz and 2100 MHz (band 4 AWS), 1900 Mhz (band 2)	LTE bands 4, 13 FDD LTE 700 MHz (band 13), 1700 MHz and 2100 MHz (band 4 AWS)	LTE bands 2, 4, 5, 12 FDD LTE 700 MHz (band 17), 700 MHz (band 12), 850 MHz (band 5 CLR), 1700 MHz and 2100 MHz (band 4 AWS)	LTE bands 1, 3, 7, 8, 20, 28 FDD LTE 700 MHz (band 28), 800 MHz (band 20), 900 MHz (band 8), 1800 MHz (band 3), 2100 MHz (band 1), and 2600 MHz (band 7)
Backward compatibility	UMTS, HSPA+ (band 2,4,5)	-	HSPA+ (band 2, 4, 5)	UMTS, HSPA+ (band 1, 8), EDGE, GSM, GPRS (900/1800)
Theoretical download and upload speeds³	150 and 50 Mbps	150 and 50 Mbps	150 and 50 Mbps	150 and 50 Mbps
United States	Multicarrier (AT&T and Verizon)	Verizon	AT&T	-
Europe	-	-	-	Yes
Band 14	Yes	-	-	-

Region theaters	P-LTE-MNA	P-LTE-VZ	P-LTE-US	P-LTE-GB
FirstNet Ready™	Approved by AT&T FirstNet	-	-	-

Table 8. LTE (3GPP Category 4) modules available with the IR1101

Region theaters	P-LTE-IN	P-LTE-JN
LTE bands	LTE bands 1, 3, 5, 8, 40, 41* FDD LTE 2100 MHz (band 1), 1800MHz (band 3), 850MHz (band 5) , 900MHz (band 8) TDD LTE 2300 MHz (band 40), 2500MHz (band 41). *B41 supported frequency range: (2535-2655 MHz)	LTE bands 1, 3, 8, 11, 18, 19, 21 FDD LTE 2100 MHz (band 1), 1800MHz (band 3), 900MHz (band 8), 1500MHz (band 11), 850MHz (band 18 and band 19), 1500MHz (band 21)
Backward compatibility	HSPA+, UMTS (band 1, 8)	HSPA+, UMTS (band 1, 6, 19)
Theoretical download and upload speeds³	150 and 50 Mbps	150 and 50 Mbps
India	Yes	-
Japan	-	Yes (NTT Docomo, KDDI, Softbank)

Table 9. LTE Advanced (3GPP Category 6) modules available with the IR1101

Region theaters	P-LTEA-EA	P-LTEA-LA
LTE bands	LTE bands 1-5, 7, 8, 12, 13, 20, 25, 26, 29, 30, and 41 FDD LTE 700 MHz (band 12), 700 MHz (band 29), 800 MHz (band 20), 850 MHz (band 5 CLR), 850 MHz (band 26 Low), 900 MHz (band 8), 1800 MHz (band 3), 1900 MHz (band 2), 1900 MHz (PCS band 25), 1700 MHz and 2100 MHz (band 4 AWS), 2100 MHz (band 1), 2300 MHz (band 30), or 2600 MHz (band 7) TDD LTE 2500 MHz (band 41) Carrier aggregation band combinations: 1+8; 2+(2,5,12,13,29); 3+(7,20); 4+(4,5,12,13,29); 7+(7,20); 12+30, 5+30, and 41+41	LTE bands 1, 3, 5, 7, 8, 18, 19, 21, 28, 38, 39, 40, and 41 FDD LTE 700 MHz (band 28), 850 MHz (band 5 CLR), 850 MHz (bands 18 and 19 Low), 900 MHz (band 8), 1500 MHz (band 21), 1800 MHz (band 3), 2100 MHz (band 1), or 2600 MHz (band 7) TDD LTE 1900 MHz (band 39), 2300 MHz (band 40), 2500 MHz (band 41), or 2600 MHz (band 38) Carrier aggregation band combinations: 1+(8,18,19,21); 3+(5,7,19,28); 7+(5,7,28); 19+21, 38+38, 39+39,40+40, and 41+41
Theoretical download and upload speeds³	300 and 50 Mbps	300 and 50 Mbps
United States	Verizon, AT&T	-
Europe	-	-
Canada	Yes	

Region theaters	P-LTEA-EA	P-LTEA-LA
Australia and New Zealand	-	Yes (Approved by Telstra)
Japan	-	Yes (NTT Docomo, KDDI, Softbank)
India, Singapore, Malaysia, Thailand		Yes
United Arab Emirates	Yes	

Table 10. LTE Advanced Pro (3GPP Category 18) module available with the IR1101

Region theaters	P-LTEAP18-GL ²
LTE bands	LTE bands 1-5, 7, 8, 12-14, 17, 18-20, 25, 26, 28-30, 32, 38-43, 46, 48, 66, and 71. FDD LTE 600 MHz (band 71), 700 MHz (bands 12, 13, 14, 17, 28, and 29), 800 MHz (band 20), 850 MHz (bands 5, 18, 19, and 26), 900 MHz (band 8), 1500 MHz (band 32), 1700 MHz (bands 4 and 66), 1800 MHz (band 3), 1900 MHz (bands 2 and 25), 2100 MHz (band 1), 2300 MHz (band 30), 2600 MHz (band 7). TDD LTE 1900 MHz (band 39), 2300 MHz (band 40), 2500 MHz (band 41), 2600 MHz (band 38), 3500 MHz (bands 42 and 48), 3700 MHz (band 43), 5200 MHz (band 46).
Theoretical download and upload speeds ²	1.2 Gbps/200 Mbps
United States	Multicarrier (AT&T and Verizon)
Europe	Yes
Canada	Yes
Australia	Yes
Japan	Yes
Band 14	Yes
FirstNet Certification	Completed
Band 48 (CBRS)	Yes

Cisco Small Form-Factor Pluggable (SFPs) modules

The IR1101 Ethernet SFP module provides connections to other devices. These field-replaceable transceiver modules provide the uplink interfaces. Local connectors provide the fiber-optic connection. RJ-45 connectors allow for copper connections.

Table 11. Supported SFP modules

GE SFP	Distance	Fiber	Classification
GLC-SX-MM-RGD	220-550 m	MMF	Industrial (-40C to +85C)
GLC-LX-SM-RGD	550m / 10 km	MMF / SMF	Industrial (-40C to +85C)
GLC-ZX-SM-RGD	70 km	SMF	Industrial (-40C to +85C)
GLC-SX-MMD	220-550m	MMF	Extended (-5C to +85C)
GLC-LH-SMD	550m / 10 km	MMF/SMF	Extended (-5C to +85C)
GLC-ZX-SMD	70 km	SMF	Extended (-5C to +85C)
GLC-BX-U	10 km	SMF	Commercial (0C to +70C)
GLC-BX-D	10 km	SMF	Commercial (0C to +70C)
GLC-LH-MMD	550m / 10km	MMF/SMF	Extended (-5C to +85C)
GLC-EX-SMD	40 km	SMF	Extended (-5C to +85C)
GLC-FE-100FX-RGD	2 km	MMF	Industrial (-40C to +85C)
GLC-FE-100LX-RGD	10 km	SMF	Industrial (-40C to +85C)
GLC-FE-100FX	2 km	MMF	Commercial (0C to +70C)
GLC-FE-100LX	10 km	SMF	Commercial (0C to +70C)
GLC-FE-100EX	40 km	SMF	Commercial (0C to +70C)
GLC-FE-100ZX	80 km	SMF	Commercial (0C to +70C)
GLC-FE-100BX-U	10 km	SMF	Commercial (0C to +70C)
GLC-FE-100BX-D	10 km	SMF	Commercial (0C to +70C)
GLC-TE	100m	NA (RJ45)	Extended (-5C to +85C)

Note: The IR1101 is designed to operate in the industrial temperature range (-40C to +85C internal component temperature range) and therefore, using a non-industrial or commercial-rated SFP modules could bring down the temperature profile of the system.

Ordering information

The IR1101 is a Smart License-enabled product. Cisco Smart Accounts and Virtual Accounts are required to order the product. For more information how to order the IR1101 and Cisco Smart Accounts, visit the [Cisco Smart Account user guide](#).

Table 12. Ordering information for Cisco IR1101 integrated Services Router Rugged

Hardware	Description
IR1101-K9	Cisco IR1101 Integrated Services Router Rugged with SL-IR1101-NE software license
IR1101-A-K9	Cisco IR1101 Integrated Services Router Rugged with SL-IR1101-NA software license

Management	SKU	Description
Cisco IoT Field Network Director (FND) for hosting on premises	IOTFND-SOFTWARE-K9	FND Top Level Subscription
	IOTFND-IR1100	IoT FND License for Managing IR1101 Router
Cisco IoT Operations Dashboard	IR1101-IOTOC	IR1101 and IoT Operations Dashboard bundle
Cisco Digital Network Architecture (Cisco DNA) with SDWAN for cloud or on premises hosting	IR1101-K9-DNA	Cisco IR1101 Integrated Services Router Rugged with Cisco DNA Essentials subscription for SDWAN
	IR1101-A-K9-DNA	Cisco IR1101 Integrated Services Router Rugged with Cisco DNA Advantage subscription for SDWAN

FirstNet Bundle	Hardware PID	Cloud manager (subscription PID)
IR1101	IR1101-A-K9	KIN-ESS-CLD-C
	IR1101-K9	KIN-ESS-CLD-C

FirstNet Ready™ LTE Module	Description	RF band information
P-LTE-MNA	3GPP Category 4 LTE supporting AT&T commercial, FirstNet™ and Verizon networks in the U.S	<p>LTE bands: 2,4,5,12,13,14,17,66</p> <p>FDD LTE 1700 MHz and 2100 Mhz (band 66 Ext AWS), 700 Mhz (band 17, 14, 13,12), 850 Mhz (band 5 CLR), 1700 MHz and 2100 MHz (band 4 AWS), 1900 Mhz (band 2)</p> <p>UMTS, HSPA+ bands: 2,4, 5</p>

FND Ordering Guide: <https://www.cisco.com/c/dam/en/us/products/collateral/se/internet-of-things/fnd-ordering-guide.pdf>

Expansion Module	Description
IRM-1100-SPMI	Expansion module for dual active LTE, local storage for applications, SFP and input/output ports
IRM-1100-SP	Expansion module for dual active LTE and SFP

Software license	Description
SL-IR1101-NE	Network Essentials for core routing and security features
SL-IR1101-NA	Network Advantage for advanced routing and app-based policy management
SL-IR1101-NE-NPE	Network Essentials tied for No Payload Encryption software
SL-IR1101-NA-NPE	Network Advantage for No Payload Encryption software

Cellular module	Description
P-LTEAP18-GL(=)	Category 18 LTE module for North America, Europe and Asia Pacific
P-LTEA-EA(=)	Category 6 LTE module for North America, Europe and Middle East
P-LTEA-LA(=)	Category 6 LTE module for Asia Pacific and Latin America
P-LTE-MNA(=)	Category 4 LTE module for AT&T, FirstNet™ Ready and Verizon, US
P-LTE-US(=)	Category 4 LTE module for AT&T, U.S
P-LTE-VZ(=)	Category 4 LTE module for Verizon, U.S
P-LTE-GB(=)	Category 4 LTE module for Europe
P-LTE-IN(=)	Category 4 LTE module for India
P-LTE-JN(=)	Category 4 LTE module for Japan

Mounting	Description
IR1101-DINRAIL(=)	Din-rail clip for vertical or horizontal mounting
IR1101-WALLMNT(=)	Wall-mount kit
IRM-1100-DINRAIL(=)	Din-rail kit for Expansion Module

Power supply	Description
PWR-IE50W-AC-L=	AC power adapter for 110/220V AC and 88-300V DC input (temperature profile: -40C to 60C)
PWR-IE50W-AC=	Expansion power module: Input AC 100-240V/1.25A or DC 125-250V/1A, Output DC 24V/2.1A, DIN-Rail Mount.
PWR-IE50W-AC-IEC=	Power Module supporting input AC 100-240V/1.25A 50-60Hz, Output DC 24V/2.1A, IEC Plug, DIN-Rail Mount

Antenna and lightning arrestors	Description
Refer to the Cisco Antenna and Options Guide	
Note: Antennas and other accessories are not included automatically with the IR1101.	

Warranty coverage and technical service options

The IR1101 comes with the Cisco 5-year limited hardware warranty. Adding a contract for a technical service offering, such as Cisco SMARTnet® Service, provides benefits not available with the warranty, including access to OS updates, Cisco.com online resources, and Cisco Technical Assistance Center (TAC) support services. Table 10 shows the available technical services.

Find more information about [Cisco product warranties](#).

Learn more about [Cisco Technical Services](#).

Table 13. Cisco technical services for the Cisco IR1101

Technical Services
<p>Cisco SMARTnet Service</p> <ul style="list-style-type: none"> • Global access to the Cisco TAC 24 hours daily • Unrestricted access to the extensive Cisco.com resources, communities, and tools • Next-Business-Day (NBD), 8 x 5 x 4, 24 x 7 x 4, and 24 x 7 x 2 advance hardware replacement and onsite parts replacement and installation available⁵ • Ongoing operating system software updates within the licensed feature set⁶ • Proactive diagnostics and real-time alerts on Cisco Smart Call Home-enabled devices
<p>Cisco Smart Foundation Service</p> <ul style="list-style-type: none"> • NBD advance hardware replacement, as available • Business-hours access to Small and Medium-sized Business (SMB) Cisco TAC (access levels vary by region) • Access to Cisco.com SMB knowledge base • Online technical resources through the Cisco Smart Foundation portal • OS software bug fixes and patches

Cisco environmental sustainability

Information about Cisco’s environmental sustainability policies and initiatives for our products, solutions, operations, and extended operations or supply chain is provided in the “Environment Sustainability” section of Cisco’s [Corporate Social Responsibility](#) (CSR) Report.

Reference links to information about key environmental sustainability topics (mentioned in the “Environment Sustainability” section of the CSR Report) are provided in the following table:

Sustainability Topic	Reference
Information on product-material-content laws and regulations	Materials
Information on electronic waste laws and regulations, including products, batteries and packaging	WEEE Compliance

Reference links to product-specific environmental sustainability information that is mentioned in relevant sections of this data sheet are provided in the following table:

Sustainability Topic	Reference
Power	
Power specifications and consumption	Table 6: System Specifications for Cisco IR1101 Integrated Services Router Rugged
Environmental Characteristics	
Operating temperature, industry standards, EMC emissions	Table 6: System Specifications for Cisco IR1101 Integrated Services Router Rugged
Material	
Unit Weight	Table 6: System Specifications for Cisco IR1101 Integrated Services Router Rugged

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Cisco Capital

Flexible payment solutions to help you achieve your objectives

Cisco Capital makes it easier to get the right technology to achieve your objectives, enable business transformation and help you stay competitive. We can help you reduce the total cost of ownership, conserve capital, and accelerate growth. In more than 100 countries, our flexible payment solutions can help you acquire hardware, software, services and complementary third-party equipment in easy, predictable payments. [Learn more.](#)

For more information

For more information about the Cisco IR1101 Integrated Services Router Rugged, visit <https://www.cisco.com/go/ir1101> or contact your local Cisco account representative.

Footnotes and Document history

¹ DNAC for PnP/SWIM will be available in 1H 2021.

² P-LTEAP18-GL can only be used in the main IR1101 chassis. It is not supported on the IR1101 expansion modules.

² P-LTEAP18-GL does not support GPS.

² P-LTEAP18-GL: Conforms to IEC 61850 reliability Class 1.

² P-LTEAP18-GL: Throughput degradation may be observed at high temperature. Uplink communication range may be temporarily reduced at the highest temperatures supported.

³ Throughput degradation may be observed at a high temperature.

⁴ FirstNet certification is in progress.

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

⁶ Cisco OS updates include maintenance releases, minor updates, and major updates in the licensed feature set.

