ACX Series Universal Metro Routers

Product Overview

ACX Series Universal Metro Routers add operational intelligence to metro environments, providing the option to deploy packet optical, metro Ethernet, or IP/MPLS infrastructure. High-precision synchronization technology, industry-leading security, and high availability features enhance QoE, while extensive OAM, built-in advanced SLA management, and zero touch deployment capabilities reduce TCO. ACX Series platforms address a variety of service provider use cases, including business, cable distributed access architectures, residential fiber, and mobile backhaul, as well as enterprise applications for power utilities, oil and gas, mining, transportation, and defense and public safety industries.

Product Description

Juniper Networks® ACX Series Universal Metro Routers are Juniper's response to a shift in metro network architecture, where the access and aggregation layers are extending the operational intelligence from the service provider edge to the access network. The ACX Series simplifies access and aggregation architectures by eliminating unnecessary layers and network overlays, dramatically reducing CapEx and OpEx. Based on architectural simplification and cost reduction, the ACX Series enables service providers and enterprises to adopt the true universal metro paradigm. In addition to Metro Ethernet Forum (MEF) CE2.0 compliance for supporting both Ethernet and IP/MPLS, the ACX Series provides high capacity, scalability, and a secure packet optical transport layer, while delivering industry-leading performance with a wide range of port densities and interface types. Table 1 provides an overview of the interfaces supported on each ACX Series model. Flexibility and upgradability (the ability to mix and match interface types) makes the ACX Series ideal for a wide range of use cases.

ACX Series Product Family

The ACX Series Universal Metro Routers family includes multiple models, all targeted at different applications.

- **ACX500**: The ACX500 is a small form factor, hardened fanless router that delivers up to 6 Gbps throughput. It is ideal for small cell, LTE-Advanced mobile backhaul deployments, as well as use cases in the industrial environment. An ACX500-O version is available for outdoor deployment.
- **ACX1000**: The ACX1000 is a 1 U fanless router that delivers up to 60 Gbps through a fixed configuration of eight T1/E1 interfaces, eight copper 10/100/1000 GbE ports, and four GbE combination fiber/copper ports. It is designed for enterprise and service provider cabinet and tower deployments.
- **ACX1100**: The compact, 1 U, environmentally hardened ACX1100 is an Ethernet-only access router with a fixed configuration of eight copper GbE 10/100/1000 Mbps interfaces, and four GbE copper/fiber combination ports. It provides 60 Gbps performance, programmability, and a fanless passive cooling system that makes it ideal for external cabinet or tower installations.
- **ACX2100**: The ACX2100 features fanless passive cooling and a fixed port configuration that includes 16 T1/E1 interfaces, four copper 10/100/1000 Mbps interfaces, four combination copper/fiber GbE ports, two GbE small form-factor pluggable transceiver (SFP) ports, and two 10GbE SFP+ transceiver ports.
- **ACX2200**: The ACX2200 is a compact, Ethernet only, environmentally hardened router with fanless passive cooling and a fixed-port configuration featuring four copper 10/100/1000 Mbps interfaces, four combination copper/fiber GbE ports, two GbE SFP ports, and two 10 GbE SFP+ ports, making it ideal for IP-RAN deployments.
- **ACX4000**: The 2.5 U ACX4000 offers two Modular Interface Card (MIC) slots that can house 16 T1/E1 ports, 6 GbE copper/fiber combination ports, or 4 CHOC3/STM-1 ports. The platform also provides a number of fixed ports that include 2x10GbE,

2xGbE SFP, or 8xGbE copper/fiber combination. It is optimized to enhance the mobile subscriber experience while significantly improving network monetization for service providers.

- **ACX5000**: The ACX5000 line, which includes the ACX5048 and ACX5096, is ideal for metro Ethernet access and aggregation deployments in carrier Ethernet networks. Built to handle 1GbE/10GbE capacity and density, ACX5000 routers feature 40GbE interfaces for network-to-network (NNI) uplinks and full support of E-Line, E-LAN, E-Tree, and E-Access, as well as IP/IP VPN services.
- **ACX5448**: The ACX5448 offers 48 10GbE aggregation ports, four high-capacity 100GbE uplink ports, and supports full Metro Ethernet and IP/MPLS VPN services in a space- and cost-optimized platform to smooth the transition from 10GbE to 100GbE for providers preparing for the emerging 5G rollout.
- **ACX6360**: The ACX6360 bridges between a secure packet optical transport layer and an IP/MPLS networking layer by letting operators seamlessly collapse both layers into a single platform. Powered by the latest Juniper Networks ExpressPlus™ silicon running at 3.6 Tbps, the ACX6360 supports 20xQSFP28 100GbE interfaces and 8x100/200 Gbps CFP2-DCO interfaces. This provides a secure IEEE 802.1AE/802.1X industry-compliant 256AES MACsec encrypted solution for pervasive security across IP and optical.

The environmentally hardened small form factor ACX Series platforms deliver comprehensive routing and security services, application awareness and control, with high availability to ensure business continuity and resiliency, and they are perfect choices for supporting such mission-critical communications networks. The ACX Series enables seamless migration from legacy TDM/SONET to Ethernet/IP, with support for legacy services.

Mobile Haul

The accelerating speed of innovation is forcing mobile operators to start planning their migration to LTE-Advanced now and 5G in the near future. LTE-Advanced and 5G place more stringent requirements for capacity, latency, synchronization, and security on the network infrastructure.

Equipped with 1GbE/10GbE interfaces and providing up to 60 Gbps of throughput, the ACX Series satisfies LTE-Advanced and 5G capacity requirements. In addition to high capacity and density to address scaling requirements, the ACX Series also addresses end-user quality requirements through high-precision timing, advanced security features, and enhanced SLA management capabilities.

