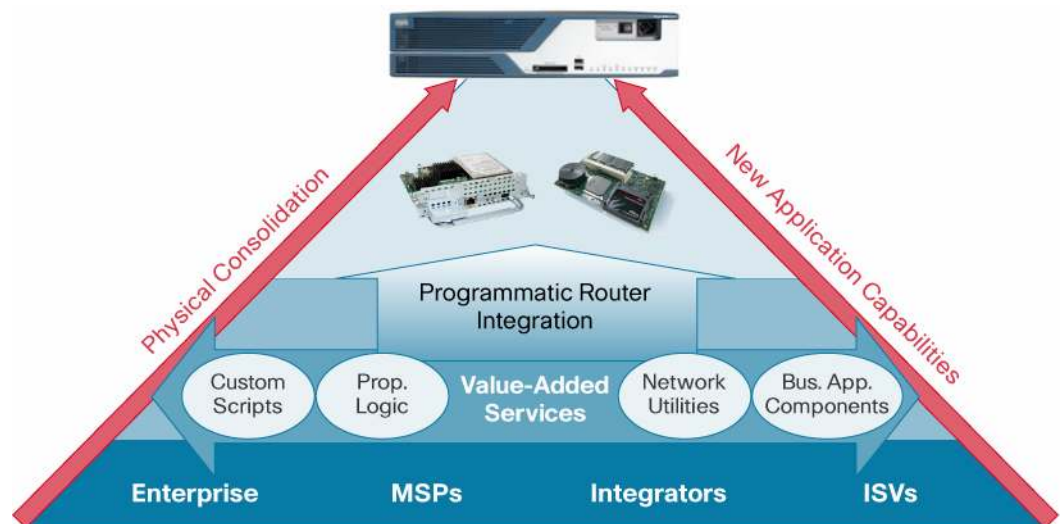# Cisco Applications eXtension Platform

Organizations of all sizes share an ongoing goal of increasing employee productivity and reducing costs through technology. Businesses can cost-effectively meet their office communications and application integration needs by using Cisco® integrated services router platforms to deliver data, voice, security, wireless LAN, switching, and video services on a single converged network, customized to meet the needs of the business today and in the future.

As organizations continue with the trend toward centralization and consolidation of their branch IT footprint, the Cisco integrated services router has been instrumental in integrating the networking infrastructure together and reducing operational costs significantly. The Cisco Application eXtensions Platform (AXP) provides a powerful and flexible environment to extend this concept. It enables hosting and integration of custom applications and network services into the Cisco integrated services routers. Using the AXP (Figure 1), the integrated services router becomes a powerful integration platform to build and host complete verticalcentric solutions.

Figure 1. Cisco AXP

Cisco Applications eXtension improves the end customer's TCO for deployed branch applications by enabling complete unified solutions. Enterprises, Managed Service Providers (MSPs) and integrators can use AXP to:

- Integrate custom applications and services into the integrated services routers
- Differentiate themselves from their competitors
- Provide complete end-to-end integrated single-box solutions

For more information about the benefits and deployment models of AXP, refer to the AXP white paper on the AXP home page at: http://www.cisco.com/go/axp

Product Overview

The Cisco AXP provides a standards-based Linux hosting environment within the integrated services router, allowing third parties to integrate applications with the router. Tightly integrated, the AXP environment is configured and managed through the router. Harnessing this integration, an AXP application can appear to the end user as an extension of the router. (See Figure 2.)

Figure 2.

The AXP solution consists of:

- Application runtime network module, providing dedicated resources to host applications
- AXP hosting environment, providing the infrastructure to securely host, install, upgrade, and manage third-party applications and services
- Cisco IOS® Software integration APIs, allowing the application to integrate and use the features of the router
- Software developer kit (SDK), allowing certified customers and partners to develop applications and services
- AXP Partner Program, providing the collateral, extended technical support, and online resources to help partners develop, deploy, and market their AXP-based solutions

Application Runtime Environment Network Module

Enabled on an integrated services router network module, the application runtime environment network module (APPRE) provides dedicated hardware resources, preventing the application from affecting the performance of the router. The APPREs are built using standard x86-based processors, providing an ideal environment for solutions developed for standard Linux hardware.