New or Revised Topic	Described in	Date
Added new certifications	Table 6	May, 2020
Added new LTE Pluggables: P-LTEAP18-GL, P-LTE-IN and P-LTE-JN	Table 7 and Table 10	
Added information on FirstNet approval	Product highlights , Table 6 , Table 7 and Table 12	September, 2020

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Cisco 4000 Family Integrated Services Router

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Cisco® 4000 Family Integrated Services Routers (ISRs) form an Software Defined WAN platform that delivers the performance, security, and convergence capabilities that today's branch offices need.

Product Overview

The Cisco 4000 Family Integrated Services Router (ISR) revolutionizes WAN communications in the enterprise branch. With new levels of built-in intelligent network capabilities and convergence, it specifically addresses the growing need for application-aware networking in distributed enterprise sites. These locations tend to have lean IT resources. But they often also have a growing need for direct communication with both private data centers and public clouds across diverse links, including Multiprotocol Label Switching (MPLS) VPNs and the Internet.

The Cisco 4000 Family contains the following platforms: the 4461, 4451, 4431, 4351, 4331, 4321 and 4221 ISRs.



Figure 1.
Cisco 4000 Series Integrated Services Routers

Features and Benefits

Cisco 4000 Family ISRs provide you with Cisco® Software Defined WAN (SDWAN) software features and a converged branch infrastructure. Along with superior throughput, these capabilities form the building blocks of next-generation branch-office WAN solutions.

Cisco Software Defined WAN

Cisco SDWAN is a set of intelligent software services that allow you to reliably and securely connect users, devices, and branch office locations across a diverse set of WAN transport links. SDWAN-enabled routers like the ISR 4000 dynamically route traffic across the "best" link based on up-to-the-minute application and network conditions for great application experiences. You get tight control over application performance, bandwidth usage, data privacy, and availability of your WAN links - control that you need as your branches conduct greater volumes of mission-critical business.

Cisco Converged Branch Infrastructure

The Cisco 4000 Series ISRs consolidate many must-have IT functions, including network, compute, and storage resources. The high-performance, integrated routers run multiple concurrent services, including encryption, traffic management, and WAN optimization, without slowing your data throughput. And you can activate new services on demand through a simple licensing change.

Cisco Intent Based Networking and Digital Network Architecture (Cisco DNA)

The last few years has seen a rapid transformation and adoption of digital technologies. This puts pressure on the on the Network teams supporting this changing infrastructure - especially when provisioning, managing, monitoring and troubleshooting these diverse devices. Additionally innovations such as Software Defined WAN (SDWAN), Network Function Virtualization (NFV), Open APIs and Cloud Management show great promise in transforming Organizations IT networks. This transformation raises further questions and challenges for the IT teams.

The Cisco Digital Network Architecture (Cisco DNA) is an open, extensible, software-driven architecture that provides for faster innovation, helping to generate deeper insights, and deliver exceptional experiences across many different applications. Cisco DNA relies on intent-based networking, a revolutionary approach in networking that helps organizations automate, simplify, and secure the network.

The intent-based Cisco DNA network is:

- **Informed by Context:** Interprets every byte of data that flows across it, resulting in better security, more customized experiences, and faster operations.
- **Powered by Intent:** Translates your intent into the right network configuration, making it possible to manage and provision multiple devices and things in minutes.
- **Driven by Intuition:** Continually learns from the massive amounts of data flowing through it and turns that data into actionable insight. Helps you solve issues before they become problems and learn from every incident.

Cisco DNA Center provides a centralized management dashboard across your entire network — the branch, campus, data center, and cloud. Rather than relying on box-by-box management, you can design, provision, and set policy end-to-end from the single Cisco DNA Center interface. This allows you to respond to organizational needs faster and to simplify day-to-day operations. Cisco DNA Analytics and Assurance and Cisco Network Data Platform (NDP) help you get the most from your network by continuously collecting and putting insights into action. Cisco DNA is open, extensible, and programmable at every layer. It integrates Cisco and third-party technology, open APIs, and a developer platform, to support a rich ecosystem of network-enabled applications.

Table 1 breaks out many of the features and benefits of the Cisco 4000 Family that create a Software Define WAN (SDWAN) and a converged branch infrastructure.

Table 1. Cisco 4000 Family ISR General Feature Highlights

Business Requirement(s)	Feature/Solution
Performance <ul style="list-style-type: none"> • Throughput • Service reliability 	<ul style="list-style-type: none"> • Concurrent software services at speeds up to 2 Gbps. Backplane architecture supports high-bandwidth module-to-module communication at speeds up to 10 Gbps. • A distributed multicore architecture with the industry's first internal services plane. • Remote installation of application-aware services, which run identically to their counterparts in dedicated appliances.
Lower WAN expenditures	<ul style="list-style-type: none"> • Embedded SDWAN solution for creating lower-cost, business-class Internet connections.
Pay-as-you-grow <ul style="list-style-type: none"> • Performance upgrade model • Investment protection • CapEx budget management 	<ul style="list-style-type: none"> • Router capacity can be increased with a remote performance-on-demand license upgrade (no hardware upgrade) for exceptional savings.
Superior and secure user application experiences	<ul style="list-style-type: none"> • ISR-AX "Application Experience" software bundle with advanced routing and network monitoring services. • Dynamic Multipoint VPN (DMVPN), zone-based firewalls, Intrusion Prevention (Snort & Umbrella Branch) and Content Management using Cisco Cloud Web security & OpenDNS protecting data,

Business Requirement(s)	Feature/Solution
	<ul style="list-style-type: none"> providing authentication credentials, and transmissions not backhauled through the data center. Secure boot feature performs hardware-based authentication of the bootloader software to prevent malicious or unintended software from booting on the system. Code signing verifies digital signatures of executables prior to loading to prevent execution of altered or corrupted code. Hardware authentication protects against hardware counterfeiting by using an on-board tamper-proof silicon, including field replaceable modules. If authentication fails, the module is not allowed to boot.
IT consolidation, space savings, and improved Total Cost of Ownership (TCO)	<ul style="list-style-type: none"> Single converged branch platform integrates routing, switching, virtual server, storage, security, unified communications, WAN optimization, and performance management tools.
Business continuity and increased resiliency	<ul style="list-style-type: none"> ISR 4400 Series models (4461, 4451, and 4431 ISRs) support dual integrated power supplies for backup. The entire ISR 4,000 Family supports optional power supply capable of delivering additional PoE power to endpoints. Modular network interfaces with diverse connection options for load-balancing and network resiliency. Modular interfaces with online removal and insertion (OIR) for module upgrades without network disruption. Cisco Unified Survivable Remote Site Telephony (SRST), which serves as a resiliency complement to Cisco Hosted Collaboration Solution (HCS), a Cisco cloud-based UC service. Support for multiple, diverse access links: T1/E1, T3/E3, Serial, xDSL, Gigabit and Ten-Gigabit Ethernet.
Lower telephony costs with VoIP and rich media experiences	<ul style="list-style-type: none"> High-performance analog/digital gateway, allowing VoIP over less expensive Session Initiation Protocol (SIP) trunks. Integrated IP PBX (Cisco Unified Communications Express) and Session Border Controller (Cisco Unified Border Element, or CUBE).
Easier manageability and support	<ul style="list-style-type: none"> Single, universal software image for all features and performance-on-demand licensing flexibility. No additional services and support needed for compute and storage. Supported by Cisco and third-party management tools, with programmability and automation.

Platform Architecture

Table 2 lists the primary hardware architectural features and benefits of the Cisco 4000 Family. The routers run modular Cisco IOS XE Software, widely deployed in the world's most demanding networks. The software's comprehensive portfolio of services spans multiple technology areas, including security, WAN optimization, app and network Quality of Service (QoS), and embedded management.

Table 2. Architectural Highlights

Architectural Features	Benefits/Description
Multicore processors	<ul style="list-style-type: none"> High-performance multicore processors support high-speed WAN connections. The data plane uses an emulated Flow Processor (FP) that delivers Application-Specific Integrated Circuit (ASIC)-like performance that does not degrade as services are added.
Embedded IP Security (IPsec) VPN hardware acceleration	<ul style="list-style-type: none"> Increases scalability. When combined with an optional Cisco IOS XE Software Security license, enables WAN link security and VPN services.

Architectural Features	Benefits/Description
Integrated Gigabit Ethernet ports	<ul style="list-style-type: none"> The Cisco 4000 Family provides up to four built-in 10/100/1000 Ethernet ports for WAN or LAN. Based on the platform, some of the 10/100/1000 Ethernet ports can support Small Form-Factor Pluggable (SFP)-based connectivity in addition to RJ-45 connections, enabling fiber or copper connectivity. Optionally, depending on the platform, up to 30W PoE+ can be enabled on two of the built-in front panel Gigabit Ethernet interfaces to provide power to external devices such as fourth-generation (4G) LTE routers. An additional dedicated Gigabit Ethernet port is provided for device management¹.
USB-based console access	<ul style="list-style-type: none"> A mini type-B USB console port¹ supports management connectivity when traditional serial ports are not available. Traditional console and auxiliary ports are also available².
Optional integrated power supply for distribution of PoE	<ul style="list-style-type: none"> An optional upgrade to the internal power supply provides inline power (802.3af-compliant PoE or 802.3at-compliant PoE+) to optional integrated switch modules. Redundant PoE conversion modules provide an additional layer of fault tolerance.
Optional integrated Redundant Power Supply (RPS)	<ul style="list-style-type: none"> For the ISR 4400 Series, power redundancy is available by installing an optional integrated RPS for decreasing network downtime and protecting the network from power failures. Optional PoE boost mode increases total PoE capacity to up to 1000W.
Cisco Enhanced Services Module (SM-X)	<ul style="list-style-type: none"> Each service-module slot offers high data-throughput capability of up to 10 Gbps toward the system and up to 1 Gbps to other module slots. Support for both single- and double-wide service modules provides flexibility in deployment options. An SM-X slot can be converted into a Network Interface Module (NIM) slot using an optional carrier card. Service modules support Online Insertion and Removal (OIR), avoiding network disruption when installing new or replacement modules¹.
Cisco Network Interface Modules (NIMs)³	<ul style="list-style-type: none"> Up to three integrated NIM slots on the Cisco 4000 Family allow for flexible configurations. Each NIM slot offers options of up to two 2Gbps connections. One towards the route processor and one for direct module to module communication. The ISR 4221 has only one 1Gbps connection to the Route Processor NIMs support OIR. Special NIMs add support Solid-State Drives (SSDs) and Hard Disk Drives (HDDs)¹.
Cisco Integrated Services Card (ISC) slot on motherboard	<ul style="list-style-type: none"> Integrated Services Card natively supports the new Cisco High-Density Packet Voice Digital Signal Processor Modules (PVD4s), providing greater-density rich-media voice. Each Integrated Services Card slot connects to the system architecture through an up-to 2-Gbps link. Future modules can be hosted on the Integrated Services Card slot, improving system functions.
Flash memory support	<ul style="list-style-type: none"> A single flash memory slot is available to support high-speed storage densities, upgradable to up to 32 GB. The ISR4221 ships with a fixed 8GB Flash Two USB type A 2.0 ports provide capabilities for convenient storage¹.

¹ Not supported on ISR4221

² ISR4221 supports shared Console & Auxiliary ports

³ Unified Communications (UC) and UC based NIM's are not supported

Architectural Features	Benefits/Description
DRAM	<ul style="list-style-type: none"> For the ISR 4400 Series, the default control-plane memory is 4 GB, upgradable to 16 GB to provide additional scalability for control-plane features. The default data-plane memory is 2 GB. For the ISR 4300 Series, the default memory is 4 GB, upgradable to 16 GB (only 8GB for 4321) to provide additional scalability. The ISR 4200 Series comes with 4GB Fixed DRAM

Managing your Cisco ISR 4000 Family ISRs

The Cisco network management applications listed at the top of Table 3 are standalone products that can be purchased or downloaded to manage your Cisco network devices. The applications are built specifically for the different operational phases; select those that best fit your needs. Those management capabilities listed under the "Cisco IOS Software XE Embedded Management" heading are directly integrated into the routers' software operating system.

Table 3. Cisco DNA Center

Operational Phase	Application	Description
Device staging and configuration	WebUI	<ul style="list-style-type: none"> A GUI-based device-management tool for Cisco IOS and Cisco IOS XE Software-based access routers. This tool simplifies routing, firewall, VPN, unified communications, and WAN and LAN configuration through easy-to-use wizards.
Network-wide deployment, configuration, monitoring, and troubleshooting	Cisco Prime™ Infrastructure	<ul style="list-style-type: none"> Offers comprehensive lifecycle management of wired and wireless access, campus, and branch-office networks, rich visibility into end-user connectivity, and application performance assurance. Provides wired lifecycle functions such as inventory, configuration, and image management; automated deployment; compliance reporting; integrated best practices; and reporting.
Staging, deployment, and changes to configuration and image files	Cisco Configuration Engine	<ul style="list-style-type: none"> A secure network management product that provides zero-touch image and configuration distribution through centralized, template-based management.
Context-aware security configuration and monitoring	Cisco Prime Security Manager	<ul style="list-style-type: none"> Management tool for configuring and managing context-aware security. The application supports both single- and multi-device manager form factors. Provides the ability to write and enforce the granular context-aware security policies.
Cisco Wide Area Application Service (WAAS) management	Cisco WAAS Central Manager	<ul style="list-style-type: none"> The management tool for the WAAS⁴(WAN optimization and application acceleration) integrated service. It provides a centralized mechanism for configuring WAAS features, reporting, and monitoring.

Cisco IOS XE Software Embedded Management Capabilities	
Feature	Description
Cisco IOS Embedded Event Manager (EEM)	<ul style="list-style-type: none"> A distributed and customized approach to event detection and recovery. 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.
Cisco IOS XE IP Service-Level Agreements (IP SLAs)	<ul style="list-style-type: none"> Helps assure the performance of new business-critical IP applications as well as IP services that use data and voice in an IP network.
SNMP , Remote Monitoring (RMON), syslog , NetFlow , IP Flow Information Export (IPFix)	<ul style="list-style-type: none"> Network monitoring and accounting tools.

⁴ It is suggested to use AppNav with an External WAAS device for the ISR4221

Product Specifications

Table 4 lists the general product specifications for the Cisco 4000 Family routers.