Today, the ACX Series supports all mobile services profiles including 2G/3G high-speed packet access (HSPA), 4G LTE, LTE-Advanced, and small cell. In a typical backhaul deployment scenario, the ACX500 is used as a small cell router and grandmaster, whereas the ACX1000 line, ACX2000 line, or ACX4000 are macro cell site routers. The backhaul traffic carried over Ethernet or IP/MPLS is aggregated by the ACX5448 before it hits the mobile core. In a C-RAN deployment scenario, the ACX5448 can be used for fronthaul in a baseband unit (BBU) model.

Enterprise Networking and Field Area Network

As enterprises and governments are embarking on their digital transformation journey, they need to deploy and upgrade their mission-critical communications networks, some of which are located in demanding and harsh environments such as the field area networks for providing supervisory control and data acquisition (SCADA) system connectivity. These include power utilities, oil and gas, mining, rail and transportation, defense and public safety industries, and so on.

Table 1: Built-In Interface Options for Various ACX Series Models

Model	TDM (T1/E1)	OC3 (STM1)/ OC12 (STM4)	GbE (copper)	GbE (combo)	GbE (SFP)	10GbE (SFP+)	40GbE (QSFP)	100GbE (QSFP28)	100/200 Gbps (CFP2-DCO)
ACX500	-	-	-	4 (PoE+ support on 3 ports)	2	-	-	-	-
ACX500-O	-	-	3	-	3	-	-	-	-
ACX500-O-POE	-	-	3 with PoE+ support	-	3	-	-	-	-
ACX1000	8	-	8	4	-	-	-	-	-
ACX1100	-	-	8	4	-	-	-	-	-
ACX2100	16	-	4	4	2	2*	-	-	-
ACX2200	-	-	4	4	2	2*	-	-	-
ACX4000	Up to 32**	Up to 8/2**	-	8 (PoE++ support on 2 ports)	Up to 14**	2*	-	-	-
ACX5048	-	-	-	-	-	48*	6	-	-
ACX5096	-	-	-	-	-	96*	8	-	-
ACX5448	-	-	-	-	-	48	-	4	-
ACX6360	-	-	-	-	-	-	-	20	8

* SFP+ ports can be configured to be 1GbE ports and accept 1GbE small form-factor pluggable transceiver (SFP).
** When equipped with appropriate I/O MIC modules. See table with "Ordering Information."

Architecture and Key Components

Powered by Juniper Networks Junos® operating system, the ACX Series routers complement Juniper Networks MX Series 3D Universal Edge Routers through a flexible and scalable service provider and enterprise branch routing portfolio optimized to support rapidly growing mobile, video, and cloud computing applications. The ACX Series introduces Juniper's proven IP/MPLS leadership from core and edge into the access layers of the network. Maintaining relative simplicity in the access network, the ACX Series supports a rich suite of L2, L3, and IP/MPLS functionality to allow large-scale seamless MPLS networks with simplified service provisioning and operations.

- **Seamless MPLS**: ACX Series routers support both Ethernet bridging and MPLS. Growing demands for bandwidth are accompanied by network growth in terms of number of nodes. In some cases, we can see demands to scale a network up to tens of thousands of nodes. Seamless MPLS architecture enables scale and service flexibility by decoupling physical topology for transport and service layers. With a seamless MPLS architecture, service providers can leverage the existing investment of MPLS in the core and edge and extend the operational benefit into the access layer. This enables higher network service flexibility and higher scaling parameters of the metro area network (MAN), where metro Ethernet services can span across multiple network segments and be seamlessly terminated at any point of the network or cloud.
- **Junos OS**: Junos OS is a reliable, high-performance, modular network operating system that is supported across all of Juniper's physical and virtual routing, switching, and security platforms. Junos OS improves network operations and increases service availability, performance, and security with features like low-latency multicast, comprehensive quality of service (QoS), unified in-service software upgrade (unified ISSU), and Junos Continuity, which eliminates the risk and complexity of OS upgrades. Junos OS comes with embedded scripting tools and APIs, which enable automation of many routines and practical integration with any operator's back-end management tools. With secure programming interfaces, the Juniper Extension Toolkit (JET), versatile scripting support, and integration with popular orchestration frameworks, Junos OS offers flexible options for DevOps-style management that can unlock more value from the network.
- **Management**: Junos Space® Network Management Platform provides comprehensive management with broad fault, configuration, accounting, performance, and security management (FCAPS) capabilities, for both device and service-level management. For device management, it supports Network Configuration Protocol (NETCONF), CLI, SNMP v1/v2/v3 protocols, while its northbound APIs support easy integration with existing network management systems (NMS) and operations/business support systems (OSS/BSS). Running on the Junos Space platform, Junos Space Connectivity Services Director ensures effortless end-to-end service provisioning of time-division multiplexing (TDM), ATM, carrier Ethernet (E-Line, E-LAN, E-Tree, E-Access), VPLS, L3VPN, EVPN, and MPLS, using a simple interface to design, validate, and manage these services. Another application of Junos Space, Cross Provisioning Platform helps service providers provision E-Line, L2/L3 VPN services, and virtual private LAN service (VPLS) between Juniper devices and those from third-party vendors. The Juniper Networks proNX Optical Director software platform manages and controls Juniper Programmable Photonic Layer open-line system elements and Juniper coherent dense wavelength-division multiplexing (DWDM) transponder-based solutions, including the ACX6360, as well as integrated DWDM transponders on MX Series routers, PTX Series Packet Transport Routers, and QFX Series switches.