Table 1 lists the multiple APPRE models available to host AXP applications.

Table 1.   Available APPRE Models

Hardware SKU	Resources	Positioning
AIM-APPRE-102-K9	• AIM form factor • 300-MHz Intel Celeron • 256-MB RAM • 1-GB Compact Flash	The 102 Application Internal Module (AIM) is ideal for smaller footprint, embedded applications.
NME-APPRE-302-K9	• NME form factor • 1.0-GHz Intel Celeron • 512-MB RAM • 80-GB hard disk	General purpose ISR Enhanced Network Module powerful enough to host a variety of business applications and packet services.

Hardware SKU	Resources	Positioning
NME-APPRE-522-K9	• NME form factor • 1.4-GHz Intel Pentium M • 2-GB RAM • 160-GB hard disk	Designed for inline packet services and advanced applications, the 522 is supported on the 38xx for high-powered applications and services.

Integrated Services Router Enhanced Network Module (NME)
NME-APPRE-302-K9
NME-APPRE-522-K9

Integrated Services Router Internal Application Module (AIM)
AIM-APPRE-102-K9

AXP Features

The AXP provides a Linux-based integration environment to host custom applications and services. The features of the platform include:

- **Robust packaging, installation, and upgrade facilities.** The complexity of managing software for multiple devices is provided as part of the core platform offering. AXP provides full appliance functionality, allowing the application developer to focus on the application and not worry about the underlying infrastructure.

- **Multiple application support.** Utilizing the virtual instance manager, AXP supports the ability to host multiple applications or components. These components can be independently installed, upgraded, or removed. The instance manager provides the ability to segment and guarantee resources (CPU, memory, disk) consumed by each. In addition to resource controls, the virtual instance manager provides a segmented Linux OS instance on the AXP fully controlled by the developer. This allows the developer to use custom libraries and binaries built for different Linux distributions.

- **Extensible command-line interface (CLI).** AXP allows the customer to extend the interface of the Cisco module by adding custom CLI commands to administer and monitor an application. By extending the supported Cisco interface, the end user has a consistent and integrated experience.

- **Prepackaged value-added components and programming environments.** AXP allows the customer to use all programming technologies supported by Linux. To ease integration, Cisco provides prepackaged and certified libraries to implement C, Python, Perl, and Java applications.

- **Secure hosting infrastructure.** The AXP protects against rogue software by enforcing that all software is authorized. Only Partners and Developers can build applications that run on AXP. This helps ensure that all AXP-based solutions are of the highest quality and reliability. The AXP infrastructure also provides a layer of protection between Cisco IOS Software and the AXP application, helping ensure a misbehaving application cannot compromise the security and performance of Cisco IOS Software.

Cisco IOS Software Integration Application Programming Interfaces

Beyond providing a hosting platform within the router, AXP provides a robust set of application programming interfaces (APIs), allowing the application to integrate into the network:

- **Packet monitoring API.** Applications can monitor selected packets flowing through the network for monitoring and analysis purposes. With AXP, the need for a dedicated span port and complex wiring is no longer necessary.
- **Cisco IOS Software information API.** Utilizing this API, an application can programmatically query the router to retrieve current configuration, statistics, routing information, and so on. All information available to the Cisco IOS Software CLI and Simple Network Management Protocol (SNMP) agents are accessible though this interface.
- **Event trigger API.** The event trigger API allows the application to react to changes or events that occur within the router. An application event can be triggered on events such as a router interface failing over, packet loss exceeding a certain threshold, changes to routing table state, and so on.
- **Cisco IOS Software configuration API.** The configuration API allows the application to dynamically change the configuration of the router. Used in conjunction with the monitoring, information, and event trigger APIs, an application can dynamically change the behavior of the router in real time.
- **Serial device API.** AXP provides an application to communicate directly with serial ports of the router. This provides the ability for the integrated services router to support connectivity to traditional and nonstandard devices.