Table 4. Specifications of Cisco 4000 Family Integrated Services Routers

Technical Specifications	Cisco 4461	Cisco 4451	Cisco 4431	Cisco 4351	Cisco 4331	Cisco 4321	Cisco 4221
Aggregate Throughput (Default)	1.5Gbps	1 Gbps	500 Mbps	200 Mbps	100 Mbps	50 Mbps	35Mbps
Aggregate Throughput (Performance License)	3Gbps	2 Gbps	1 Gbps	400 Mbps	300 Mbps	100 Mbps	75 Mbps
Aggregate CEF Only ⁵ Throughput (Boost License)	Over 7Gbps	Over 4Gbps	Over 4Gbps	Over 2Gbps	Over 2Gbps	1.5Gbps	1.2Gbps
Total onboard WAN or LAN 10/100/1000 ports	4	4	4	3	3	2	2
Total onboard WAN or LAN 10Gbps ports	2	-	-	-	-	-	-
RJ-45-based ports	4	4	4	3	2	2	2
SFP-based ports	4	4	4	3	2	1	1

⁵ Using onboard Gigabit Ethernet Interfaces

Technical Specifications	Cisco 4461	Cisco 4451	Cisco 4431	Cisco 4351	Cisco 4331	Cisco 4321	Cisco 4221
Enhanced service-module slots	3	2	0	2	1	0	0
Doublewide service-module slots	2	1 (assumes no singlewide SM-X modules installed)	0	1 (assumes no singlewide SM-X modules installed)	0	0	0
NIM slots	3	3	3	3	2	2	2
OIR (all I/O modules)	Yes	Yes	Yes	Yes	Yes	Yes	No
Onboard ISC slot	1	1	1	1	1	1	No
Default memory double-data-rate 3 (DDR3) error-correction-code (ECC) DRAM (Combined control/services/data planes)	NA	NA	NA	4 GB	4 GB	4 GB	4GB
Maximum memory DDR3 ECC DRAM (Combined control/services/data planes)	NA	NA	NA	16 GB	16 GB	8 GB	4GB
Default memory DDR3 ECC DRAM (data plane)	4 GB	2 GB	2 GB	NA	NA	NA	NA
Maximum memory DDR3 ECC DRAM (data plane)	4 GB	2 GB	2 GB	NA	NA	NA	NA
Default memory DDR3 ECC DRAM (control/services plane)	8 GB	4 GB	4 GB	NA	NA	NA	NA

Technical Specifications	Cisco 4461	Cisco 4451	Cisco 4431	Cisco 4351	Cisco 4331	Cisco 4321	Cisco 4221
Maximum memory DDR3 ECC DRAM (control/services plane)	32 GB	16 GB	16 GB	NA	NA	NA	NA
Default flash memory	8 GB	8 GB	8 GB	4 GB	4 GB	4 GB	8GB
Maximum flash memory	32 GB	32 GB	32 GB	16 GB	16 GB	8 GB	8GB
External USB 2.0 slots (type A)	2	2	2	2	1	1	1
USB console port -type B mini (up to 115.2 kbps)	1	1	1	1	1	1	0
Serial console port - RJ45 (up to 115.2 kbps)	1	1	1	1	1	1	1 (combo CON/AUX port)
Serial auxiliary port - RJ45 (up to 115.2 kbps)	1	1	1	1	1	1	1 (combo CON/AUX port)
Power-supply options	Internal: AC, DC and PoE	Internal: AC, DC and PoE	Internal: AC, DC, and PoE	Internal: AC, DC and PoE	Internal: AC,DC and PoE	External: AC and PoE	External AC only
Redundant power supply	Internal: AC, DC and PoE	Internal: AC, DC and PoE	Internal: AC, DC, and PoE	N/A	N/A	N/A	NA
Power Specifications							
AC input voltage	100 to 240 VAC autoranging	100 to 240 VAC autoranging	100 to 240 VAC autoranging	100 to 240 VAC autoranging	100 to 240 VAC autoranging	100 to 240 VAC autoranging	100 to 240 VAC autoranging
DC Input Voltage	48 – 60V	48 – 60V	48 – 60V	NA	24 – 60V	NA	NA
Input Voltage	12A Max	12A Max	12A Max	NA	14 - 5A	NA	NA
Input Current							
AC input frequency	47 to 63 Hz	47 to 63 Hz	47 to 63 Hz	47 to 63 Hz	47 to 63 Hz	47 to 63 Hz	47 to 63 Hz
AC input current range, AC power supply (maximum)	7.1 to 3.0A	7.1 to 3.0A	3 to 1.3A	7.1 to 3.0A	3 to 1.3A	1.5 to 0.6A	1.5 to 0.6A
AC input surge current	60 A peak and less than 5 Arms per half cycle	<50 A	60 A peak and less than 5 Arms per half cycle	60 A peak and less than 12 Arms per half cycle	60 A peak and less than 5 Arms per half cycle	90 A peak and less than 3 Arms per half cycle	90 A peak and less than 3 Arms per half cycle
Typical power (no		158	65	48	42	36	24

Technical Specifications	Cisco 4461	Cisco 4451	Cisco 4431	Cisco 4351	Cisco 4331	Cisco 4321	Cisco 4221
modules) (watts)							
Maximum power with AC power supply (watts)	1000W (no PoE)	450 (no PoE)	250 (no PoE)	430	250	125	90
Maximum power with DC power supply (watts)	437 (no PoE)	437 (no PoE)	437 (no PoE)	437 (no PoE)	250 (no PoE)		
Maximum power with PoE power supply (platform only) (watts)	1000 with PoE redundant 1450 with PoE boost no redundancy	1000 with PoE redundant 1450 with PoE boost no redundancy	500 with PoE redundant 1000 with PoE boost no redundancy	990	530	260	NA (No PoE Support)
Maximum endpoint PoE power available from PoE power supply (watts)	500 W with optional redundancy	500 W with optional redundancy	250 W with optional redundancy	500	250	120	NA (No PoE Support)
Maximum endpoint PoE power capacity with PoE boost (watts)	950 W no redundancy	950 W no redundancy	500 W no redundancy	N/A	N/A	N/A	NA (No PoE Support)
Sizes and Weights							
Dimensions (H x W x D)	3.5 x 17.25 x 18.5 in 88.9 x 438.15 x 469.9 mm)	3.5 x 17.25 x 18.5 in (88.9 x 438.15 x 469.9 mm)	1.73 x 17.25 x 19.97 in (43.9 x 438.15 x 507.2 mm)	3.5 x 17.25 x 18.5 in (88.9 x 438.15 x 469.9 mm)	1.75 x 17.25 x 17.25 in (44.45 x 438.15 x 438.15 mm)	1.75 x 14.55 x 11.60 in (44.55 x 369.57 x 294.64 mm)	1.72 x 12.7 x 10" (43.7 x 322.6 x 254 mm)

Technical Specifications	Cisco 4461	Cisco 4451	Cisco 4431	Cisco 4351	Cisco 4331	Cisco 4321	Cisco 4221
External Power Supply Dimensions (H x W x D)	N/A	N/A	N/A	N/A	N/A	2.95 x 1.18 x 6.10 in (75 x 30 x 155 mm)	37 x 73 x 152 mm (Phihong mfg PN: AA90U-120A-R) 36.5 x 67 x 155 mm (Delta mfg PN: ADP90GR BA)
Shipping Box Dimensions (H x W x D)	9.75 x 22.25 x 26 in (24.76 x 56.51 x 66.04 mm)	9.75 x 22.25 x 26 in (24.76 x 56.51 x 66.04 mm)	7.88 x 22.25 x 28.75 in (200.2 x 565.1 x 730.25 mm)	9.75 x 22.25 x 26 in (24.76 x 56.51 x 66.04 mm)	7.125 x 22.75 x 22.5 in (180.98 x 577.85 x 571.5 mm)	7.0 x 21.5 x 16.125 in (177.8 x 546.1 x 409.6 mm)	4.13 x 18.25 x 12.94" (104.9 x 463.6 x 328.7 mm)
Rack height	3 Rack Units (3RU)	2 Rack Units (2RU)	1 Rack Units (1RU)	2 Rack Units (2RU)	1 Rack Unit (1RU)	1 Rack Unit (1RU)	1 Rack Unit (1RU)
Rack-mount 19in. (48.3 cm) EIA	Included	Included	Included	Included	Included	Included	Optional
Rack-mount 23in. (58.4 cm) EIA	Optional	Optional	Optional	Optional	Optional	N/A	NA
Wall-mount	No	No	Yes	No	Yes	Mounting holes under chassis	Yes
Weight with 1, 450-WAC power supply (no modules)		28.8 lb (13.1 kg)	N/A	28.8 lb (13.1 kg)	N/A	N/A	NA
Weight with 1 1,000-WAC power supply+ 1 PoE power module (no other modules)		30.6 lb (13.9 kg)	N/A	29.0 lb (13.2 kg)	N/A	N/A	NA
Weight with AC PS (no modules)		N/A	18.5 lb (8.4 kg)	N/A	13.5 lb (6.2 kg)	7.7 lb (3.5 kg) + 1.2 lb (0.66 kg) external PS	7.1 lb (3.22kg)
Weight with DC PS (no modules)		28.8lb (13.1kg)	28.8lb (13.1kg)	28.8lb (13.1kg)	13.5 lb (6.2 kg)		
Weight with AC PS with POE (no modules)		N/A	18.6 lb (8.4 kg)	N/A	14.1 lb (6.4 kg)	N/A	NA
Typical weight (fully loaded with modules)		42.7 lb (19.4 kg)	22.4 lb (10.2 kg)	37.7 lb (17.1 kg)	16.1 lb (7.3 kg)	9.14 lb (4.2 kg) + 1.2 lb (0.66 kg) external PS	8.11 lb (3.68kg)
Packaging		6.4 lb (2.9 kg)	5.9 lb (2.7 kg)	6.4 lb (2.9 kg)	4.6 lb (2.1 kg)	2.2 lb (1 kg)	1.28 lb (0.58kg)

Technical Specifications	Cisco 4461	Cisco 4451	Cisco 4431	Cisco 4351	Cisco 4331	Cisco 4321	Cisco 4221
Weight							
Airflow	I/O side to bezel side	Right I/O side to Left I/O side	I/O side to bezel side				
MTBF (Hours)	480770	480770	512970	566310	587250	593270	593270
Environmental Specifications							
Operating Conditions							
Temperature	32 to 104°F (0 to 40°C)	32 to 104°F (0 to 40°C)	32 to 104°F (0 to 40°C)				
Altitude (China)	0 – 6,560 ft. (0 – 2,000 m)	0 – 6,560 ft. (0 – 2,000 m)	0 – 6,560 ft. (0 – 2,000 m)				
Altitude (Rest of the world)	0 – 10,000 ft. (0 – 3,050 m)	0 – 10,000 ft. (0 – 3,050 m)	0 – 10,000 ft. (0 – 3,050 m)				
Short Term Temperature upto 6560ft per NEBS GR-63-CORE	NA	NA	NA	NA	32° to 131° (0° to 55° C) (for ISR4331-DC version)	NA	NA
Relative humidity	5% to 85%	5% to 85%	5% to 85%				
Short-term humidity	5% to 90%, not to exceed 0.024 kg water/kg of dry air	5% to 90%, not to exceed 0.024 kg water/kg of dry air	5% to 90%, not to exceed 0.024 kg water/kg of dry air	5% to 90%, not to exceed 0.024 kg water/kg of dry air	5% to 90%, not to exceed 0.024 kg water/kg of dry air	5% to 90%, not to exceed 0.024 kg water/kg of dry air	5% to 90%, not to exceed 0.024 kg water/kg of dry air
Acoustics: Sound pressure (Typical/ maximum)	50.6/73.1 dBA	50.6/73.1 dBA	54.3/79.1 dBA	50.6/73.1 dBA	52.8/74.8 dBA	24.2/51.9 dBA	28.5/53 dBA

Technical Specifications	Cisco 4461	Cisco 4451	Cisco 4431	Cisco 4351	Cisco 4331	Cisco 4321	Cisco 4221	
Acoustics: Sound power (Typical/ maximum)	58.2/78.8 dBA	58.2/78.8 dBA	57.2/80.8 dBA	58.2/78.8 dBA	61.2/81.6 dBA	31.9/59.9 dBA	41 / 68 dBA	
Nonoperating Conditions								
Temperature	-40 to 158°F (-40 to 70°C)	-40 to 158°F (-40 to 70°C)	-40 to 158°F (-40 to 70°C)	-40 to 158°F (-40 to 70°C)	-40 to 158°F (-40 to 70°C)	-40 to 158°F (-40 to 70°C)	-40 to 158°F (-40 to 70°C)	
Relative humidity	5% to 95%	5% to 95%	5% to 95%	5% to 95%	5% to 95%	5% to 95%	5% to 95%	
Altitude	15,584 ft (4750m)	15,584 ft (4750m)	15,584 ft (4750m)	15,584 ft (4750m)	15,584 ft (4750m)	15,584 ft (4750m)	15,584 ft (4750m)	
Regulatory and Compliance								
Safety	UL 60950-1 CAN/CSA C22.2 No. 60950-1 EN 60950-1 AS/NZS 60950-1 IEC 60950-1	UL 60950-1 CAN/CSA C22.2 No. 60950-1 EN 60950-1 AS/NZS 60950-1 IEC 60950-1	UL 60950-1 CAN/CSA C22.2 No. 60950-1 EN 60950-1 AS/NZS 60950-1 IEC 60950-1	UL 60950-1 CAN/CSA C22.2 No. 60950-1 EN 60950-1 AS/NZS 60950-1 IEC 60950-1	UL 60950-1 CAN/CSA C22.2 No. 60950-1 EN 60950-1 AS/NZS 60950-1 IEC 60950-1	UL 60950-1 CAN/CSA C22.2 No. 60950-1 EN 60950-1 AS/NZS 60950-1 IEC 60950-1	UL 60950-1 CAN/CSA C22.2 No. 60950-1 EN 60950-1 AS/NZS 60950-1 IEC 60950-1	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 EN55032 Class A CISPR32 Class A AS/NZS CISPR 32 Class A VCCI V-3 CNS 13438 EN 300-386 EN 61000 (Immunity) EN 55024, CISPR 24 KN22, KN24	47 CFR, Part 15 ICES-003 Class A EN55032 Class A CISPR32 Class A AS/NZS CISPR 32 Class A VCCI V-3 CNS 13438 EN 300-386 EN 61000 (Immunity) EN 55024, CISPR 24 KN22, KN24	47 CFR, Part 15 ICES-003 Class A EN55032 Class A CISPR32 Class A AS/NZS CISPR 32 Class A VCCI V-3 CNS 13438 EN 300-386 EN 61000 (Immunity) EN 55024, CISPR 24 KN22, KN24	47 CFR, Part 15 ICES-003 Class A EN55032 Class A CISPR32 Class A AS/NZS CISPR 32 Class A VCCI V-3 CNS 13438 EN 300-386 EN 61000 (Immunity) EN 55024, CISPR 24 KN22, KN24	47 CFR, Part 15 ICES-003 Class A EN55032 Class A CISPR32 Class A AS/NZS CISPR 32 Class A VCCI V-3 CNS 13438 EN 300-386 EN 61000 (Immunity) EN 55024, CISPR 24 KN22, KN24	47 CFR, Part 15 ICES-003 Class A EN55032 Class A CISPR32 Class A AS/NZS CISPR 32 Class A VCCI V-3 CNS 13438 EN 300-386 EN 61000 (Immunity) EN 55024, CISPR 24 KN22, KN24	ICES-003 Class A EN55032 Class A CISPR32 Class A AS/NZS CISPR 32 Class A VCCI V-3 CNS 13438 EN 300-386 EN 61000 (Immunity) EN 55024, CISPR 24 KN22, KN24	ICES-003 Class A EN55032 Class A CISPR32 Class A AS/NZS CISPR 32 Class A VCCI V-3 CNS 13438 EN 300-386 EN 61000 (Immunity) EN 55024, CISPR 24 KN22, KN24
Telecom	T1 IC CS- 03:2004	T1 IC CS-03:2004 TIA-968-	TIA-968-B CS-03 ANSI T1.101	TIA-968-B CS-03 ANSI T1.101	TIA-968-B CS-03 ANSI T1.101	TIA-968-B CS-03 ANSI T1.101	TIA-968-B CS-03 ANSI T1.101	

Technical Specifications	Cisco 4461	Cisco 4451	Cisco 4431	Cisco 4351	Cisco 4331	Cisco 4321	Cisco 4221
	TIA-968-B:2009 HKTA 2028:2010 HKTA 2017:2010 HKTA 2015:2006 G.703:2001 ID0002:2007 IS6100:2004 DSPR Gray Book:2000 DSPR Technical Condition:2004 E1 AS/ACIF S016:2001 AS/ACIF S038:2001 G.703:2001 TBR 4:1995 TBR 12:1993 TBR 13:1996 RRA 2009-38 (RRL 2005-96) IDA TS DLCN:2011 IDA TS ISDN PRA:2005 IS6100:2004 PTC 220:2008 Ethernet IEEE 802.3 ANSA X3.263	B:2009 HKTA 2028:2010 HKTA 2017:2010 HKTA 2015:2006 G.703:2001 ID0002:2007 IS6100:2004 DSPR Gray Book:2000 DSPR Technical Condition:2004 E1 AS/ACIF S016:2001 AS/ACIF S038:2001 G.703:2001 TBR 4:1995 TBR 12:1993 TBR 13:1996 RRA 2009-38 (RRL 2005-96) IDA TS DLCN:2011 IDA TS ISDN PRA:2005 IS6100:2004 PTC 220:2008 Ethernet IEEE 802.3 ANSA X3.263	ITU-T G.823, G.824 IEEE 802.3 RTTE Directive Homologation requirements vary by country and interface type. For specific country information, refer to the online approvals data base at: https://www.cisco.com/ .	ITU-T G.823, G.824 IEEE 802.3 RTTE Directive Homologation requirements vary by country and interface type. For specific country information, refer to the online approvals data base at: https://www.cisco.com/ .	ITU-T G.823, G.824 IEEE 802.3 RTTE Directive Homologation requirements vary by country and interface type. For specific country information, refer to the online approvals data base at: https://www.cisco.com/ .	ITU-T G.823, G.824 IEEE 802.3 RTTE Directive Homologation requirements vary by country and interface type. For specific country information, refer to the online approvals data base at: https://www.cisco.com/ .	ITU-T G.823, G.824 IEEE 802.3 RTTE Directive Homologation requirements vary by country and interface type. For specific country information, refer to the online approvals data base at: https://www.cisco.com/ .
Cisco IOS XE Software							
Protocols	IPv4, IPv6, static routes, Routing Information Protocol Versions 1 and 2 (RIP and RIPv2), 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 Version 3 (IGMPv3), Protocol Independent						

Technical Specifications	Cisco 4461	Cisco 4451	Cisco 4431	Cisco 4351	Cisco 4331	Cisco 4321	Cisco 4221
	Multicast sparse mode (PIM SM), PIM Source Specific Multicast (SSM), RSVP, CDP, ERSPAN, IPSLA, Call Home, EEM, IKE, ACL, EVC, DHCP, FR, DNS, LISP, OTV ⁶ , HSRP, RADIUS, AAA, AVC, Distance Vector Multicast Routing Protocol (DVMRP), IPv4-to-IPv6 Multicast, MPLS, Layer 2 and Layer 3 VPN, IP sec, Layer 2 Tunneling Protocol Version 3 (L2TPv3), Bidirectional Forwarding Detection (BFD), IEEE802.1ag, and IEEE802.3ah						
Encapsulations	Generic routing encapsulation (GRE), 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), and PPP over Ethernet (PPPoE)						
Traffic management	QoS, Class-Based Weighted Fair Queuing (CBWFQ), Weighted Random Early Detection (WRED), Hierarchical QoS, Policy-Based Routing (PBR), Performance Routing, and NBAR.						
Cryptographic Algorithms	Encryption: DES, 3DES, AES-128 or AES-256 (in CBC and GCM modes); Authentication: RSA (748/1024/2048 bit), ECDSA (256/384 bit); Integrity: MD5, SHA, SHA-256, SHA-384, SHA-512						

Services plane: Enabling the Branch-in-a-Box

All Cisco ISR 4000 routers contain processing cores built-in as standard to allow full-featured services to run on-board. This includes the full-featured Cisco WAAS engine that provides application acceleration and highly responsive virtual desktop experience. The technology is known as Cisco Service Containers and it uses a standard hypervisor to allow x64 based applications to run.