Features and Benefits

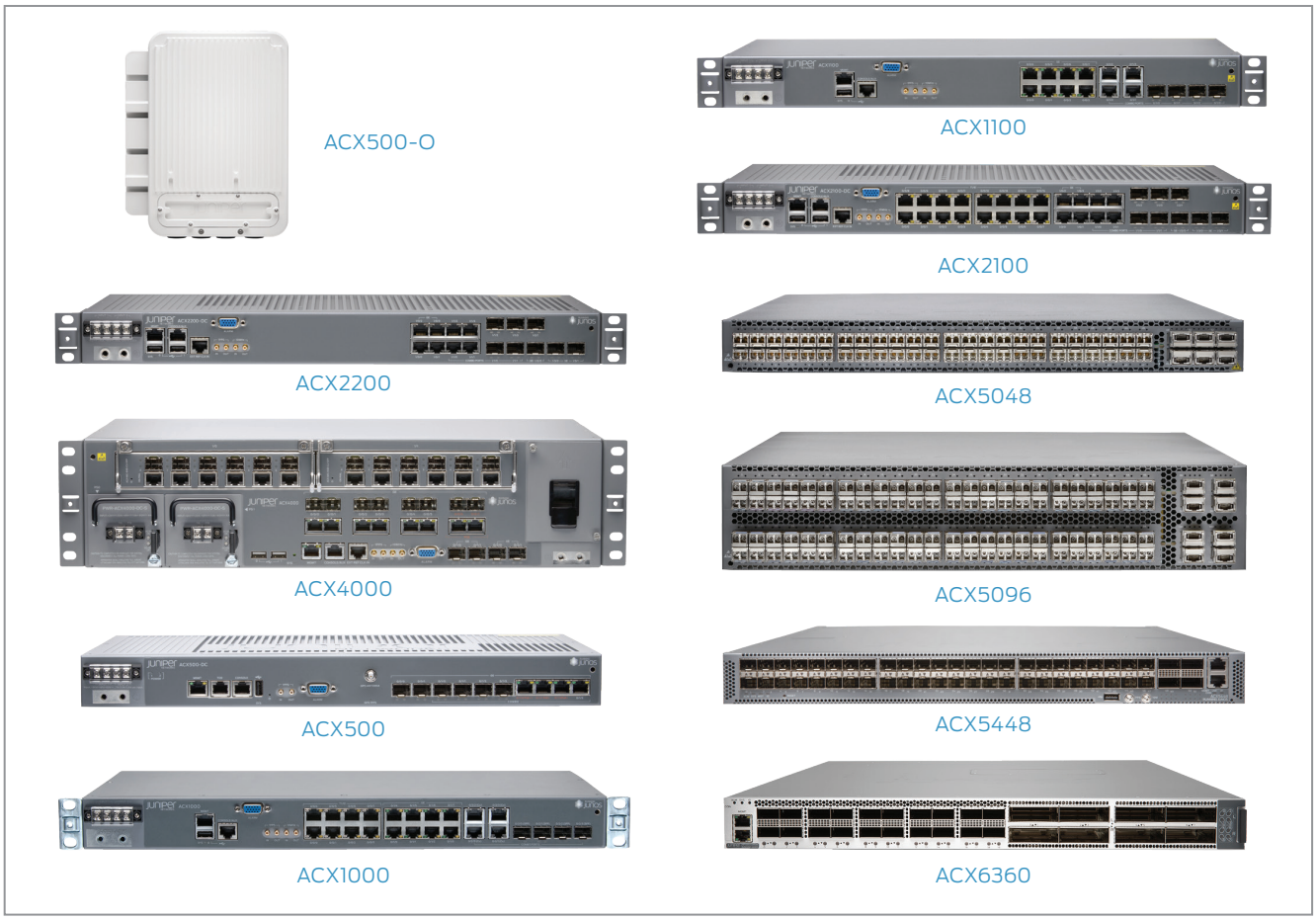
The ACX Series delivers new levels of programmability, reliability, and scalability to service provider and enterprise networks. The ACX Series portfolio improves customer satisfaction while lowering the total cost of operating, maintaining, and updating the network infrastructure.

Zero Touch Deployment (ZTD)

Based on Junos OS automation capabilities, ACX Series routers support a zero touch deployment (ZTD) model. The ZTD model significantly reduces the time for any new equipment installation and provisioning, resulting in lower OpEx and TCO and improved operational efficiency. In addition, this model reduces the traditional complexity of deploying MPLS in the access layer.

Integrated High-Precision Timing

The ACX Series incorporates highly scalable and reliable hardware-based timing technology, based on Juniper's intellectual property that meets the strictest LTE-A requirements for frequency and phase synchronization. Providing an accurate timing reference is one of the most significant technical and operational challenges for deployment of LTE radio access networks. ACX Series routers support Synchronous Ethernet for frequency as well as Precision Time Protocol (PTP) for both frequency and phase synchronization. Furthermore, the ACX Series allows Synchronous Ethernet and PTP to be used in a hybrid mode for the highest level of frequency (10 ppb) and phase (<500 nS) accuracy required for LTE-A. The ACX500, ACX500-O, and ACX500-O-PoE also provide an integrated GPS receiver and can act as a grandmaster (GM) clock for a distributed PTP implementation, making them an ideal choice for the aggregation of small cell traffic when the backhaul is transported over the Internet.



Advanced Security Services

One of the significant challenges in the rollout of small cells is the risk of security threats from easily accessible locations. The ACX500 enables advanced security services such as IPsec, Media Access Control Security (MACsec), Network Address Translation (NAT), and TPM to protect against potential vulnerabilities to the network as well as subscriber traffic. Hardware acceleration through a purpose-built services engine enhances the scalability of these computationally intensive services to support a large-scale small cell deployment.