SDK

The AXP SDK provides all the tools necessary to package, host, and integrate applications into the router. SDK features include:

- Packaging tools allowing the third party to build an installation package. All the complexity of installation, upgrades, dependency management, and recovery is provided as part of the AXP packaging toolkit:
  - Bundling tool allows developer to create a single image composed of their application, add-on components, and the entire AXP infrastructure. Users can install or upgrade to the latest version of the software by downloading a single image.
  - Linux software RPM package conversion tools allow the application developer to easily port standard Linux components onto AXP.
  - Dependency tool helps developer identify missing libraries and executables required by their application.
- CLI extension API provides all the tools necessary to extend the AXP CLI with custom application commands.
- Header files and source code for the Cisco IOS Software packet, information, event, configuration, and serial APIs. Multiple programming language support including C/C++, Java, Perl, and shell scripts.
- Example source code illustrating the usage of the APIs.

AXP Partner program

The Cisco® Application eXtension Platform (AXP) provides a platform for developing applications that are integrated with Cisco integrated services routers. The AXP Development Partner Program is a framework for customers, systems integrators, service providers, and independent software vendors (ISVs) interested in developing software on Cisco AXP and uses existing Cisco programs, such as Cisco Developer Services and the Cisco Technology Developer Program, for the necessary technical and marketing support for development and distribution of AXP-based solutions:

- A partner or customer can be technically enabled for developing new AXP applications through technical documentation, software development kits (SDKs), developer community support, training, and technical support.
- Strategic ISVs can obtain support in their business planning and go-to-market efforts of AXP-based solutions.

For more information about the AXP Development Partner Program, refer to the AXP Partner Program Bulletin at http://www.cisco.com/go/axpdev

Hardware Specifications

Table 2.   Hardware Specifications

	Cisco AIM-APPRE-102-K9	Cisco NME-APPRE-302-K9	Cisco NME-APPRE-522-K9
Form factor	AIM	NME	NME
CPU	300-MHz Intel Celeron	1.0-GHz Intel Celeron	1.4-GHz Intel Pentium M
Memory (RAM)	256 MB	512 MB	2 GB
Storage	1-GB Compact Flash	80-GB hard disk	160-GB hard disk
Supported integrated services router platforms	Cisco 1841 Cisco 2800 Series Cisco 3800 Series	Cisco 28xx Series (2811-2851) Cisco 38xx Series (3825, 3845)	Cisco 38xx Series (3825, 3845 only)
Internal network interfaces	10/100/1000 Gigabit Ethernet connectivity to router backplane	10/100/1000 Gigabit Ethernet connectivity to router backplane	10/100/1000 Gigabit Ethernet connectivity to router backplane
External network interfaces	–	10/100/100 Gigabit Ethernet	10/100/100 Gigabit Ethernet
USB interfaces	–	USB 2.0	USB 2.0
Cisco IOS Software (on router)*	Cisco IOS Software Release 12.4.15(T3)*	Cisco IOS Software Release 12.4.15(T3)*	Cisco IOS Software Release 12.4.15(T3)*
Physical characteristics	Dimensions (H xWxS): 5.25 x 3.35 x 0.75 in. Weight: 0.20 lb (0.09 kg) maximum	Dimensions (H x W x D): 1.55 x 7.10 x 7.2 in. (3.9 x 18.0 x 18.3 cm) Weight:1.5 lb (0.7 kg) maximum	Dimensions (H x W x D): 7.10 x 7.2 in. (3.9 x18.0 x 18.3 cm) Weight: 1.5 lb (0.7 kg) maximum
Operating environment	Operating temperature: 23 to 122℉ (−5 to 50℃) Nonoperating and storage temperature: 40 to 158℉ (−40 to 70°C) Operating humidity: 5 to 90% (noncondensing) Operating altitude: 0 to 13,000 ft (0 to 3963m)	Operating temperature: 41 to 104℉ (5 to 40℃) Nonoperating and storage temperature: −40 to 158℉ (−40 to 70℃) Operating humidity: 5 to 85% (noncondensing) Operating altitude: −197 to 6000 ft (−60 to 1800m)	Operating temperature: 41 to 104℉ (5 to 40℃) Nonoperating and storage temperature: −40 to 158℉ (−40 to 70℃) Operating humidity: 5 to 85% (noncondensing) Operating altitude: −197 to 6000 ft (−60 to 1800m)