The 4000 series routers can be fitted with Solid State Drives (SSD) and server cards for local storage and computing capability. The Cisco UCS-E server cards are available with 8-core Intel Xeon processors with up to 48GB of high speed DDR3 memory and three drives built in offering RAID 0, 1 and 5. This immense amount of compute power can eliminate the need for any dedicated servers at branch sites. UCS-E cards can be configured and managed using VMware vCenter and pooled with Data Center compute resources.

⁶ Supported only on the 4451 for Bandwidths <100Mbps

Software Subscription through Cisco DNA Licensing

The ISR4000 series supports software based subscription using Cisco DNA based licensing. Three Cisco DNA based software subscription licenses are available for the WAN portfolio: Cisco DNA Essentials, Cisco DNA Advantage and Cisco ONE Advantage allowing customers to have a single unified solution that spans across the ISR4000 series routers and its ASR1000 and ISR1000 counterparts

The license tiers are structured to support the growth in business needs enabling the customer to move from basic functionality using the Cisco DNA Essentials to full-functionality with the Cisco DNA Advantage and expanding that to include WAN Optimization and Analytics on the Cisco ONE Advantage. This provides complete flexibility to move the same license across end-points based on growing network and security requirements, growth in bandwidth based on user and application growth at the sites as also the ability to change the management of the platform from on-prem to cloud or vice-versa.

Cisco DNA Licenses are supported for all ISR4000 platforms using the Cisco DNA Center, the controller and analytics platform at the heart of Cisco's intent-based network. For more information on the Cisco DNA Center and supported platforms, please refer to <https://www.cisco.com/c/en/us/products/cloud-systems-management/dna-center/index.html>

Enterprise NFV on ISR4000

Built to reduce costs without compromising vital network services, the UCS E-Series router-integrated branch blade servers provide support for a Virtualization-ready and Application-centric platform that can be seamlessly integrated on the ISR4000 platform. Customers can now install virtualized applications on the ISR4000 routers through the Cisco® Enterprise NFV Infrastructure Software (NFVIS) – a virtualization infrastructure that integrates full VM lifecycle management, monitoring, device programmability, and service chaining in a single, installable package. For more information on Enterprise NFV and NFVIS, please refer to the link at <https://www.cisco.com/c/en/us/solutions/enterprise-networks/enterprise-network-functions-virtualization-nfv/index.html#~stickynav=2>

Support for DC Power

ISR4000 platforms support both DC and AC Power Supplies as options. Specifically, the ISR 4331 has two separate product SKU's – the ISR4331/K9 and the ISR4331-DC/K9 which support AC and DC Power respectively, The ISR4400 can independently support an AC or a DC Power supply on the same chassis. While the 4300 supports between 24V and 60Vdc, the 4400 supports between 48V and 60Vdc. The 4331 provides for upto 250W of power rating while the 4400 provides upto 437W. It is important to note that when DC Power supplies are installed on the router, PoE based modules may not be used.

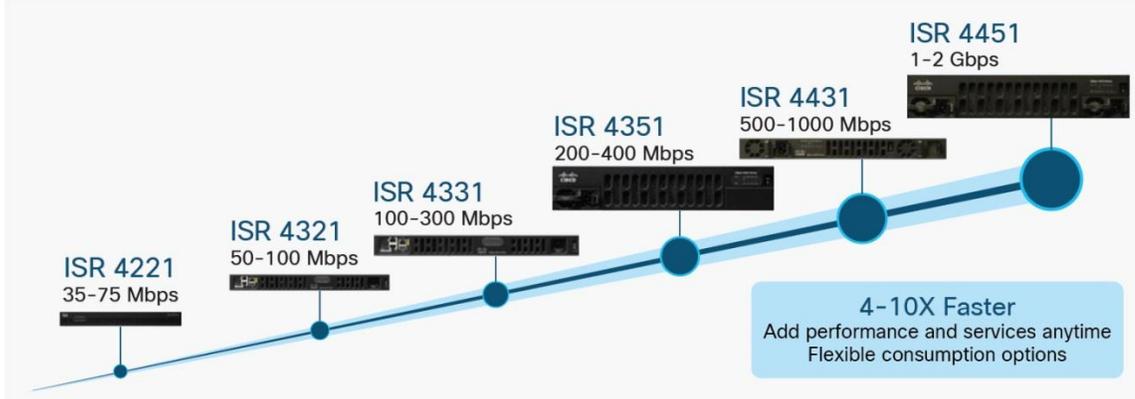
More details about the DC Power supplies and its capabilities can be found at the below url https://www.cisco.com/c/en/us/td/docs/routers/access/4400/hardware/installation/guide4400-4300/C4400_isr/FRUs_Modules.html#49534

Product Performance and Scalability

The Cisco 4000 Family is built on a multicore CPU architecture. It runs modular Cisco IOS XE Software, which allows the platform to use to full advantage a distributed multicore architecture. The architecture of the Cisco 4000 separates control- and data-plane operations and integrates an industry-first services plane. This design delivers full-featured integrated services up to Layer 7 at high performance with the ability to deliver application-aware network services while maintaining a stable platform and a high level of performance during periods of heavy network traffic.

The ISR 4000 consists of 3 series of Routers – the ISR 4400 series, the 4300 series and ISR 4200 series whose performance levels maybe represented by the chart below

Investment Protection Without Oversubscription



Common for the new 4000 Family is that all platforms come with fixed maximum performance levels. One fixed base performance level is delivered as factory default with an optional performance-on-demand license to increase the base forwarding throughput. This scenario enables deployment in high-speed WAN environments through performance-on-demand licensing to double or, for one of the platforms, triple the router capacity without any hardware upgrades.

All 4000 platforms have their fixed performance levels set well within actual capacity, with the result that performance does not necessarily degrade when a service is added to the configuration. This setup provides a deterministic performance, eliminating a network administrator's guesswork when planning for new services.

For a more detailed document on ISR 4000 Series Performance and Platform Scalability, please refer to the Performance Whitepaper at <https://www.cisco.com/c/en/us/products/collateral/routers/4000-series-integrated-services-routers-isr/white-paper-c11-734550.html>

ISR 4000 Boost License

In addition to the Performance License, customers may now order a Booster (or Boost) License that allows the router to perform between five or more times than that of the throughput with Performance License. In contrast to the deterministic performance described above, in the Booster mode, the router does not provide the deterministic level of performance as provided when operating with the default license or with the Performance license.

The Boost License provides a license tier above the Performance License allowing customers to completely remove the ISR4000's performance limiters. This will make the ISR 4000 platforms perform at entirely new performance levels, allowing for 4+ Gbps of IP Routing (CEF) performance on the 4400 series ISRs. For deployments using encryption, IPSec throughput with AES 256 increases to 250Mbps on the lowest platform up to 10Gbps on the ISR4461.

ISR 4000 Interfaces and Modules Support

The Cisco 4000 Series Integrated Services Routers (ISRs) are modular routers with LAN and WAN connectivity. The routers provide for Network Interface Module (NIM) slots and Enhanced service module (SM-X) slots offering a rich set of Modules, such as LAN, WAN and Wireless Interfaces plus a range of Compute engines for embedded services

For the complete list of supported modules on the ISR4000 Series refer to the Interfaces and Modules sheet at <https://www.cisco.com/c/en/us/products/routers/4000-series-integrated-services-routers-isr/relevant-interfaces-and-modules.html>.

Software defined WAN with the ISR4000 Series

The ISR 4000 series is optimized for the Software Defined WAN (SD-WAN). For enterprises this means that business critical applications run faster, with more reliability and reduced Operational Expenditure (OpEx). The SDWAN achieves this by making all branches and Data Centers have the ability to monitor, control, move and report on streams of application data such as specific web (HTTP) traffic for example. The ISR 4000 series has deep packet inspection capability and can accurately identify and control thousands of different applications including custom in-house enterprise applications.

The entire SD-WAN implementation on the ISR4000 is maybe implemented by managing the end device either from the Cloud or On-Premise through ascending levels of throughput based licenses. All licenses that support SD-WAN, whether On-Premise or on Cloud are all enabled using Subscription Licenses. These subscription licenses enable all customers to seamlessly transition between On-Premise and Cloud management as needed. The license tiers are structured to support the growth in business needs through simple subscriptions that help simplify the journey to intent-based networking for the WAN.

The SDWAN subscriptions are aligned across three subscription licenses of **Cisco DNA Essentials**, **DNA Advantage** and **Cisco DNA Premier**, each expanding functionally. The **Cisco DNA Essentials** covers all types of connectivity & router life cycle management, support for Network & application visibility coupled with basic premise and transport security. The **Cisco DNA Advantage** provides for Advanced WAN topologies, Application aware policies supported by enhanced network security. The **Cisco DNA Premier** provides for Cloud connectivity with unlimited segmentation, Advanced Application optimization & Network Analytics, secured by advanced threat protection

For more information on Cisco SDWAN please refer to <https://www.cisco.com/c/en/us/products/software/one-wan-subscription/index.html>

The benefits are immense;

1. Business-critical applications no longer have to contend each other or with traffic that should be served on best effort basis.
2. The Enterprise network becomes more reliable because multiple paths can be used.
3. Costs are greatly reduced because dual MPLS links can be replaced with a mix of MPLS and Internet.
4. The time to bring up new remote sites is dramatically reduced because the SD-WAN supports rapidly deployed DSL and 3G/4G LTE connections as easily as MPLS.
5. Security is assured across these connections using a zero-touch secure VPN technology used by governments and finance organizations worldwide.

From a platform perspective, the ISR 4000 series has

1. Separated control and data planes for Denial of Service (DoS) attack prevention and Intrusion Prevention System (IPS) and firewall capability built-in.
2. SaaS applications can have content locally cached. The caching is automatic and peers directly with Akamai technology to obtain intelligence.
3. Application performance speed is greatly increased using in-built application acceleration technology that can locally cache at a byte-level.

Cisco Security Solutions for the ISR4000 Series

Cisco WAN MACsec,

Cisco routers support a wide-range of ever enhancing security features on the ISR4000 routers. Cisco WAN MACsec is supported on the ISR4000 series routers using the NIM-2GE-CU-SFP module. WAN MACsec provides a line-rate network encryption solution over Layer 2 Ethernet transport services and can be leveraged outside campus networks, whether it be over Metro Ethernet transport or Data Center Interconnect (DCI) links. MACsec also secures WAN connections that are leveraging Ethernet as the link-layer media. For more information refer to the whitepaper at <https://www.cisco.com/c/dam/en/us/td/docs/solutions/CVD/Aug2016/WP-WAN-MACsecDep-Aug2016.pdf>

Cisco Encrypted Threat Analytics

The rapid rise in encrypted traffic is changing the threat landscape. As more businesses become digital, a significant number of services and applications are using encryption as the primary method of securing information. Encrypted Threat Analytics (ETA) is a functionality that allows customers to do cryptographic assessments and identify malware communications in encrypted traffic through passive monitoring. Using information about events that occur inside of a flow or intraflow telemetry to identify malware communication in encrypted traffic means Encrypted Traffic Analytics can maintain the integrity of the encrypted flow without the need for bulk decryption. For more information and platform support refer to <https://www.cisco.com/c/dam/en/us/solutions/collateral/enterprise-networks/enterprise-network-security/nb-09-encrytd-traf-anlytcs-wp-cte-en.pdf>

Cisco Snort IPS and Cisco Umbrella Branch

Cisco[®] Snort[®] IPS for Cisco 4000 Series Integrated Services Routers (ISRs) offers a lightweight threat defense solution that uses industry-recognized Snort open-source Intrusion Prevention System (IPS) technology. It is perfect for customers who are looking for a cost-effective solution that provides one box for both advanced routing capabilities and integrated threat defense security to help comply with regulatory requirements.

Cisco Umbrella Branch is a cloud-delivered security service for the Cisco Integrated Services Router (ISR). It provides the first layer of defense against threats at branch offices. And it offers the simplest, fastest way to protect every device on your branch network. You gain visibility and enforcement at the DNS layer, so you can block requests to malicious domains and IPs before a connection is ever made.

When enabling MACsec, you will need to procure the Security and HSEC licenses to stay within the limits of federal export control regulations. When customers wish to enable ETA, the Security (SEC) license needs to be enabled. Enabling Snort needs a Security (SEC) license and a signature subscription license. Enabling Cisco Umbrella Branch needs an Umbrella Branch license and a subscription license.

Reducing Operational Costs using Cisco ISR

Support for Data Modelling

Enterprises and Service Providers (SP's) wish to drive down the operational cost (opex) of their networks and increase the agility and speed with which they deliver new services furthered by investments in Software Defined Networking (SDN) and Network Function Virtualization (NFV). Cisco routers provide support for Netconf and YANG data-modelling with increasing model coverage in successive releases

Software Maintenance Upgrades (SMU)

The ISR4000 routers now support Software Maintenance Upgrades (SMU)⁷. The Software Maintenance Upgrade (SMU) is a package that can be installed on a system to provide a patch fix or security resolution to a released image. An SMU package is provided on a per release and per component basis and is specific to the platform. An SMU is an independent and self-sufficient package and it does not have any prerequisites or dependencies. Please refer to <https://www.cisco.com/c/en/us/td/docs/ios-xml/ios/config-mgmt/configuration/xe-16-6/config-mgmt-xe-16-6-book/cm-smu.html> for additional details

Network Plug and Play

Network Plug and Play helps automate the onboarding of new devices on your network by applying configuration settings without manual intervention. With the ease of a centrally managed controller, it reduces the time a new device takes to join your network and become functional. For more information on Plug and Play (PnP), please refer to <https://www.cisco.com/c/en/us/td/docs/solutions/Enterprise/Plug-and-Play/release/notes/pnp-connect-release-notes.html>

Cisco IOS Software Licensing and Packaging

Universal IOS XE and XE-SDWAN Image

A single Cisco IOS XE Universal image encompassing all functions is delivered with the platform. Advanced features can be enabled by simply activating a software license on the Universal image. Technology packages and feature licenses, enabled through right-to-use licenses, simplify software delivery and decrease the operational costs of deploying new features.