Enhanced Service Assurance, SLA Management, and Ethernet OAM

The ACX Series routers provide a comprehensive set of features. Using 802.3ah, 802.1ag, Y.1731, Two-Way Active Measurement Protocol (TWAMP), and RFC2544, mobile operators and wholesale service providers can make sure that the services being offered through ACX Series routers are meeting the desired SLAs.

Environmentally Hardened Design

Most of the ACX Series models such as ACX500, ACX1x00, and ACX2x00, are temperature hardened and support passive cooling for outdoor deployments in extreme weather conditions. The ACX500-O and ACX500-O-PoE are based on environmentally hardened, ruggedized chassis and are IP65-compliant for outdoor deployments with no need for an enclosure or cabinet. These routers are designed to be pole or strand mounted alongside outdoor small cells.

High Availability and Reliability

Junos Continuity and unified ISSU features remove the downtime risks associated with implementing new hardware or upgrading operating systems. Junos Continuity eliminates OS upgrades and system reboots when adding new hardware to ACX Series routers—a plug-in package provides the drivers and support files needed to bring the hardware online. Unified ISSU reduces the risks associated with OS upgrades by enabling upgrades between two different Junos OS releases (major or minor) with no control plane disruption and minimal traffic disruption on the forwarding plane.

MEF CE 2.0 Compliant

The ACX Series routers are all MEF CE 2.0-compliant and are able to support all carrier Ethernet services, which include E-Line, E-LAN, E-Tree, and E-Access.

Full Feature Set of L2, L3, IP/MPLS

The ACX Series routers support a full feature set of L2, L3, and IP/MPLS. Service providers cannot only monetize Layer 2 Ethernet services, but also Layer 3, IP/IP-VPN services, etc., for greater monetization.

Table 2: ACX Series Platform Feature Matrix

	Features	ACX500, ACX500-O, ACX500-O-POE	ACX1000, ACX1100	ACX2100, ACX2200	ACX4000	ACX5048, ACX5096	ACX5448	ACX6360
	Throughput	Up to 60 Gbps	Up to 60 Gbps	Up to 60 Gbps	Up to 60 Gbps	1.44/2.56 Tbps	1.8/3.6 Tbps	3.6/7.2 Tbps
Layer 2	IEEE 802.3 bridging	√	√	√	√	√	√	
	IEEE 802.1q	√	√	√	√	√	√	
	IEEE 802.1ad (Q-in-Q)	√	√	√	√	√	√	
	VLAN id manipulation for outer/inner: swap/ pop/push	√	√	√	√	√	√	
	Rapid Spanning Tree Protocol (RSTP)/ VLAN Spanning Tree Protocol (VSTP)/ Multiple Spanning Tree Protocol (MSTP)	√	√	√	√	√	√	
	ERPS G.8032v1	√	√	√	√	√	√	
	ERPS G8032v2					√	√	
	Link Aggregation Control Protocol (LACP)	√	√	√	√	√	√	√
	Enhanced load balancing based on L2-L4 header info	√	√	√	√	√	√	
	Link Layer Discovery Protocol (LLDP)	√	√	√	√	√	√	√
	Layer 2 bridge protocol data unit (BPDU) tunneling/ MAC rewrite	√	√	√	√	√	√	
Layer 3	IPv4	√	√	√	√	√	√	√
	IPv6	√	√	√	√	√	√	√
	RPF	√	√	√	√	√	√	√
	Equal-cost multipath (ECMP)	√	√	√	√	√	√	√
	Enhanced load balancing based on L2-L4 header info	√	√	√	√	√	√	√
	OSPF	√	√	√	√	√	√	√
	IS-IS	√	√	√	√	√	√	√
	BGP	√	√	√	√	√	√	√
	Indirect/composite next hop	√	√	√	√	√	√	√
MPLS and Seamless MPLS	RSVP	√	√	√	√	√	√	√
	LDP	√	√	√	√	√	√	√
	Path Computation Element Protocol (PCEP)	√	√	√	√	√	√	√
	RSVP-TE	√	√	√	√	√	√	√
	BGP-LU	√	√	√	√	√	√	√
	LDP-RSVP	√	√	√	√	√	√	√
	RSVP fast reroute (FRR)	√	√	√	√	√	√	√

	Features	ACX500, ACX500-O, ACX500-O-POE	ACX1000, ACX1100	ACX2100, ACX2200	ACX4000	ACX5048, ACX5096	ACX5448	ACX6360
Services	IEEE 802.3 bridge domain	√	√	√	√	√	√	
	PWE (T-LDP)	√	√	√	√	√	√	
	L2VPN (BGP)	√	√	√	√	√	√	
	VPLS (T-LDP/BGP/ LDP autodiscovery)					√	√	
	Layer 3 VPN	√	√	√	√	√	√	
	Circuit emulation SAToP/CESoPSN/ ATM o MPLS		√[1]	√[1]	√			
	Integrated routing and bridging (IRB)	√	√	√	√	√	√	
	Stateless filters L2-L4	√	√	√	√	√	√	
Class of Service (CoS)	8 queues per port with schedulers and shaping	√	√	√	√	√	√	
	Classification based on 802.1p, DiffServ code point (DSCP), IP-precedence, Exp bit	√	√	√	√	√	√	
	Single-rate policer ingress/egress	√	√	√	√	√	√	
	Two-rate three-color policer ingress/ egress	√	√	√	√	√	√	
OAM and SLA Management	Bidirectional Forwarding Detection (BFD)	√	√	√	√	√	√	
	Connectivity fault management (CFM)	√	√	√	√	√	√	
	Y.1731	√	√	√	√	√[2]	√[2]	
	RFC2544	√	√	√	√	√[3]	√[3]	
	TWAMP	√	√	√	√			
Multicast	Physical Interface Module (PIM)	√	√	√	√	√	√	
	Internet Group Management Protocol (IGMP)	√	√	√	√	√	√	
	IGMP snooping	√	√	√	√	√	√	
Timing and Sync	BITS/1pps/10MHz	√	√	√	√		√	
	1588v2 BC	√	√	√	√		√	
	1588v2 Transparent					√	√	
	1588v2 over IP	√	√	√	√	√	√	
	1588v2 over Ethernet	√	√	√	√	√	√	
	Synchronous Ethernet	√	√	√	√		√	
	Hybrid mode	√	√	√	√		√	
	Embedded GM	√						
Security	L2 storm control	√	√	√	√	√	√	
	IPsec	√[4]	√[4]					
	NAT	√[4]	√[4]					
	IEEE 802.1AE/802.1X industry-compliant 256AES MACsec							√