	Cisco AIM-APPRE-102-K9	Cisco NME-APPRE-302-K9	Cisco NME-APPRE-522-K9
Safety	UL 60950, IEC 950, and EN60950	UL 60950-1, Safety of Information Technology Equipment-Safety-Part 1: General Requirements (USA); plastic materials that are exposed to the end user shall meet the requirements of fire enclosure (UL94V-1) as defined in UL 60950	UL 60950-1, Safety of Information Technology Equipment-Safety-Part 1: General Requirements (USA); plastic materials that are exposed to the end user shall meet the requirements of fire enclosure (UL94V-1) as defined in UL 60950
EMC	Emission: • FCC Part 15 Class A • EN55022 Class A • AS/NZS 3548 Class A • CISPR22 Class A • VCCI Class A • EN55024 • EN61000-3-2 • EN61000-3-3	Emission: • 47 CFR Part 15 Class A • CISPR22 Class A • EN300386 Class A • EN55022 Class A • EN61000-3-2 • EN61000-3-3 • SD/EMI (India) • KN22 (Korea) • VCCI Class I • AS/NZS CISPR 22 Class A Immunity: • CISPR24 • EN300386 • EN50082-1 • EN55024 • SD/EMI (India) • KN22 (Korea) • EN61000-6-1	Emission: • 47 CFR Part 15 Class A • CISPR22 Class A • EN300386 Class A • EN55022 Class A • EN61000-3-2 • EN61000-3-3 • SD/EMI (India) • KN22 (Korea) • VCCI Class I • AS/NZS CISPR 22 • Class A Immunity: • CISPR24 • EN300386 • EN50082-1 • EN55024 • SD/EMI (India) • KN22 (Korea) • EN61000-6-1

Ordering Information

The application runtime engine hardware is generally available as an integrated services router option or as a spare. Table 3 shows ordering information.

Table 3.   Ordering Information

SKU	Description	Platforms
AIM-APPRE-102-K9 **SA-AXP**	300-MHz, 256-MB RAM, 1-GB Compact Flash AXP software infrastructure	1841, 2811, 2821, 2851, 3825, 3845
NME-APPRE-302-K9 **SN-AXP**	1.0-GHz Pentium, 512-MB RAM, 80-GB HD AXP software infrastructure (required)	2811, 2821, 2851, 3825, 3845
NME-APPRE-522-K9 **SN-AXP**	1.4-GHz Pentium, 2-GB RAM, 120-GB HD (38xx only) AXP software infrastructure (required)	3825, 3845

When purchasing AXP, you must choose both a hardware option (APPRE) as well as a software option (AXP).

Services and Support

- Hardware and AXP runtime support is provided as part of the standard ISR SmartNet support contract.

- Cisco offers a variety of developer support services for the AXP product line:

1. **Customers Engagements**

    Full life-cycle customer engagements, based on Cisco's Advanced Services methodologies and processes.

2. **Solutions**

   Design and implementation of custom solutions to fit specific requirements, or jointly with qualified partners in several verticals

3. **Training**

   Onsite or offsite delivery of Operator and Developer Trainings targeted at AXP network engineers or AXP application developers, including instructor-led hands-on exercises

4. **Customizable Services**

   As needed by the specific customer environment, Cisco AS will provide AXP-centric mentoring, architecture sessions, hands-on

5. **Partners Ramp-up**

   Dedicated AS team and lab resources to help new partners ramp-up on AXP, with guidance and support from Cisco AS engineering team.

6. **Developer Support**

   Self-service support through tools, documentation, and technology forums from Cisco's Developer web portal, or live case-based technical expertise to help developers design, code and troubleshoot AXP.

For more information, contact: axp-advanced-services@cisco.com

- Technical support for development is provided through Developer Services and an annual subscription fee. Requires prior sign-up and approval as an AXP Development Partner, see: http://www.cisco.com/go/axpdev