Beginning IOS version 16.9.1, SDWAN support is provided for IOS image on the ISR4000 series router. The SDWAN features are provisioned through a separate image, the XE-SDWAN image. While the Universal IOS-XE image provides for routing features, the XE-SDWAN image provides support for OnPrem or Cloud based Software Defined WAN solutions. Unified Communications for XE-SDWAN will be supported in upcoming releases

When ordering an ISR router, a customer may choose either of IOS-XE or XE-SDWAN image. With IOS-XE image, customers may opt for subscription based licensing or for perpetual licensing. With XE-SDWAN image, customers may order only subscription licensing. Refer to Cisco DNA Ordering Guide at <https://www.cisco.com/c/dam/en/us/products/collateral/cloud-systems-management/dna-center/nb-09-dna-1-x-ordering-guide-cte-en-latest.pdf>.

⁷ Supported from IOS-XE16.6.1 for all ISR4000 and ASR1000 series routers

Four major technology licenses are available on the Cisco 4000 Family and use the IOS-XE image; these licenses can be activated through the Cisco software activation process identified at <https://www.cisco.com/go/sa>. The following licenses are available:

- IP Base: This technology package is available as default.
- Application Experience (APPX): This license includes data and application performance features.
- Unified Communications (UC)⁸: This license includes voice features.
- Security (SEC) or Security with No Payload Encryption (SEC-NPE): This license includes features for securing network infrastructure.

The Cisco 4000 Series has a performance-on-demand license to increase the base forwarding throughput with no hardware changes. Also present is the High Security (HSEC) license, which removes the curtailment enforced by the U.S. government export restrictions on the encrypted tunnel count and encrypted throughput. The HSECKg license is a separately required license for a feature to have full crypto functionality. Without the HSECKg license, only 1000 secure tunnels and 250⁹ Mbps of crypto bandwidth would be available.

For additional information and details about Cisco IOS Software licensing and packaging on the Cisco 4000 Family, please visit <https://www.cisco.com/c/en/us/td/docs/routers/access/4400/software/configuration/guide/isr4400swcfg.pdf>.

IOS-XE provides support for both perpetual and subscription licensing. Subscription Licensing with support for Cisco DNA Center is offered using the 3-Licenses of Cisco DNA Essentials, Cisco DNA Advantage and Cisco DNA Premier in-line with similar licenses that provide support on the XE-SDWAN side. Please refer to Cisco DNA Ordering Guide at: <https://www.cisco.com/c/dam/en/us/products/collateral/cloud-systems-management/dna-center/nb-og-dna-1-x-ordering-guide-cte-en-latest.pdf>.

Software Defined Networks maybe provisioned through three major licenses on the Cisco 4000 Family; these licenses can be activated through the Cisco software activation process identified at <https://www.cisco.com/go/sa> using the Cisco DNA Center or through the vManage management portal. The XE-SDWAN image provides for its own licensing schema through the Cisco DNA Licensing

The following licenses are available:

- **Cisco DNA Essentials** covers all types of connectivity & router life cycle management, support for Network & application visibility coupled with basic premise and transport security
- **Cisco DNA Advantage** provides for Advanced WAN topologies, Application aware policies supported by enhanced network security
- The **Cisco DNA Premier** provides for Cloud connectivity with unlimited segmentation, Advanced Application optimization & Network Analytics, secured by advanced threat protection

For more information please refer to <https://www.cisco.com/c/dam/en/us/products/collateral/software/dna-software-routing-subscription.pdf>

⁸ Unified Communications is not supported by ISR4221

⁹ The change to 250Mbps was achieved in the IOS-XE version 16.8.1 pursuant to revised Federal regulations

Smart Software Licensing Support for IOS-XE

IOS-XE supports Smart Licensing beginning with image version 16.6.1 and Device Led Conversion with image version 16.9.1. Smart Software licensing is a simplified license management system that delivers visibility into customer license ownership and consumption. Licenses are managed through a central Cisco Smart License cloud portal (CSSM). The cloud portal maintains an account of what the customer has bought and what they are using, thus alerting the customer if they go out of compliance. Customers can determine what licenses they own and how they are being used. Customers benefit from being able to pool available licenses thus providing for a more straightforward license usage across like-platforms, thus decreasing operational costs.

While customers can purchase existing SKU's, they must mandatorily create a Smart Account when implementing Smart Licensing. One or more Virtual Accounts maybe created under the Smart Account to enable the organization to logically segregate the purchased licenses. Device Led Conversion (DLC) allows the customer to convert all existing PAK and RTU licenses on the router into a Smart License. For more information, refer to the link at <https://www.cisco.com/c/en/us/products/software/smart-accounts/software-licensing.html>.

Cisco ISR 4000 Bundles

Cisco ISR 4000 is available is several attractive bundles. The AX bundles integrate Cisco Wide Area Application Services (WAAS), Security (SEC), and Data (DATA) licenses into a single bundle that is simple to order, configure, and deploy. For customers who are also interested in voice along with all of these features, AXV presents an attractive option. See Table 6 for details.

Table 5. Cisco ISR 4000 Feature Bundles

Bundles	Features
Application Experience with Voice (AXV)	AX + Voice
Voice with Security (VSEC)	Voice + Security
Application Experience (AX)	IP Base + Security + advanced networking protocols: L2TPv3, BFD, MPLS, VRF, VXLAN ¹⁰ (Bandwidth <100Mbps) Application Experience: PfRv3, WAAS with AppNav, NBAR2, AVC, IP SLA Hybrid Cloud Connectivity: LISP, OTV (for Bandwidth <100Mbps), VPLS, EoMPLS Intelligent Web Caching: Akamai Connect
Voice (V)	IP Base + Unified Communications: CME, SRST, CUBE
Security (SEC)	IP Base + Advanced Security: Zone Based Firewall, IPSec VPN, EZVPN, DMVPN, FlexVPN

Note: ISR4221/K9 does not support UC (Voice), hence no V, VSEC, AXV bundles for ISR4221/K9

More information on ISR AX bundles is available at <https://www.cisco.com/go/ax>.

A pay-as-you-grow licensing model lets you increase the performance level for the platforms from the base level to a higher level. So you can purchase at an attractive entry-level price point and increase the performance level as your business demand grows. Table 7 describes the performance licenses.

¹⁰ Supported only on the ISR4451

Table 6. Cisco ISR 4000 Performance Licenses

Platform	Performance-on-Demand License	Features
ISR4461	FL-4460-PERF-K9	Increases the performance from base performance 1.5 Gbps to 3 Gbps
ISR4451	FL-44-PERF-K9	Increases the performance from base performance 1 Gbps to 2 Gbps
ISR4431	FL-44-PERF-K9	Increases the performance from base performance 500 Mbps to 1 Gbps
ISR4351	FL-4350-PERF-K9	Increases the performance from base performance 200 Mbps to 400 Mbps
ISR4331	FL-4330-PERF-K9	Increases the performance from base performance 100 Mbps to 300 Mbps
ISR4321	FL-4320-PERF-K9	Increases the performance from base performance 50 Mbps to 100 Mbps
ISR4221	FL-4220-PERF-K9	Increases the performance from base performance 35 Mbps to 75 Mbps

Table 7. Cisco ISR 4000 Booster (boost) Performance Licenses

Part number	Description
FL-4220-BOOST-K9 (=)	Booster Performance License for 4220 Series Router
FL-4320-BOOST-K9 (=)	Booster Performance License for 4320 Series Router
FL-4330-BOOST-K9 (=)	Booster Performance License for 4330 Series Router
FL-4350-BOOST-K9 (=)	Booster Performance License for 4350 Series Router
FL-4430-BOOST-K9 (=)	Booster Performance License for 4430 Series Router
FL-44-BOOST-K9 (=)	Booster Performance License for 4450 Series Router
FL-4460-BOOST-K9 (=)	Booster Performance License for 4460 Series Router

Ordering Information

The Cisco ISR 4000 Family is orderable and shipping. To place an order, refer to Table 8 below and visit the [Cisco Ordering Home Page](#).

Table 8. Cisco ISR 4000 Series Ordering Information

Product Name	Product Description
ISR4461/K9	Cisco ISR 4461 with 4 onboard GE, 3 NIM slots, 1 ISC slot, 3 SM slots, 8 GB Flash Memory default, 2 GB DRAM default (data plane), 4 GB DRAM default (control plane)
ISR4451-X/K9	ISR 4451 with 4 onboard GE, 3 NIM slots, 1 ISC slot, 2 SM slots, 8 GB Flash Memory default, 2 GB DRAM default (data plane), 4 GB DRAM default (control plane)
ISR4431/K9	ISR 4431 with 4 onboard GE, 3 NIM slots, 1 ISC slot, 8GB Flash Memory default, 2 GB DRAM default (data plane), 4 GB DRAM default (control plane)
ISR4351/K9	ISR 4351 with 3 onboard GE, 3 NIM slots, 1 ISC slot, 2 SM slots, 4 GB Flash Memory default, 4 GB DRAM default
ISR4331/K9	ISR 4331 with 3 onboard GE, 2 NIM slots, 1 ISC slot, 1 SM slots, 4 GB Flash Memory default, 4 GB DRAM default
ISR4321/K9	ISR 4321 with 2 onboard GE, 2 NIM slots, 1 ISC slot, 4 GB Flash Memory default, 4 GB DRAM default
ISR4221/K9	ISR 4221 with 2 onboard GE, 2 NIM slots, 1 ISC slot, 8 GB Flash Memory default, 4 GB DRAM default

For additional product numbers, including the Cisco 4000 Family bundle offerings, please contact your local Cisco account representative. To place an order, visit the [Cisco Ordering Home Page](#). To download software, visit the [Cisco Software Center](#).

Integrated Services Router Migration Options

The Cisco ISR 4000 Family is included in the standard Cisco Technology Migration Program (TMP). Refer to <https://www.cisco.com/go/tmp> and contact your local Cisco account representative for program details.

Warranty Information

The Cisco ISR 4000 Series Integrated Services Routers have a go-day limited liability warranty.

Cisco and Partner Services for the Branch Office

Services from Cisco and our certified partners help you transform the branch-office experience and accelerate business innovation and growth. We have the expertise to create a clear, replicable, optimized branch-office footprint across technologies. Planning and design services align technology with your business goals and can increase deployment efficiency. Technical services help you improve operational efficiency, save money, and mitigate risk. Optimization services help you continuously improve performance and succeed with new technologies. For more information, please visit <https://www.cisco.com/go/services>.

Cisco SMARTnet[®] technical support for the Cisco ISR 4000 Family 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 for protocol, security, bandwidth, and feature improvements
- Full access rights to Cisco.com technical libraries for technical assistance, electronic commerce, and product information
- Access 24 hours a day to the industry's largest dedicated technical support staff

Cisco Capital

Flexible payment solutions to help you achieve your objectives

Cisco Capital makes it easier to get the right technology to achieve your objectives, enable business transformation and help you stay competitive. We can help you reduce the total cost of ownership, conserve capital, and accelerate growth. In more than 100 countries, our flexible payment solutions can help you acquire hardware, software, services and complementary third-party equipment in easy, predictable payments. [Learn more.](#)

For More Information

For more information about the Cisco ISR 4000 Family, visit <https://www.cisco.com/go/ISR4K> or contact your local Cisco account representative.

Document History

New or revised topic	Described In	Date
Change 4461 from 2RU to 3RU	Sizing Section	December 4, 2018
Added 4461 and SD-WAN		November 13, 2018
Added support for Cisco SD-WAN with IOS XE SD-WAN, 16.9.1 software release. Added Encrypted Traffic Analytics as well as Boost Performance Licensing support information.	Ordering Information	August 8, 2018
Added new ISR 4000 Series model, the ISR 4221. Updated all related modules, memory, licenses and bundles support related to the ISR 4221.	Features and Benefits	August 23, 2017

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Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at <https://www.cisco.com/go/offices>.

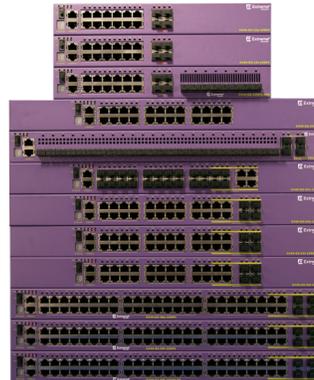
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Highlights

- Scalable cost-effective edge switches
- 12, 24, and 48-port Gigabit Ethernet connectivity
- 4 x 1Gb uplinks upgradeable to 10Gb via software license
- PoE/PoE+ models for powered connection of edge devices
- SFP and 100Base-FX fiber model options
- AC and DC Power options
- Non-blocking, wire-speed design
- Up to 8-unit 40Gb stacking via SummitStack-V
- Role-based policy and Fabric Attach for secure, automated access to network applications or services

Smart Management Choices

- ExtremeCloud™ IQ for powerful, simple and secure public or private cloud management
- Extreme Management Center for centralized, unified management capabilities
- Extreme Cloud Appliance for campus or private cloud requirements



ExtremeSwitching™ X440-G2

Scalable Cost-Effective Edge Switch with ExtremeXOS Operating System

Product Overview

The ExtremeSwitching X440-G2 series is a scalable cost-effective family of edge switches powered by Extreme Networks ExtremeXOS, a highly resilient OS providing continuous uptime, manageability and operational efficiency. The X440-G2 series switches provide high-performance routing and switching, flexible stacking, PoE+ support and comprehensive security, while extending the benefits of ExtremeXOS to the campus edge.

The X440-G2 Series easy-to-use, yet powerful, management options include ExtremeCloud™ IQ, Extreme Management Center and Extreme Cloud Appliance for either cloud-based or on-premise oversight and configuration. The X440-G2 also supports role-based policies and Fabric Attach for secure, automated access to specific network resources and applications.



ExtremeSwitching™ X450-G2



Built to Suit Your Business Needs

Extreme Elements are the building blocks that allow you to tailor your network to your specific business environment, goals, and objectives. They enable the creation of an Autonomous Network that delivers the positive experiences and business outcomes most important to your organization.

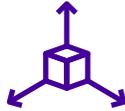
Combining architecture, automation, and artificial intelligence, Extreme Elements enable you to ensure that your users get what they need — when and where they need it. Providing these superior user experiences is as simple as mixing and matching the right elements.

Learn more at extremenetworks.com/elements.



Intelligent Switching

The X440-G2 Series supports sophisticated and intelligent Layer 2 switching, as well as Layer 3 IPv4/IPv6 routing. They also support role-based policy capabilities, bidirectional Access Control Lists, as well as granular (8 Kbps) ingress/egress bandwidth control. Altogether, these enable fine-grained control over traffic flows, as well as controlled access to specific network services and applications.



Flexible 10Gb Upgrades

All X440-G2 base models come equipped with 4 upgradeable 1Gb ports, resident on either the faceplate or rear panel of each model. These 1Gb ports can be upgraded to 10Gb Ethernet via a simple software license. This gives administrators the option to increase switch uplink speeds without replacing the entire switch.



High-Performance Stacking

ExtremeXOS SummitStack-V capabilities allow up to eight X440-G2 switches to be stacked together via two of the native X440-G2 10Gb ports. This provides 40Gb per unit stacking and allows use of standard 10Gb Ethernet cabling and optics technologies, enabling long distance stacking connectivity of up to 40 Km.



Power over Ethernet (PoE)

X440-G2 Series switches support both IEEE 802.3at PoE+ and IEEE 802.3af PoE to enable connection of standards compliant PoE devices today and into the future. The X440-G2 can support full PoE+ 30W power across all 48 ports with an external redundant power supply (RPS).



Role-Based Policy

The X440-G2 supports role-based policies that can be centrally administered through the ExtremeControl policy manager. This policy framework empowers network administrators to define distinct roles or profiles to represent specific operational groups that may exist in an enterprise. Each defined role can then be granted individualized access to specific network services and applications and these access privileges remain associated with users as they move across both wired and wireless network access points.