Features		ACX500, ACX500-O, ACX500-O-POE	ACX1000, ACX1100	ACX2100, ACX2200	ACX4000	ACX5048, ACX5096	ACX5448	ACX6360
Configuration, Management and Automation	CLI	√	√	√	√	√	√	√
	NETCONF	√	√	√	√	√	√	√
	SNMP v2/v3	√	√	√	√	√	√	√
	SLAX/Python on-box scripting tools	√	√	√	√	√	√	√
	ZTD	√	√	√	√	√	√	√
	YANG	√	√	√	√	√	√	√

[1] See Table 2 for E1/T1/STM/OC ports support per each platform.
[2] SLM and DM are supported.
[3] RFC2544 reflector mode only.
[4] Some restrictions are applicable. See technical documentation for details.

Specifications

This section lists basic specifications for the ACX Series routers. For further details, please refer to the hardware installation manuals at www.juniper.net/techpubs.

Specifications	ACX500, ACX500-O, ACX500-O-POE	ACX1000, ACX1100	ACX2100, ACX2200	ACX4000	ACX5048, ACX5096	ACX5448	ACX6360
Dimensions (W x H x D)	ACX500: 17.5 x 1.75 x 9.4 in (44.5 x 4.4 x 24 cm) ACX500-O: 8x12.3 x 4.3 in (20.3x31.2 x 10.9 cm) ACX500-O-POE: 10 x 16 x 4.7 in (25.4 x 40.6 x 11.9 cm)	17.5 x 1.75 x 9.4 in (44.5 x 4.4 x 24 cm)	17.5 x 1.75 x 9.4 in (44.5 x 4.4 x 24 cm)	17.5 x 4.35 x 9.25 in (44.5 x 11 x 23.5 cm)	ACX5048: 17.36 x 1.72 x 20.48 in (44.09 x 4.37 x 52.02 cm) ACX5096: 17.36 x 3.46 x 22.44 in (44.09 x 8.8 x 57 cm)	17.36 x 1.72 x 20.48 in (44.09 x 4.37 x 52.02 cm)	17.36 x 1.72 x 24.40 in (44.09 x 4.37 x 61.98 cm)
Weight (lb/kg) fully configured	ACX500-DC: 8.6 lb (3.9 kg) ACX500-AC: 9.26 lb (4.2 kg) ACX500-O-DC: 11 lb (5 kg) ACX500-O-AC: 11.68 lb (5.3 kg) ACX500-O-POE-DC: 13.66 lb (6.2 kg) ACX500-O-POE-AC: 14.33 lb (6.5 kg)	ACX1000: 6.5 lb (2.94 kg) ACX1100: 7.8 lb (3.54 kg)	8.3 lb (3.77 kg)	23.8 lb (10.82 kg) (Fully configured with two power supply units, two MICs)	ACX5048: 21.8 lb (9.9 kg) ACX5096: 32.5 lb (14.74 kg)	16 lb (7.26 kg)	30 lb (13.6 kg)
Power (DC)	-48 V nominal or -60 V telco nominal or +24 VDC nominal	-48 V nominal or -60 V telco nominal or +24 VDC nominal	-48 V nominal or -60 V telco nominal or +24 VDC nominal	-48 V nominal or -60 V telco nominal or +24 VDC nominal	-36 to -72 VDC power	-44 to -72 VDC power	-40 to -72 VDC power
Power (AC)	90-240 V	90 to 240 VAC for ACX1100-AC only	90 to 240 VAC for ACX2100-AC only	90 to 240 VAC	110-240 VAC	110-240 VAC	100-240 VAC
Maximum power draw	65 W + PoE power (80 W) (ACX500); 55 W (ACX500-O); 55 W + PoE power (80 W) (ACX500-O-POE)	50 W (ACX1000); 35 W (ACX1100-AC); 40 W (ACX1100-DC)	70 W (ACX2000); 60 W (ACX2100-AC); 80 W (ACX2100-DC)	150 W (w/o MICs); 45 W for each MIC; 65 W for each PoE++ port	~350 W (with optical SFPs) (ACX5048); ~550 W (with optical SFPs) (ACX5096)	~450 W (with optical SFPs) (ACX5448)	ACX6360 main board: 502 W fan tray: 102 W CFP2 board: 152.5 W Total power = 756.5 W
Operating temperature	-40° to 149° F (-40° to 65° C)	-40° to 149° F (-40° to 65° C)	-40° to 149° F (-40° to 65° C) full featured	-40° to 149° F (-40° to 65° C)	32° to 104° F (0° to 40° C)	32° to 104° F (0° to 40° C)[5] 32° to 131° F (0° to 55° C)[6]	32° to 104° F (0° to 40° C)
Humidity	95% RH noncondensing	95% RH noncondensing	95% RH noncondensing	95% RH noncondensing	5%-90% RH noncondensing	5%-90% RH noncondensing	5%-90% RH noncondensing

[5] Long term operating range
[6] Short term operating range.

Approvals

	ACX500	ACX500-O	ACX500-O-POE	ACX1000	ACX1100	ACX2100	ACX2200	ACX4000	ACX5048, ACX5096	ACX5448	ACX6360
Safety Approvals											
CAN/CSA-C22.2 No. 60950-1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UL 60950-1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
EN 60950-1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IEC 60950-1—CB Scheme	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
EN 60825-1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UL 60950-22 , IEC 60950-22, CSA 60950-22: Safety equipment to be installed outdoors	-	Yes	Yes	-	-	-	-	-	-	-	-
EMC											
AS/NZS CISPR22 Class A	Yes	-	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
EN55022 Class A	Yes	-	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
VCCI Class A	Yes	-	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FCC Part 15 Class A	Yes	-	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IECS-003 Issue 4	Yes	-	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
BSMI CNS 13438 and NCC C6357 Taiwan Radiated Emissions	Yes	-	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
KN 22, Class A	Yes	-	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CISPR 32/EN55032: 2012 European Radiated Emissions Class A	Yes	-	-	Yes	Yes	Yes	Yes	Yes	-	-	-
AS/NZS CISPR22 Class B	-	Yes	Yes	-	-	-	-	-	-	-	-
EN55022 Class B	-	Yes	Yes	-	-	-	-	-	-	-	-
VCCI Class B	-	Yes	Yes	-	-	-	-	-	-	-	-
FCC Part 15 Class B	-	Yes	Yes	-	-	-	-	-	-	-	-
IECS-003 Issue 4 Class B	-	Yes	Yes	-	-	-	-	-	-	-	-
BSMI CNS 13438 and NCC C6357 Taiwan Radiated Emissions	-	Yes	Yes	-	-	-	-	-	-	-	-
KN 22, Class B	-	Yes	Yes	-	-	-	-	-	-	-	-
CISPR 32/EN55032: 2012 European Radiated Emissions Class B	-	Yes	Yes	-	-	-	-	-	-	-	-
Immunity											
EN-61000-4-6 Low Frequency Common Immunity	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
EN-61000-4-11 Voltage Dips and Sags	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CISPR 24/EN55024 Information Technology Equipment Immunity Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ETSI (European Telecommunications Standardization Institute)											
EN 300 386 V1.6.1 Telecommunication Network Equipment, Electromagnetic Compatibility Requirements	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ETSI EN 300 019-2-1 (2000)—Storage, Class T1.2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

	ACX500	ACX500-O	ACX500-O-POE	ACX1000	ACX1100	ACX2100	ACX2200	ACX4000	ACX5048, ACX5096	ACX5448	ACX6360
ETSI (European Telecommunications Standardization Institute)											
ETSI EN 300 019-2-2 (1999)—Transportation,	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Class T2.3	-	-	-	-	Yes	Yes	Yes	-	-	-	-
ETSI EN 300 019-2-3 (2003)—Stationary Use at Weather Protected Locations, Class T3.4	Yes	-	-	-	-	-	-	-	Yes	Yes	Yes
ETSI EN 300 019-2-3 (2003)—Stationary Use at Weather Protected Locations, Class T3.2	-	Yes	Yes	-	-	-	-	Yes	-	-	-
ETSI EN 300 019-2-4 (2003)—Stationary Use at Non-Weather Protected Locations, Class 4.1	-	-	-	Yes	-	-	-	-	-	-	-
ETSI EN 300 019-2-4 (2003)—Stationary Use at Non-Weather Protected Locations, Class 4.1E	-	-	-	-	-	-	-	-	-	-	-
ETSI EN 300 019-2-4 (2003)—Stationary Use at Non- Weather Protected Locations, Class 4.2H	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other EMC Requirements											
IEEE 1613 Class 2 Environmental and Testing Requirements for Communications Networking											
Devices in Electric Power Substations	Yes	Yes	Yes	-	-	-	-	-	-	-	-
IEC 61850-3 Communication networks and systems for power utility automation	Yes	Yes	Yes	-	-	-	-	-	-	-	-
EN50121-4 Railway applications	Yes	Yes	Yes	-	-	-	-	-	-	-	-
ETSI EN 300 440-1/-2 GPS spurious emission	Yes	Yes	Yes	-	-	-	-	-	-	-	-
Deutsche Telekom 1TR9 (2008) EMC Specification	Yes	Yes	Yes	Yes	-	-	-	-	Yes	Yes	Yes
British Telecom EMC Immunity Requirements (2007)	Yes	Yes	Yes	Yes	-	-	-	-	Yes	Yes	Yes
ITU-T K.21 (2011) Resistibility of telecommunication equipment installed in customer premises to overvoltages and overcurrents	Yes	Yes	Yes	-	-	-	-	-	-	-	-
ITU-T K.20 (2011) Resistibility of telecommunication equipment installed in telecom centers to overvoltages and overcurrents	Yes	Yes	Yes	-	-	-	-	-	-	-	-