Audio Video Bridging (AVB)

The X440-G2 series supports IEEE 802.1 Audio Video Bridging to enable reliable, real-time audio/video transmission over Ethernet. AVB technology delivers the quality of service required for today's high-definition and time-sensitive multimedia streams.



Management

The X440-G2 can be managed in a variety of ways. Simple on-box management functions are delivered by a web-based GUI, and a generic CLI is available for manual configuration.

ExtremeCloud™ IQ along with Extreme Management Center (XMC) and Extreme Cloud Appliance also provide a comprehensive unified management capability with a consolidated view of users, devices and applications for wired and wireless networks. Zero-touch provisioning lets one quickly bring new X440-G2 switches online and a granular view of devices, ports and users enables efficient inventory and network topology management.

Product Specifications

Performance and Scaling

Switch Model	Maximum 10/100/1000 Base-T Ports	Maximum Active 1Gb SFP Ports	Maximum 10Gb SFP+ Ports	Aggregated Switch Bandwidth*	Frame Forwarding Rate*
X440-G2-12t-10GE4	12	4	4 via license	104 GBPS	77.4 MPPS
X440-G2-24t-10GE4	24	8 (4 + 4 Combo)	4 via license	128 GBPS	95.2 MPPS
X440-G2-48t-10GE4	48	8 (2 + 6 Combo)	4 via license	176 GBPS	130.9 MPPS
X440-G2-12p-10GE4	12	4	4 via license	104 GBPS	77.4 MPPS
X440-G2-24p-10GE4	24	8 (4 + 4 Combo)	4 via license	128 GBPS	95.2 MPPS
X440-G2-48p-10GE4	48	8 (2 + 6 Combo)	4 via license	176 GBPS	130.9 MPPS
X440-G2-24t-10GE4-DC	24	8 (4 + 4 Combo)	4 via license	128 GBPS	95.2 MPPS
X440-G2-48t-10GE4-DC	48	8 (2 + 6 Combo)	4 via license ¹	176 GBPS	130.9 MPPS
X440-G2-24x-10GE4	4 Combo	28 (24 + 4 Combo)	4 via license	128 GBPS	95.2 MPPS
X440-G2-24fx-GE4	24 100 Base-FX	4	0	12.8 GBPS	9.5 MPPS
X440-G2-12t8fx-GE4	12 10/100/1000 + 8 100 Base-FX	4	0	33.6 GBPS	25.0 MPPS
X440-G2-24t-GE4	24 10/100/1000	4	0	56 GBPS	41.7 MPPS

¹ 2 10GBase-T combo ports

*with 10Gb licenses if available with license

- Less than 4 microsecond latency (64-byte)
- Layer 2/MAC Addresses: 16K
- IPv4 LPM Entries: 480
- IPv4 Hosts: 1000
- IPv6 LPM (64-bit) Entries: 240
- 4096 user-created VLAN/VMANs *
- 9216 Byte Max Packet Size (Jumbo Frame)
- 128 load sharing trunks, up to 8 members per trunk
- 1,024 ingress bandwidth meters, 256 egress meters
- Ingress and egress bandwidth policing/rate limiting per flow/ACL
- 8 QoS egress queues/port
- Egress bandwidth rate shaping per egress queue and per port.
- Rate Limiting Granularity: 8 Kbps
- Half-duplex 10/100 supported on the following 10/100/1000 ports:
 - 12 port switches: Ports 1-12
 - 24 port switches: Ports 1-16
 - 48 port switches: Ports 1-16 and Ports 25-40

* 2 VLANs reserved for system use

- LRM support on rear-panel SFP/SFP+ ports on all 48-port switches
- Policy Capabilities
 - Policy Profiles: 63
 - Rules per Profile: Up to 440
 - Authenticated Policy Users per Switch: Up to 1,536
 - Authenticated Policy Users per Port: Up to 1,536
 - Unique Permit/Deny Rules per switch: 440
 - MAC Rules: N/A
 - IPv4 Rules: 256
 - IPv6 Rules: N/A
 - L2 Rules: 184
- Rate Limiting: Per Class of Service

Specifications (cont.)

External Ports/Slots

Switch Hardware	Ports
X440-G2-12t-10GE4	<ul style="list-style-type: none"> • 12 x 10/100/1000BASE-T (RJ-45) • 4 x 1GBASE-X SFP (unpopulated front-panel ports) upgradeable to 10Gb Ethernet via licensing • 1 x Serial (console port RJ-45) with RTS/CTS modem control • 1 x 10/100/1000BASE-T out-of-band management port • Coaxial Barrel Connector RPS port
X440-G2-24t-10GE4	<ul style="list-style-type: none"> • 24 x 10/100/1000BASE-T (RJ-45) • 4 x 1GBASE-X SFP (unpopulated) combo ports • 4 x 1GBASE-X SFP (unpopulated rear-panel ports) upgradeable to 10Gb Ethernet via licensing • 1 x Serial (console port RJ-45) with RTS/CTS modem control • 1 x 10/100/1000BASE-T out-of-band management port • 2x7 RPS port
X440-G2-48t-10GE4	<ul style="list-style-type: none"> • 48 x 10/100/1000BASE-T (RJ-45) • 4 x 1GBASE-X SFP (unpopulated) combo ports • 2 x 1GbE copper combo ports upgradable to 10GbE on rear-panel • 4 x 1GBASE-X SFP (unpopulated rear-panel ports) upgradeable to 10Gb Ethernet via licensing • 1 x Serial (console port RJ-45) with RTS/CTS modem control • 1 x 10/100/1000BASE-T out-of-band management port • 2x7 RPS port
X440-G2-12p-10GE4	<ul style="list-style-type: none"> • 12 x 10/100/1000BASE-T PoE-Plus • 4 x 1GBASE-X SFP (unpopulated front-panel ports) upgradeable to 10Gb Ethernet via licensing • 1 x Serial (console port RJ-45) with RTS/CTS modem control • 1 x 10/100/1000BASE-T out-of-band management port • 2x7 RPS port
X440-G2-24p-10GE4	<ul style="list-style-type: none"> • 24 x 10/100/1000BASE-T PoE-Plus • 4 x 1GBASE-X SFP (unpopulated) combo ports • 4 x 1GBASE-X SFP (unpopulated rear-panel ports) upgradeable to 10Gb Ethernet via licensing • 1 x Serial (console port RJ-45) with RTS/CTS modem control • 1 x 10/100/1000BASE-T out-of-band management port • 2x7 RPS port
X440-G2-48p-10GE4	<ul style="list-style-type: none"> • 48 x 10/100/1000BASE-T PoE-Plus • 4 x 1GBASE-X SFP (unpopulated) combo ports • 2 x 1GbE copper combo ports upgradable to 10GbE on rear-panel • 4 x 1GBASE-X SFP (unpopulated rear-panel ports) upgradeable to 10Gb Ethernet via licensing • 1 x Serial (console port RJ-45) with RTS/CTS modem control • 1 x 10/100/1000BASE-T out-of-band management port • 2x9 RPS port
X440-G2-24t-10GE4-DC	<ul style="list-style-type: none"> • 24 x 10/100/1000BASE-T (RJ-45) • 4 x 1GBASE-X SFP (unpopulated) combo ports • 4 x 1GBASE-X SFP (unpopulated rear-panel ports) upgradeable to 10Gb Ethernet via licensing • 1 x Serial (console port RJ-45) with RTS/CTS modem control • 1 x 10/100/1000BASE-T out-of-band management port • 2x7 RPS port
X440-G2-48t-10GE4-DC	<ul style="list-style-type: none"> • 48 x 10/100/1000BASE-T (RJ-45) • 4 x 1GBASE-X SFP (unpopulated) combo ports • 2 x 1GbE copper combo ports upgradable to 10GbE on rear-panel • 4 x 1GBASE-X SFP (unpopulated rear-panel ports) upgradeable to 10Gb Ethernet via licensing • 1 x Serial (console port RJ-45) with RTS/CTS modem control • 1 x 10/100/1000BASE-T out-of-band management port • 2x7 RPS port
X440-G2-24x-10GE4	<ul style="list-style-type: none"> • 24 x SFP (unpopulated) • 4 x 10/100/1000 combo ports • 4 x 1GBASE-X SFP (unpopulated rear-panel ports) upgradeable to 10Gb Ethernet via licensing • 1 x Serial (console port RJ-45) with RTS/CTS modem control • 1 x 10/100/1000BASE-T out-of-band management port • 2x7 RPS port

Specifications (cont.)

Switch Hardware	Ports
X440-G2-24fx-GE4	<ul style="list-style-type: none"> • 24 x 100Base-FX - LC connectors • 4 x 1GBASE-X SFP (unpopulated front-panel ports) • 1 x Serial (console port RJ-45) with RTS/CTS modem control • 1 x 10/100/1000BASE-T out-of-band management port • 2x7 RPS port
X440-G2-12t8fx-GE4	<ul style="list-style-type: none"> • 12 x 10/100/1000BASE-T with 8 x 100Base-FX - LC connectors • 4 x 1GBASE-X SFP (unpopulated front-panel ports) • 1 x Serial (console port RJ-45) with RTS/CTS modem control • 1 x 10/100/1000BASE-T out-of-band management port • 2x7 RPS port
X440-G2-24t-GE4	<ul style="list-style-type: none"> • 24 x 10/100/1000BASE-T (RJ-45) • 4 x 1GBASE-X SFP (unpopulated rear-panel ports) • 1 x Serial (console port RJ-45) with RTS/CTS modem control • 1 x 10/100/1000BASE-T out-of-band management port • 2x7 RPS port

Physical

Switch Model	Weight	Height	Width	Depth
X440-G2-12t-10GE4	5.82 lb (2.64 kg)	1 RU / 1.73 inches (4.4 cm)	12.01 inches (30.5 cm)	10.28 inches (26.1 cm)
X440-G2-24t-10GE4	8.07 lb (3.66 kg)	1 RU / 1.73 inches (4.4 cm)	17.36 inches (44.1 cm)	10.01 inches (25.4 cm)
X440-G2-48t-10GE4	11.22 lb (5.09 kg)	1 RU / 1.73 inches (4.4 cm)	17.36 inches (44.1 cm)	14.51 inches (36.85 cm)
X440-G2-12p-10GE4	6.66 lb (3.02 kg)	1 RU / 1.73 inches (4.4 cm)	12.01 inches (30.5 cm)	10.28 inches (26.1 cm)
X440-G2-24p-10GE4	9.44 lb (4.28 kg)	1 RU / 1.73 inches (4.4 cm)	17.36 inches (44.1 cm)	10.01 inches (25.4 cm)
X440-G2-48p-10GE4	14.55 lb (6.60 kg)	1 RU / 1.73 inches (4.4 cm)	17.36 inches (44.1 cm)	14.51 inches (36.85 cm)
X440-G2-24t-10GE4-DC	8.07 lb (3.66 kg)	1 RU / 1.73 inches (4.4 cm)	17.36 inches (44.1 cm)	10.01 inches (25.4 cm)
X440-G2-48t-10GE4-DC	11.20 lb (5.08 kg)	1 RU / 1.73 inches (4.4 cm)	17.36 inches (44.1 cm)	14.51 inches (36.85 cm)
X440-G2-24x-10GE4	8.22 lb (3.73 kg)	1 RU / 1.73 inches (4.4 cm)	17.36 inches (44.1 cm)	10.01 inches (25.4 cm)
X440-G2-24fx-GE4	8.66 lb (3.93 kg)	1 RU / 1.73 inches (4.4 cm)	17.36 inches (44.1 cm)	10.01 inches (25.4 cm)
X440-G2-12t8fx-GE4	6.50 lb (2.95 kg)	1 RU / 1.73 inches (4.4 cm)	12.01 inches (30.5 cm)	10.28 inches (26.1 cm)
X440-G2-24t-GE4	7.98 lb (3.62 kg)	1 RU / 1.73 inches (4.4 cm)	17.36 inches (44.1 cm)	10.01 inches (25.4 cm)

CPU/Memory

- 64-bit MIPS Processor, 1 GHz clock, single core
- 1GB ECC DDR3 DRAM
- 4GB eMMC Flash
- 1.5MB packet buffer on 12 - 24 port switches, 3.0MB packet buffer on 48 port switches

LED Indicators

- Per port status LED including power status.
- System Status LEDs: management, fan and power.
- 7 segment display of stack number - operational on switches that support stacking.

Stacking

- SummitStack-V with support for up to eight switches per stack.
- Mixed stacking with other ExtremeXOS Series switches, so long as all are running the same ExtremeXOS version.
- Requires two of the four available X440-G2 uplink ports.

Note: SummitStack-V stacking is enabled on two of the four X440-G2 uplink ports by default (no license required). All stacking ports operate at 10Gb, but do not use standard Ethernet protocols. X440-G2 uplink ports, when not used for stacking, run the standard Ethernet protocol. Non-stacking uplink ports are limited by default to 1GbE, unless upgraded via software license. 10GbE licenses are available, in both two- and four-port versions, as well as a license to upgrade a dual 10GbE uplink switch to a four 10GbE uplink switch, that enable X440-G2 uplink ports to run the 10Gb Ethernet protocol.

Mapping of the two default X440-G2 stacking ports to their respective physical chassis interface #'s – by chassis type – are listed below.

X440-G2 Switches*	Stack Port #	Physical Uplink Port # On Chassis
48 Port Models	1	49 (Rear Panel, Dedicated SFP+ Port)
	2	50 (rear panel, dedicated SFP+ port)
24 Port Models	1	27 (Rear Panel)
	2	28 (Rear Panel)
12 Port Models	1	15 (Front Panel)
	2	16 (Front Panel)

*The three extended temperature X440-G2 models (16539, 16540 and 16541) do NOT stack.

Minimum/Maximum Power Consumption and Heat Dissipation

Switch Model	Minimum ¹ Heat Dissipation (BTU/HR)	Minimum ¹ Power Consumption (Watts)	Maximum ¹ Heat Dissipation (BTU/Hr)	Maximum ² Power Consumption (Watts)
X440-G2-12t-10GE4	52	15	109	32
X440-G2-24t-10GE4	87	26	136	40
X440-G2-48t-10GE4	141	41	208	61
X440-G2-12p-10GE4	72	21	216 (@200W PoE)	264
X440-G2-24p-10GE4	121	35	410 (@380W PoE)	500
X440-G2-48p-10GE4	196	53	755 (@740W PoE)	961
X440-G2-24t-10GE4-DC	77	23	134	39
X440-G2-48t-10GE4-DC	137	40	207	61
X440-G2-24x-10GE4	87	26	172	51
X440-G2-24fx-GE4	166	49	223	65
X440-G2-12t8fx-GE4	108	32	159	47
X440-G2-24t-GE4	76	22	130	38

¹ Idle no ports linked

² fans high all ports 100% traffic

The Non-PoE Extended Temperature Switches (X440-G2-24FX-GE4, X440-G2-12T8FX-GE4, X440-G2-24T-GE4)

	Fixed Internal Power Supply
Voltage Input Range	100 - 240 VAC [†]
Line Frequency Range	50 - 60 Hz +/- 5%
Power Supply Input Socket	IEC 320 C14
Power Cord Input Plug	IEC 320 C13
Operating Temperature	0° C to 60° C Normal Operation

The 12, 24, and 48 Port 10/100/1000 Models (Both PoE and Non-PoE)

	Fixed Internal Power Supply
Voltage Input Range	100 - 240 VAC [†]
Line Frequency Range	50 - 60 Hz +/- 5%
Power Supply Input Socket	IEC 320 C14
Power Cord Input Plug	IEC 320 C13
Operating Temperature	0° C to 50° C Normal Operation

[†] The power supplies will continue to operate +/- 10% of the rated input to accommodate temporary loss of input voltage regulation.