	ACX500	ACX500-O	ACX500-O-POE	ACX1000	ACX1100	ACX2100	ACX2200	ACX4000	ACX5048, ACX5096	ACX5448	ACX6360
NEBS											
SR-3580 NEBS Criteria Levels (Level 3 Compliance)	Yes	-	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
GR-63-CORE: NEBS, Physical Protection	Yes	-	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
GR-1089-CORE: EMC and Electrical Safety for Network Telecom muni-cations Equipment (Issue 6 compliant)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
GR-3108-CORE: Generic Requirements for Network Equipment in the Outside Plant (OSP)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-	-	-
GR-487-CORE: Issue 4 Electronic equipment cabinets	-	Yes	Yes	-	-	-	-	-	-	-	-
Ingress Protection											
IEC 60529 - Degree of protection provided by Enclosure (IP 65)	-	Yes	Yes	-	-	-	-	-	-	-	-
Telecomm Compliance											
RTTE Directive 1995/5/EC	-	-	-	Yes	-	Yes	-	Yes	-	-	-
T1 and XDSL Interfaces FCC Part 68	-	-	-	Yes (T1 Only)	-	Yes	-	Yes (T1 Only)	-	-	-
Industry Canada CS-03	-	-	-	Yes	-	Yes	-	Yes	-	-	-
JATE Green Book	-	-	-	Yes	-	Yes	-	Yes	-	-	-
TBR 21 (XDSL only)	-	-	-	No	-	No	-	No	-	-	-
E1 Interface TBR 12/13	-	-	-	Yes	-	Yes	-	Yes	-	-	-
ACA TS016	-	-	-	Yes	-	Yes	-	Yes	-	-	-
G.703	-	-	-	Yes	-	Yes	-	Yes	-	-	-
Device management: NETCONF, CLI, SNMP v1/v2/v3	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Comprehensive FCAPS management through Junos Space Network Management Platform: device-level configuration, software upgrade, alarms, script management	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
End-to-end provisioning of E-Line, emulated LAN (ELAN), Layer 3 VPN (L3VPN), OAM, class of service (CoS)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Device and service-level fault management	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Device and service-level performance management	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Metro Ethernet Forum (MEF)											
MEF CE2.0 compliant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Juniper Networks Services and Support

Juniper Networks is the leader in performance-enabling services that are designed to accelerate, extend, and optimize your high-performance network. Our services allow you to maximize operational efficiency while reducing costs and minimizing risk, achieving a faster time to value for your network. Juniper Networks ensures operational excellence by optimizing the network to maintain required levels of performance, reliability, and availability. For more details, please visit www.juniper.net/us/en/products-services.

Ordering Information

Product Number	Name
ACX500-AC	ACX500 indoor unit 2x1GbE (SFP) + 4x1GbE (combo) with single AC power supply, 1 U, temperature hardened, passive cooling, rack mounting options, PoE support, Junos OS
ACX500-DC	ACX500 indoor unit 2x1GbE (SFP) + 4x1GbE (combo) with single DC power supply, 1 U, temperature hardened, passive cooling, rack mounting options, PoE support, Junos OS
ACX500-O-AC	ACX500 outdoor unit 3x1GbE (SFP) + 3x1GbE (Cu) with single AC power supply, IP65-compliant for outdoor installation, pole/wall mounting options, no Power over Ethernet (PoE) support, Junos OS
ACX500-O-DC	ACX500 outdoor unit 3x1GbE (SFP) + 3x1GbE (Cu) with single DC power supply, IP65-compliant for outdoor installation, pole/wall mounting options, no PoE support, Junos OS
ACX500-O-POE-AC	ACX500 outdoor unit 3x1GbE (SFP) + 3x1GbE (Cu) with single AC power supply, IP65-compliant for outdoor installation, pole/wall mounting options, PoE support, Junos OS
ACX500-O-POE-DC	ACX500 outdoor unit 3x1GbE (SFP) + 3x1GbE (Cu) with single DC power supply, IP65-compliant for outdoor installation, pole/wall mounting options, PoE support, Junos OS
ACX500-LIC-GPS	ACX500 license to activate GPS receiver
ACX500-LIC-SEC	ACX500 license to activate IPsec and NAT features
ACX1000-DC	ACX1000 unit, 8xT1/E1, 8xGbE copper, 4xGbE combination (copper or SFP), 1 U, ETSI 300, dual feed DC power, temperature hardened, passively cooled, Junos OS (optics sold separately)
ACX1100-DC	ACX1100 unit, 8xGbE copper and 4xGbE combination (copper or SFP), 1 U, ETSI 300, redundant DC power supplies, temperature hardened, passively cooled, Junos OS (optics sold separately)
ACX1100-AC	ACX1100 unit, 8xGbE copper and 4xGbE combination (copper or SFP), 1 U, ETSI 300, redundant AC power, temperature hardened, passively cooled, Junos OS (optics sold separately)
ACX2100-DC	ACX2100 unit, 16xT1/E1, 2x10GbE SFP+, 4xGbE copper, 4xGbE combination (copper or fiber), 2xGbE SFP, 1 U, ETSI 300, redundant DC power, temperature hardened, passively cooled, Junos OS (optics sold separately)
ACX2100-AC	ACX2100 unit, 16xT1/E1, 2x10GbE SFP+, 4xGbE copper, 4xGbE combination (copper or fiber), 2xGbE SFP, 1 U, ETSI 300, redundant AC power, temperature hardened, passively cooled, Junos OS (optics sold separately)
ACX2200-DC	ACX2200 unit, 2x10GbE SFP+, 4xGbE copper, 4xGbE combination (copper or fiber), 2xGbE SFP, 1 U, ETSI 300, redundant DC power, temperature hardened, passively cooled, Junos OS (optics sold separately)
ACX2200-AC	ACX2200 unit, 2x10GbE SFP+, 4xGbE copper, 4xGbE combination (copper or fiber), 2xGbE SFP, 1 U, ETSI 300, redundant AC power, temperature hardened, passively cooled, Junos OS (optics sold separately)
ACX4000-DC	ACX4000 modular unit, 2x10GbE SFP+, 8xGbE combo (copper/fiber) with PoE++ on two ports, 2xGbE SFP, 2.5 U, ETSI 300, redundant DC power, temperature hardened, Junos OS, two configurable MIC slots (optics sold separately)
ACX4000-AC	ACX4000 modular unit, 2x10GbE SFP+, 8xGbE combo (copper/fiber) with PoE++ on two ports, 2xGbE SFP, 2.5 U, ETSI 300, redundant AC power, temperature hardened, Junos OS, two configurable MIC slots (optics sold separately)
ACX-MIC-6GE-CU-SFP	6xGbE copper/SFP MIC for ACX4000
ACX-MIC-4COC3-1COC12-CE	4xCHOC3/STM-1/1xCHOC12/STM-4 MIC for ACX4000
ACX-MIC-16CHE1-T1-CE	16x T1/E1 MIC for ACX4000
ACX5048-AC-L2-L3	ACX5048, 48 SFP+/SFP ports, 6 QSFP ports, redundant fans and AC power supplies; no right to use IP VPN
ACX5048-DC-L2-L3	ACX5048, 48 SFP+/SFP ports, 6 QSFP ports, redundant fans and DC power supplies; no right to use IP VPN
ACX5096-AC-L2-L3	ACX5096, 96 SFP+/SFP ports, 8 QSFP ports, redundant fans and AC power supplies; no right to use IP VPN
ACX5096-DC-L2-L3	ACX5096, 96 SFP+/SFP ports, 8 QSFP ports, redundant fans and DC power supplies; no right to use IP VPN
ACX5448-AC-AFO	ACX5448, 48 SFP+/SFP ports, 4 QSFP28 ports, redundant fans and AC power supplies; Front to Back Airflow; Feature Right to Use must be ordered separately
ACX5448-DC-AFO	ACX5448, 48 SFP+/SFP ports, 4 QSFP28 ports, redundant fans and DC power supplies; Front to Back Airflow; Feature Right to Use must be ordered separately
ACX5448-AC-AFI	ACX5448, 48 SFP+/SFP ports, 4 QSFP28 ports, redundant fans and AC power supplies; Back to Front Airflow; Feature Right to Use must be ordered separately
ACX5448-DC-AFI	ACX5448, 48 SFP+/SFP ports, 4 QSFP28 ports, redundant fans and DC power supplies; Back to Front Airflow; Feature Right to Use must be ordered separately
ACX5448-L-PE	ACX5448 Right to Use FIB greater than 256K and more than 512 VRFs, up to equipment limits
ACX5448-CHASSIS	ACX5448 Chassis Spare
ACX5448-FAN-AFI	ACX5448 Fan Tray Right