Power

Switch Model	Power Supply Input Socket	Power Supply Input Socket	Power Supply Cord Gauge	Redundant Power Supply Input Socket
X440-G2-12t-10GE4	IEC 320 C14	IEC 320 C13/C14	Min 18AWG/0.75mm ²	Coaxial Barrel Connector
X440-G2-24t-10GE4	IEC 320 C14	IEC 320 C13/C14	Min 18AWG/0.75mm ²	2x7 Terminal Block
X440-G2-48t-10GE4	IEC 320 C14	IEC 320 C13/C14	Min 18AWG/0.75mm ²	2x7 Terminal Block
X440-G2-12p-10GE4	IEC 320 C14	IEC 320 C13/C14	Min 18AWG/0.75mm ²	2x7 Terminal Block
X440-G2-24p-10GE4	IEC 320 C14	IEC 320 C13/C14	Min 18AWG/0.75mm ²	2x7 Terminal Block
X440-G2-48p-10GE4	IEC 320 C14	IEC 320 C13/C14	Min 16AWG/1.25mm ² (100-125VAC), Min 18AWG/.75mm ² (200-240VAC)	2x9 Terminal Block
X440-G2-24t-10GE4-DC	#6 Terminal Block	23	Min 14AWG/2.0mm ²	2x7 Terminal Block
X440-G2-48t-10GE4-DC	#6 Terminal Block	40	Min 14AWG/2.0mm ²	2x7 Terminal Block
X440-G2-24x-10GE4	IEC 320 C14	IEC 320 C13/C14	Min 18AWG/0.75mm ²	2x7 Terminal Block
X440-G2-24fx-GE4	IEC 320 C14	IEC 320 C13/C14	Min 18AWG/0.75mm ²	2x7 Terminal Block
X440-G2-12t8fx-GE4	IEC 320 C14	IEC 320 C13/C14	Min 18AWG/0.75mm ²	2x7 Terminal Block
X440-G2-24t-GE4	IEC 320 C14	IEC 320 C13/C14	Min 18AWG/0.75mm ²	2x7 Terminal Block

PoE Power Budget

Switch Model	Power Supply Input Socket	Redundant Power Supply Input Socket
X440-G2-12p-10GE4	200 W	200 W – Redundant Power Only
X440-G2-24p-10GE4	380 W	380 W – Redundant Power Only
X440-G2-48p-10GE4	740 W	1440 W – Additive Power 740 W – Redundant Power

Environmental

Environmental Specifications

- EN/ETSI 300 019-2-1 v2.1.2 - Class 1.2 Storage
- EN/ETSI 300 019-2-2 v2.1.2 - Class 2.3 Transportation
- EN/ETSI 300 019-2-3 v2.1.2 - Class 3.1e Operational
- EN/ETSI 300 753 (1997-10) - Acoustic Noise
- ASTM D3580 Random Vibration Unpackaged 1.5 G

Environmental Compliance

- EU RoHS - 2011/65/EU
- EU WEEE - 2012/19/EU
- China RoHS - SJ/T 11363-2006
- Taiwan RoHS CNS 15663(2013.7)

Operating Conditions

- Temp: 0° C to 50° C (32° F to 122° F) - all models
- Temp: 0° C to 60° C (32° F to 140° F) - extended temperature range models only (16539, 16540 and 16541)
- Humidity: 10% to 95% relative humidity, non-condensing
- Altitude: 0 to 3,000 meters (9,842 feet) - All Switch Models
- Shock (half sine): 30 m/s² (3 G), 11 ms, 6 shocks
- Random vibration: 3 to 500 Hz at 1.5 G rms

Packaging and Storing Specifications

- Temp: -40° C to 70° C (-40° F to 158° F)
- Humidity: 10% to 95% relative humidity, non-condensing
- Packaged Shock (half sine): 180 m/s² (18 G), 6 ms, 600 shocks
- Packaged Vibration: 5 to 62 Hz at velocity 5 mm/s, 62 to 500 Hz at 0.2 G
- Packaged Random Vibration: 5 to 20 Hz at 1.0 ASD w/-3 dB/oct. from 20 to 200 Hz
- Packaged Drop Height: 14 drops minimum on sides and corners at 42 inches (<15 kg box)

Regulatory and Safety

North American ITE

- UL 60950-1 2nd edition A2:2014, Listed Device (U.S.)
- CSA 22.2 No. 60950-1 2nd edition 2014(Canada)
- Complies with FCC 21CFR 1040.10 (U.S. Laser Safety)
- CDRH Letter of Approval (US FDA Approval)

European ITE

- EN 60950-1:2006+A11:2009+A1:2010+A12:2011+A2:2013 2nd Ed.
- EN 60825-1:2007 / IEC 60825-1:2007 Class 1
- (Lasers Safety)
- 2014 / 35/ EU Low Voltage Directive

International ITE

- CB Report & Certificate per IEC 60950-1 : 2005+A1:2009+A2:2013 + National Differences
- AS/NZS 60950-1 (Australia /New Zealand)

EMI/EMC Standards

North American EMC for ITE

- FCC CFR 47 part 15 Class A (USA)
- ICES-003 Class A (Canada)

European EMC Standards

- EN 55032:2015 Class A
- EN 55024:2010
- EN 61000-3-2: 2014 (Harmonics)
- EN 61000-3-3: 2013 (Flicker)
- EN 300 386 v1.6.1 (EMC Telecommunications)
- 2014/30/EU EMC Directive

International EMC Certifications

- CISPR 32:2015, Class A (International Emissions)
- AS/NZS CISPR32:2015
- CISPR 24:2010 Class A (International Immunity)
- IEC 61000-4-2:2008/EN 61000-4-2:2009 Electrostatic Discharge, 8kV Contact, 15 kV Air, Criteria B
- IEC 61000-4-3:2010/EN 61000-4-3:2006 +A1:2008 +A2:2010 Radiated Immunity 10V/m, Criteria A
- IEC 61000-4-4:2012. / EN 61000-4-4:2012 Transient Burst, 1 kV, Criteria A
- IEC 61000-4-5:2014 /EN 61000-4-5:2014 Surge, 1 kV L-L, 2 kV L-G, Level 3, Criteria B
- IEC 61000-4-6:2013/EN 61000-4-6:2014 Conducted Immunity, 0.15-80 MHz, 10Vrms, 80%AM (1kHz) Criteria A
- IEC/EN 61000-4-11:2004 Power Dips & Interruptions, >30%, 25 periods, Criteria C

Country Specific

- VCCI Class A (Japan Emissions)
- ACMA RCM (Australia Emissions)
- CCC Mark
- KCC Mark, EMC Approval (Korea)

Telecom Standards

- CE 2.0 Compliant

IEEE 802.3 Media Access Standards

- IEEE 802.3ab 1000BASE-T
- IEEE 802.3z 1000BASE-X
- IEEE 802.3ae 10GBASE-X
- IEEE 802.3at PoE-Plus

Fan and Acoustic Noise

Switch Model	Acoustic Information	
	Bystand Sound Pressure*	Declared Sound Power (LWAD)*
X440-G2-12t-10GE4	0 dB(A) Fan Off	0 bels Fan Off
X440-G2-24t-10GE4	28.1 dB(A)	4.3 bels
X440-G2-48t-10GE4	37.9 dB(A)	5.4 bels
X440-G2-12p-10GE4	0 dB(A) Fan Off	0 bels Fan Off
X440-G2-24p-10GE4	39.4 dB(A)	5.5 bels
X440-G2-48p-10GE4	48.7 dB(A)	6.4 bels
X440-G2-24t-10GE4-DC	28.1 dB(A)	4.3 bels
X440-G2-48t-10GE4-DC	37.9 dB(A)	5.4 bels
X440-G2-24x-10GE4	26.8 dB(A)	4.0 bels
X440-G2-24fx-GE4	24.7 dB(A)	3.9 bels
X440-G2-12t8fx-GE4	23.3 dB(A)	4.0 bels
X440-G2-24t-GE4	28.1 dB(A)	4.3 bels

External Redundant Power Supplies For Non-PoE Switches

All X440-G2 series non-PoE switches ship with one fixed internal power supply. If redundancy is required, an external RPS can be attached to the switch.

Model Number	Description
RPS-90	External redundant power supply Unit 90 Watts with cable for X440-G2-12t-10GE4 , Power cord ordered separately, order 10947 C5 to C14 Converter to utilize a C13 power cord.
STK-RPS-150PS	150 watt non-PoE redundant power supply for A, B, C, X450-G2 and X440-G2 switches, power cord ordered separately.
STK-RPS-150CH2	2-Slot modular shelf for rack-mounting 150W redundant power supplies (STK-RPS-150PS).
STK-RPS-150CH8	8-Slot modular shelf for rack-mounting 150W redundant power supplies (STK-RPS-150PS).
RPS-150XT	External redundant power supply unit 150 Watts with cable - Extended Temperature Range from 0 to +60 degrees Celsius, power cord ordered separately.
STK-RPS-1005CH3	3-Slot modular shelf for rack-mounting 150W extended temperature redundant power supplies (RPS-150XT) or 1005W PoE+ redundant power supplies (STK-RPS-1005PS).
EPS-C2	External Power System Chassis 2. Accepts up to three 750W AC PoE PSU 48V power supplies. Accepts up to 5 EPSCBL-2x7 or up to 1 EPS-CBL-2x9 cables. Ships with one EPS-CBL-2x7 cable.
EPS-CBL-2x7	External Power System Cable (1M) that connects EPS-C2 to any X440 or X450-G2 non-PoE switch for providing redundant DC power.
750W AC PSU	AC Power Supply module for EPS-C2 Chassis Redundant Power Supply, power cord ordered separately.

External Redundant Power Supplies For PoE X440-G2 Switches

All X440-G2 series PoE switches ship with fixed internal power supplies.

RPS Use Table	RPS-90	STK-RPS-150PS	RPS-150XT	EPS-C2	RPS-500P	STK-RPS-1005PS
12t	X					
24t, 24x, 48t, 24fx, 12t8fx		X	X	X	X	
12p and 24p				X	X	
48p						X

RPS Model	Redundant Power Supply Output
RPS-90	Coaxial Barrel Connector
STK-RPS-150PS	1 terminal block of 2x7 pins - provides system power and up to 150 watts of power
RPS-150XT	1 terminal block of 2x7 pins - provides system power and up to 150 watts of power
EPS-C2	1 terminal block of 2x9 pins - used for other Summit switches 5 terminal blocks of 2x7 pins - used for Summit X440-G2's
RPS-500p	1 terminal block of 2x7 pins - provides system power and up to 380 watts of IEEE802.3at power
STK-RPS-1005PS	1 terminal block of 2x9 pins - provides system power and up to 740 watts of IEEE802.3at power

RPS Model	Allowable PSU	Power Cord Input Plug/Socket	Power Cord Gauge
RPS-90	Not Applicable	IEC 320 C5/C14	Min 18AWG/0.75mm ²
STK-RPS-150PS	Not Applicable	IEC 320 C13/C14	Min 18AWG/0.75mm ²
RPS-150XT	Not Applicable	IEC 320 C13/C14	Min 18AWG/0.75mm ²
EPS-C2	Summit 750W PoE AC PSU	IEC 320 C13/C14	Min 18AWG/0.75mm ²
RPS-500p	Not Applicable	IEC 320 C13/C14	Min 18AWG/0.75mm ²
STK-RPS-1005PS	Not Applicable	IEC 320 C13/C16	Min 16AWG/1.25mm ² (100-125VAC), Min 18AWG/.75mm ² (200-240VAC)

RPS Model	Weight	Dimensions
RPS-90	0.73 lb (0.33 kg)	Height: 1.06 inches (2.69 cm) Width: 5.20 inches (13.21 cm) Depth: 2.25 inches (5.72 cm)
STK-RPS-150PS	3.85 lb (1.75 kg)	Height: 2.04 inches (5.2 cm) Width: 7.7 inches (19.6 cm) Depth: 10.1 inches (25.7 cm)
RPS-150XT	3.22 lb (1.46 kg)	Height: 1.77 inches (4.50 cm) Width: 6.07 inches (15.42 cm) Depth: 13.00 inches (33.02 cm)
EPS-C2	2.27 lb (1.03 kg)	Height: 1RU, 1.73 inches (4.4 cm) Width: 17.4 inches (44.1 cm) Depth: 15.1 inches (38.4 cm)
RPS-500p	8.06 lb (3.66 kg)	Height: 1RU, 1.73 inches (4.4 cm) Width: 17.4 inches (44.1 cm) Depth: 7.9 inches (20.1 cm)
STK-RPS-1005PS	4.63 lb (2.1kg)	Height: 1.77 inches (4.5 cm) Width: 6.07 inches (15.42 cm) Depth: 13.39 inches (34.0 cm)

Ordering Notes

All X440-G2 switches ship with fixed fans and power supplies:

- All the X440-G2 switches support optional external redundant power supplies (RPS).

- The following three switch models that support OC to 60C are NOT upgradeable to 10GbE:

- X440-G2-24fx-GE4
- X440-G2-12t8fx-GE4
- X440-G2-24t-GE4

Ordering Information

Part Number	Name	Description
16530	X440-G2-12t-10GE4	X440-G2 12 10/100/1000BASE-T, 4 1GbE unpopulated SFP upgradeable to 10GbE SFP+, 1 Fixed AC PSU, 1 RPS port, ExtremeXOS Edge license
16531	X440-G2-12p-10GE4	X440-G2 12 10/100/1000BASE-T POE+, 4 1GbE unpopulated SFP upgradeable to 10GbE SFP+, 1 Fixed AC PSU, 1 RPS port, ExtremeXOS Edge license
16531T	X440-G2-12p-10GE4-TAA	X440-G2 12 10/100/1000BASE-T POE+, 4 1GbE unpopulated SFP upgradeable to 10GbE SFP+, 1 Fixed AC PSU, 1 RPS port, ExtremeXOS Edge license, TAA model
16532	X440-G2-24t-10GE4	X440-G2 24 10/100/1000BASE-T, 4 SFP combo, 4 1GbE unpopulated SFP upgradeable to 10GbE SFP+, 1 Fixed AC PSU, 1 RPS port, ExtremeXOS Edge license
16532T	X440-G2-24t-10GE4-TAA	X440-G2 24 10/100/1000BASE-T, 4 SFP combo, 4 1GbE unpopulated SFP upgradeable to 10GbE SFP+, 1 Fixed AC PSU, 1 RPS port, ExtremeXOS Edge license, TAA model
16533	X440-G2-24p-10GE4	X440-G2 24 10/100/1000BASE-T POE+, 4 SFP combo, 4 1GbE unpopulated SFP upgradeable to 10GbE SFP+, 1 Fixed AC PSU, 1 RPS port, ExtremeXOS Edge license
16533T	X440-G2-24p-10GE4-TAA	X440-G2 24 10/100/1000BASE-T POE+, 4 SFP combo, 4 1GbE unpopulated SFP upgradeable to 10GbE SFP+, 1 Fixed AC PSU, 1 RPS port, ExtremeXOS Edge license, TAA model
16534	X440-G2-48t-10GE4	X440-G2 48 10/100/1000BASE-T, 4 SFP combo, 4 1GbE unpopulated SFP upgradeable to 10GbE SFP+ (2 combo/2 non-combo), 2 1GbE copper combo upgradeable to 10GbE, 1 Fixed AC PSU, 1 RPS port, ExtremeXOS Edge license
16535	X440-G2-48p-10GE4	X440-G2 48 10/100/1000BASE-T POE+, 4 SFP combo, 4 1GbE unpopulated SFP upgradeable to 10GbE SFP+ (2 combo/2 non-combo), 2 1GbE copper combo upgradeable to 10GbE, 1 Fixed AC PSU, 1 RPS port, ExtremeXOS Edge license
16535T	X440-G2-48p-10GE4-TAA	X440-G2 48 10/100/1000BASE-T POE+, 4 SFP combo, 4 1GbE unpopulated SFP upgradeable to 10GbE SFP+ (2 combo/2 non-combo), 2 1GbE copper combo upgradeable to 10GbE, 1 Fixed AC PSU, 1 RPS port, ExtremeXOS, TAA model
16536	X440-G2-24t-10GE4-DC	X440-G2 24 10/100/1000BASE-T, 4 SFP combo, 4 1GbE unpopulated SFP upgradeable to 10GbE SFP+, 1 Fixed DC PSU, 1 RPS port, ExtremeXOS Edge license
16537	X440-G2-48t-10GE4-DC	X440-G2 48 10/100/1000BASE-T, 4 SFP combo, 4 1GbE unpopulated SFP upgradeable to 10GbE SFP+ (2 combo/2 non-combo), 2 1GbE copper combo upgradeable to 10GbE, 1 Fixed DC PSU, 1 RPS port, ExtremeXOS Edge license
16538	X440-G2-24x-10GE4	X440-G2 24 unpopulated 1000BASE-X SFP (4 combo), 4 10/100/1000 combo, 4 1GbE unpopulated SFP upgradeable to 10GbE SFP+, 1 Fixed AC PSU, 1 RPS port, ExtremeXOS Edge license
16538T	X440-G2-24x-10GE4-TAA	X440-G2 24 unpopulated 1000BASE-X SFP (4 combo), 4 10/100/1000 combo, 4 1GbE unpopulated SFP, upgradeable to 10GbE SFP+, 1 Fixed AC PSU, 1 RPS port, ExtremeXOS Edge license, TAA model
16539	X440-G2-24fx-GE4	X440-G2 24 fixed 100BASE-FX LC connectors, 4 1GBASE-X unpopulated SFP, 1 Fixed AC PSU, 1 RPS port, ExtremeXOS Edge license, 0°C to 60°C operation
16540	X440-G2-12t8fx-GE4	X440-G2 12 10/100/1000BASE-T plus 8 fixed 100BASE-FX LC connectors, 4 1GBASE-X unpopulated SFP, 1 Fixed AC PSU, 1 RPS port, ExtremeXOS Edge license, 0°C to 60°C operation
16541	X440-G2-24t-GE4	X440-G2 24 fixed 10/100/1000BASE-TX, 4 1GBASE-X unpopulated SFP, 1 Fixed AC PSU, 1 RPS port, ExtremeXOS Edge license, 0°C to 60°C operation
Firmware Licenses		
16521	X440 Adv. Edge License	ExtremeXOS Advanced Edge License for X440/X440-G2 series switches
16522	X440 OpenFlow Feature Pack	ExtremeXOS SDN - OpenFlow Feature Pack for X440/X440-G2 series switches
16523	X440 Multimedia(AVB) Feature Pack	ExtremeXOS Multimedia Service (Audio Video Bridging) Feature Pack for X440/X440-G2 series switches
16778	X440-G2 MACsec Feature Pack	MACsec Feature Pack for X440-G2 series switches. Enables MACsec when used with LRM/MACsec Adapter (10965)

Ordering Information (cont.)