Product Number	Name
ACX5448-FAN-AFO	ACX5448 Fan Tray Left
ACX6360-OR-M36C-AO	ACX6360 -OR 20xQSFP28/QSFP+ 8xCFP2 AO
ACX6360-OR-M36C-DO	ACX6360 -OR 20xQSFP28/QSFP+ 8xCFP2 DOO
ACX6360-O-M36C-AO	ACX6360 -O 20xQSFP28/QSFP+ 8xCFP2 AO
ACX6360-O-M36C-DO	ACX6360 -O 20xQSFP28/QSFP+ 8xCFP2 DO
JNP6360-ChAS	ACX6360 Chassis Spare
ACX5K-L-IPVPN	ACX5K Right to Use IP VPN
ACX5K-L-1X10GE-S	ACX5K Right to Use a single 10GbE port on ACX5K system; enforceable per ACX5K system
ACX5K-L-8X10GE-S	ACX5K Right to Use 8 10GbE ports on ACX5K system; enforceable per ACX5K system
ACX5K-L-16X10GE-S	ACX5K Right to Use 16 10GbE ports on ACX5K system; enforceable per ACX5K system
ACX5K-L-24X10GE-S	ACX5K Right to Use 24 10GbE ports on ACX5K system; enforceable per ACX5K system
ACX5K-L-48X10GE-S	ACX5K Right to Use 48 10GbE ports on ACX5K system; enforceable per ACX5K system
ACX5K-L-72X10GE-S	ACX5K Right to Use 72 10GbE ports on ACX5K system; enforceable per ACX5K system

Product Number	Name
ACX5K-L-96X10GE-S	ACX5K Right to Use 96 10GbE ports on ACX5K system; enforceable per ACX5K system
ACX5K-L-104X10GE-S	ACX5K Right to Use 104 10GbE ports on ACX5K system; enforceable per ACX5K system
ACX5K-L-IPVPN	ACX5K Right to Use IP-VPN
ACX5K-L-1X10GE-S	ACX5K Right to Use a single 10GbE port on ACX5K system; enforceable per ACX5K system
ACX5K-L-8X10GE-S	ACX5K Right to Use 8 10GbE ports on ACX5K system; enforceable per ACX5K system
ACX5K-L-16X10GE-S	ACX5K Right to Use 16 10GbE ports on ACX5K system; enforceable per ACX5K system
ACX5K-L-24X10GE-S	ACX5K Right to Use 24 10GbE ports on ACX5K system; enforceable per ACX5K system
ACX5K-L-48X10GE-S	ACX5K Right to Use 48 10GbE ports on ACX5K system; enforceable per ACX5K system
ACX5K-L-L2	ACX5K Right to Use L2 features and IGP protocols (no right to use MPLS and BGP) for sole purpose on Network Management
ACX5K-L-IP-MPLS	ACX5K Right to Use IP/MPLS features except IP-VPN
ACX5K-L-100GE-S	ACX5448 Right to Use a single 100GbE ; enforceable per ACX5448 system

About Juniper Networks

Juniper Networks brings simplicity to networking with products, solutions and services that connect the world. Through engineering innovation, we remove the constraints and complexities of networking in the cloud era to solve the toughest challenges our customers and partners face daily. At Juniper Networks, we believe that the network is a resource for sharing knowledge and human advancement that changes the world. We are committed to imagining groundbreaking ways to deliver automated, scalable and secure networks to move at the speed of business.

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