Part Number	Name	Description
Firmware Licenses (cont.)		
16542	Dual 10GbE Upgrade License	License that converts the two non-stack 1GbE SFP ports to be 10GbE SFP+
16543	Quad 10GbE Upgrade License	License that converts four 1GbE SFP ports to be 10GbE SFP+
16546	Quad 10GbE Lic from Dual 10GbE Lic	Software license that upgrades an already licensed X440-G2 Dual 10GbE switch to a Quad 10GbE switch
Accessories		
10948	RPS-90	External Redundant Power Supply Unit 90 Watts with cable , Power cord ordered separately
10947	C5 to C14 Converter	Power dongle for converting an IEC C5 plug to IEC C14 plug - enables the use of to utilize a C13 power cord
STK-RPS-150PS	150W Non-PoE RPS	150 watt non-PoE redundant power supply for A, B, C and X450-G2 switches
STK-RPS-150CH2	2-Slot Modular Shelf	2-Slot Modular Shelf for rack mounting up to two 150 watt (STK-RPS-150PS) external redundant power supplies
STK-RPS-150CH8	8-Slot Modular Shelf	8-Slot Modular Shelf for rack mounting up to eight 150 watt (STK-RPS-150PS) external redundant power supplies
10932	RPS-150 XT	External Redundant Power Supply Unit 150 Watts with cable - Extended Temperature Range from 0 to +60 degrees Celsius, Power cord ordered separately
10923	RPS-500p	External PoE+ Redundant Power Supply Unit 500 Watts with cable, Power cord ordered separately
STK-RPS-1005PS	1005 W RPS	1005 watt 802.3at PoE external redundant power supply for C5 PoE and X440-48p switches
STK-RPS-1005CH3	3-Slot Modular Shelf	3-Slot Modular Shelf for rack mounting up to three of any combination of extended temperature 150 watt (10932 - RPS-150 XT) or STK-RPS-1005PS external redundant power supplies
10936	EPS-C2	External Power System Chassis 2. Accepts up to three 750W AC PoE PSU 48V power supplies. Accepts up to 5 EPS-CBL-2x7 or up to 1 EPS-CBL-2x9 cables
10939	EPS-CBL-2x7	External Power System Cable (1M with 2x7 pin) that connects EPS to any X440 or X450-G2 for providing redundant power
10931	750W AC PSU	AC Power Supply module for EPS-C2 Chassis Redundant Power Supply
10965	LRM/MACsec Adapter	LRM/MACsec Adapter, includes two host cables for host switch connection, and USB cable for optional power connection. Requires MACsec license on host switch.
10966	5-Unit Rack Mount Kit	Optional rack mount bracket for LRM/MACsec Adapter. Holds five units in 1RU
Optical Transceivers and Direct Attach Cables		
10051H	1000BASE-SX SFP, Hi	1000BASE-SX SFP, MMF 220 & 550 meters, LC connector, Industrial Temp
10052H	1000BASE-LX SFP, Hi	1000BASE-LX SFP, MMF 220 & 550 meters, SMF 10km, LC connector, Industrial Temp
10053H	1000BASE-ZX SFP, Hi	1000BASE-ZX SFP, SMF 70km, LC connector, Industrial Temp
10056H	1000BASE-BX-D BiDi SFP, Hi	1000BASE-BX-D SFP, 1490-nm TX/1310-nm RX wavelength, Industrial Temp
10057H	1000BASE-BX-U BiDi SFP, Hi	1000BASE-BX-U SFP, 1310-nm TX/1490-nm RX wavelength, Industrial Temp
10060	100FX/1000LX SFP2	100FX/1000LX SFP, SMF, LC Connector (Requires MCP and 6dB Attenuator for 100FX-MMF Operation)
10070H	10/100/1000BASE-T SFP, Hi ²	10/100/1000BASE-T, SFP, CAT 5 cable 100m, RJ-45 Connector, Industrial Temp ²
10071H	1000BASE-SX SFP 10 Pack, Hi	1000BASE-SX SFP 10 Pack, Industrial Temp
10072H	1000BASE-LX SFP 10 Pack, Hi	1000BASE-LX SFP 10 Pack, Industrial Temp
MGBIC-BX120-D	1000BASE-BX-D BiDi SFP 120Km	1 Gb, 1000Base-BX120-D Single Fiber SM, Bidirectional, 1590nm Tx / 1490nm Rx, 120 Km, Simplex LC SFP (must be paired with MGBIC-BX120-U), -40°C to +60°C
MGBIC-BX120-U	1000BASE-BX-U BiDi SFP 120Km	1 Gb, 1000Base-BX120-U Single Fiber SM, Bidirectional, 1490nm Tx / 1590nm Rx, 120 Km, Simplex LC SFP (must be paired with MGBIC-BX120-D), -40°C to +60°C
10063	100FX SFP ¹	100Mb, 100BASE-FX, MMF 2Km, LC ¹
10067	100BASE-FX SFP ¹	100BASE-FX SFP module, MMF 2km link, LC-connector for Fast Ethernet SFP Port ¹
10301	10GBASE-SR SFP+	10GBASE-SR SFP+, 850nm, LC Connector, transmission length of up to 300m on MMF
10302	10GBASE-LR SFP+	10GBASE-LR SFP+, 1310nm, LC Connector, transmission length of up to 10km on SMF
10309	10GBASE-ER SFP+	10GBASE-ER SFP+, 1550nm, LC connector, transmission length of up to 40km on SMF
10303	SFP+ LRM Module	10 Gigabit Ethernet SFP+ module, 1310nm, legacy MMF 220m link, LC connector

Ordering Information (cont.)

Part Number	Name	Description
Optical Transceivers and Direct Attach Cables		
10304	10GBASE-CR SFP+ 1m	10GBASE-CR SFP+ pre-terminated twin-ax copper cable with link lengths of 1m
10305	10GBASE-CR SFP+ 3m	10GBASE-CR SFP+ pre-terminated twin-ax copper cable with link lengths of 3m
10306	10GBASE-CR SFP+ 5m	10GBASE-CR SFP+ pre-terminated twin-ax copper cable with link lengths of 5m
10307	10GBASE-CR SFP+ 10m ³	10GBASE-CR SFP+ pre-terminated twin-ax copper cable with link lengths of 10m
10325	DWDM SFP+	10 Gigabit Ethernet SFP+ Tunable DWDM module, SMF 80km, LC connector
10338	10Gb SFP+ 10GBASE-T4	10Gb SFP+, 10GBASE-T RJ45, 30m with Cat6a4
10GB-ZR-SFPP	10GB 80KM SFP+	10Gb, 10GBASE-ZR, SM, 1550nm, 80Km, LC SFP+
10GB-BX40-D	10 GB, SINGLE FIBER SM, -D 40 KM	10Gb, Single Fiber SM, Bidirectional, 1330nm Tx / 1270nm RX, 40Km, Simplex LC SFP+ (must be paired with 10GB-BX40-U)
10GB-BX40-U	10 GB, SINGLE FIBER SM, -U 40 KM	10Gb, Single Fiber SM, Bidirectional, 1270nm Tx / 1330nm RX, 10Km, Simplex LC SFP+ (must be paired with 10GB-BX40-D)
10GB-BX10-D	10 GB, SINGLE FIBER SM, -U 10 KM	10Gb, Single Fiber SM, Bidirectional, 1330nm Tx / 1330nm RX, 40Km, Simplex LC SFP+ (must be paired with 10GB-BX10-U)
10GB-BX10-U	10 GB, SINGLE FIBER SM, -D 10 KM	10Gb, Single Fiber SM, Bidirectional, 1270nm Tx / 1330nm RX, 10Km, Simplex LC SFP+ (must be paired with 10GB-BX10-D)
10GB-F10-SFPP	10 GB, ACTIVE OPTICAL DAC, 10 M	10Gb, Active optical direct attach cable with 2 integrated SFP+ transceivers, 10m
10GB-F20-SFPP	10 GB, ACTIVE OPTICAL DAC, 20 M	10Gb, Active optical direct attach cable with 2 integrated SFP+ transceivers, 20m
MGBIC-BX40-D	1000BASE-BX40-D BIDIRECTIONAL SFP	1Gb, 1000Base-BX40-D Single Fiber SM, Bidirectional, 1490nm Tx / 1310nm RX, 40Km, Simplex LC SFP (must be paired with MGBIC-BX40-U), -40°C to +60°C
MGBIC-BX40-U	1000BASE-BX40-U BIDIRECTIONAL SFP	1Gb, 1000Base-BX40-U Single Fiber SM, Bidirectional, 1310nm Tx / 1490nm RX, 40Km, Simplex LC SFP (must be paired with MGBIC-BX40-D), -40°C to +60°C
MGBIC-BX10-D	1000BASE-BX-D SFP - 10KM	1Gb, 1000Base-BX10-D Single Fiber SM, Bidirectional, 1490nm Tx / 1310nm RX, 10Km, Simplex LC SFP (must be paired with MGBIC-BX10-U)
MGBIC-BX10-U	1000BASE-BX-U SFP - 10KM	1Gb, 1000Base-BX10-U Single Fiber SM, Bidirectional, 1310nm Tx / 1490nm RX, 10Km, Simplex LC SFP (must be paired with MGBIC-BX10-D)
I-MGBIC-LC03	Industrial 1000Base-LX 1310nm MMF Transceiver	-40°C to +60°C, 1Gb, 1000Base-LX, MM, 1310 nm, 2 km with 62.5 MMF, 1 km with 50 MMF, LC SFP
I-MGBIC-GSX	Industrial 1000Base-SX 850nm Transceiver	-40°C to +60°C, 1Gb, 1000Base-SX, IEEE 802.3 MM, 850nm Short Wave Length, 220/550m, LC SFP
I-MGBIC-GLX	Industrial 1000Base-LX 1310nm SM Transceiver	-40°C to +60°C, 1Gb, 1000Base-LX, MM - 550m, SM - 10 km, 1310 nm Long Wave Length, LC SFP, LC SFP
ExtremeCloud IQ Pilot Licenses		
XIQ-PIL-S-C-EW	XIQ Pilot SAAS Subscription and EW support (1 device)	ExtremeCloud IQ Pilot SaaS Subscription and EW SaaS support for one (1) device
XIQ-PIL-S-C-PWP	XIQ Pilot SAAS Subscription and PWP support (1 device)	ExtremeCloud IQ Pilot SaaS Subscription and PWP SaaS support for one (1) device
XIQ-PIL-S-OP-EW	XIQ Pilot RTU license and EW support (1 device)	ExtremeCloud IQ Pilot SW Subscription (RTU license, EW SW support for one (1) device
XIQ-PIL-S-OP-PWP	XIQ Pilot RTU License and PWP support (1 device)	ExtremeCloud IQ Pilot SW Subscription (RTU license, PWP SW support for one (1) device

¹ Supported in 24 SFP ports in 16538, not supported on SFP combo ports or SFP/SFP+ uplink ports.

² Supported in 24 SFP ports in 16538, not supported on SFP combo ports, 1Gb Mode Only on SFP/SFP+ uplink port.

³ Supported on 48 port 10GbE ports only

⁴ Supported configuration is to populate every other SFP+ port in system, with a maximum of half the 10Gb SFP+ ports configured with 10GBASE-T transceivers. An adjacent SFP+ port should remain unused for every 10GBASE-T SFP+ installed

Warranty

The X440-G2 Series is covered under Extreme's Limited Warranty Express. For warranty details, visit: <http://www.extremenetworks.com/go/warranty>

Power Cords

In support of the Extreme Networks Green initiatives, power cords can be ordered separately, but need to be specified at time of ordering. Please refer to www.extremenetworks.com/product/powercords/ for details on power cord availability for this product.

Maintenance Services

Extreme's maintenance and support services with 100% in-sourced engineering experts and over 90% first-person resolution ensure efficient operations of your business-essential network. 24x7x365 phone support, advanced part replacement, and on-site support augment your staff with experienced resources that help you mitigate critical network issues fast. Visit [Extreme Maintenance Services](#) for more information.



<http://www.extremenetworks.com/contact>

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EXHIBIT A - PRICING PAGE - STEP CG

TOTAL EQUIPMENT PRICE								
LOCATION - BUILDING 5, ROOM A-920 CHARLESTON, WV 25305								
Item Number	Quantity	Description	Unit Price	Smart Net Year (1)	Smart Net Year (2)	Smart Net Year (3)	Smart Net Year (4)	TOTAL
3.1.1	11	Cisco ISR 4321 Series Chassis Bundle item number ISR4321/K9 (Cisco ISR 4321 (2GE, 2NIM, 4G FLASH, 4G DRAM, IPB)) Router or equal with (4) years Smart Net or equal	\$808.29	\$202.07	\$202.07	\$202.07	\$202.07	\$17,782.27
3.1.2	7	Cisco ISR 4331 Series Chassis Bundle item number ISR4331/K9 (Cisco ISR 4331 (3GE, 2NIM, 1SM, 4G FLASH, 4G DRAM, IPB)) Router or equalwith (4) Years Smart Net or equal	\$1,308.51	\$291.69	\$291.69	\$291.69	\$291.69	\$17,326.89
3.1.3	60	Cisco ISR 1101 4 Ports GE Ethernet WAN Router, item number C1101-4P or equal. with (4) years Smart Net or equal	\$614.14	\$74.77	\$74.77	\$74.77	\$74.77	\$54,793.20
3.1.4	95	Extreme Networks 12 Port POE Switch, part number X440-G2 X440-G212p-10GE4 or equal	\$1,018.02					\$96,711.90
3.1.5	75	Extreme Networks 48 Port POE Switch, part number X440-G2 X440-G248p-10GE4 or equal.	\$2,281.52					\$171,114.00
3.1.6	20	Extreme Networks 24 Port POE Switch, part number X440-G2 X440-G2-24p-10GE4 or equal.	\$1,442.48					\$28,849.60
Total								\$386,577.86