# Overview to the Cisco Mobility Services Architecture

## Introduction

Business has gone mobile. The number of employees that expect access to network resources to improve productivity has increased significantly over the past few years and the trend shows little sign of slowing anytime soon. Business mobility means consistent access to corporate applications over the right network to the right user at the right time. Delivering this experience requires IT to give careful consideration to how the network is architected. The proliferation of mobile devices, the need to unify multiple access networks and the demand for mobility applications has increased the drain on IT resources. Few IT organizations will see an increase in the resources required to meet these impending mobility demands. Yet, a new approach to architecting the mobility network will simplify the delivery of business mobility without requiring a significant increase in IT resources to get the job done.

To deliver true business mobility, IT must take a practical approach focused on unifying networks, managing the wave of mobile devices, and enabling mobile application development. IT must evolve existing wireless networks to support a variety of new mobility applications. What's more, these applications must be able to extend across multiple networks and scale from small businesses to the very largest enterprises.

To achieve this transition, IT must transform the wireless LAN into a mobility network by creating an open network platform capable of enabling the development of a broad variety of mobility applications designed to improve business agility and competitiveness. Such a platform requires an open interface to allow third parties to source network intelligence in a consistent way without compromising the security or performance of the production network. To achieve this, IT must abstract the services layer from the network layer. This approach allows for the delivery of mobile applications across access networks, including Wi-Fi, Ethernet, cellular, and WiMAX. Furthermore, this allows for the integration of a broader Internet of "things" including passive RFID and sensor networks by bridging control and provisioning of these physical networks.

Cisco is enabling this transition through the introduction of its Cisco Mobility Services architecture based on an innovative new product, the Cisco® 3300 Series Mobility Services Engine. By centralizing the delivery of network services and by standardizing the application interface, the platform enables a broad ecosystem of partners to develop industry relevant mobility solutions.

## Cisco Motion: A Mobility Services Architecture

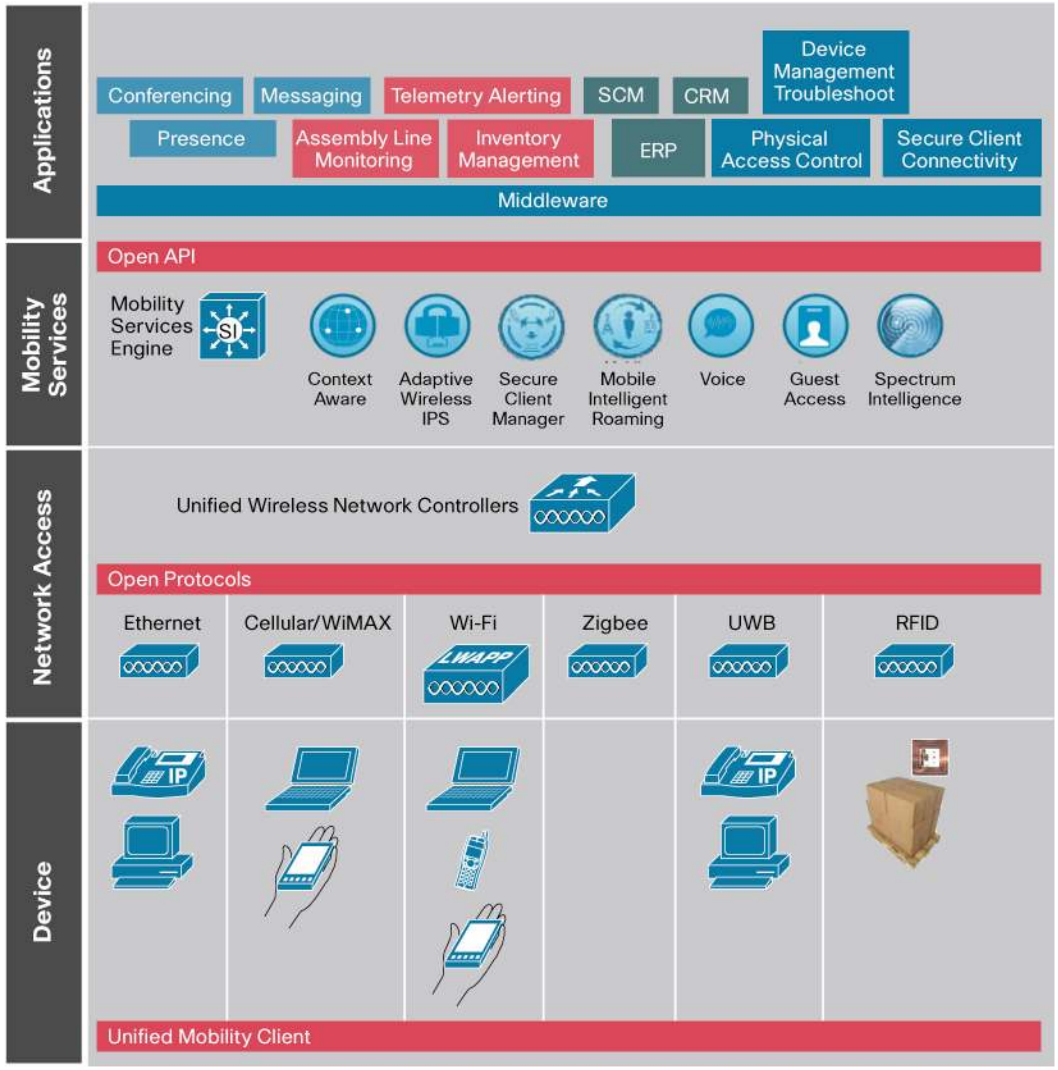
Mobility services are a set of value-added network services that consolidate intelligence from various points in the network to enable and optimize the delivery of business mobility applications. This intelligence has typically been highly distributed throughout the network, resulting in complex service provisioning and management. The combination of the services, control, and data planes adds complexity and limits the network's ability to adapt to new services while maintaining consistent performance. As businesses start to design their networks to natively support mobility, the combination of the services, control, and data planes becomes a limiting factor in the flexibility and scale the network can provide to support mobile applications.

The answer lies in a centralized services architecture. While still critical to the ability of networks to provide the intelligence for optimal application performance, mobility services should be abstracted from the control and data planes in order to be centralized into a services engine. This centralization of services offers several benefits, including scalability and improved provisioning and management. Additionally, a centralized services architecture removes the direct linkage between service and network, allowing services to extend across a variety of networks, including access networks such as Wi-Fi, Ethernet, WiMAX, and cellular. This services centralization also integrates inteligence from physical networks such as passive RFID and sensor networks by offering a standards-based way to unify control and provisioning.

Increasingly, the mobility network must be able to support a multitude of applications. The true value of mobility services is delivered via their ability to enhance application performance by providing real-time information from the network and related applications. This cross-pollination of network and application intelligence has a synergistic effect, augmenting the richness and breadth of the types of mobility solutions that can be delivered. At the same time, a critical component of services delivery is helping to ensure that third-party applications have a standard interface by which they can access this network and application intelligence. The Cisco Mobility Services Engine supports an open API based on Simple Object Access Protocol/Extensible Markup Language (SOAP/XML), which provides northbound access to these services to an ecosystem of mobility application partners. With service intelligence centralized from the control network into the Mobility Services Engine, IT can open access to the API without concern about disruption to the underlying production network.

The Cisco Mobility Services Engine transforms the mobility architecture by centralizing services, for improved flexibility and simplicity in the development of mobility applications. Figure 1 provides an overview of the mobility services architecture.

**Figure 1.** Cisco Mobility Services High-Level Architecture

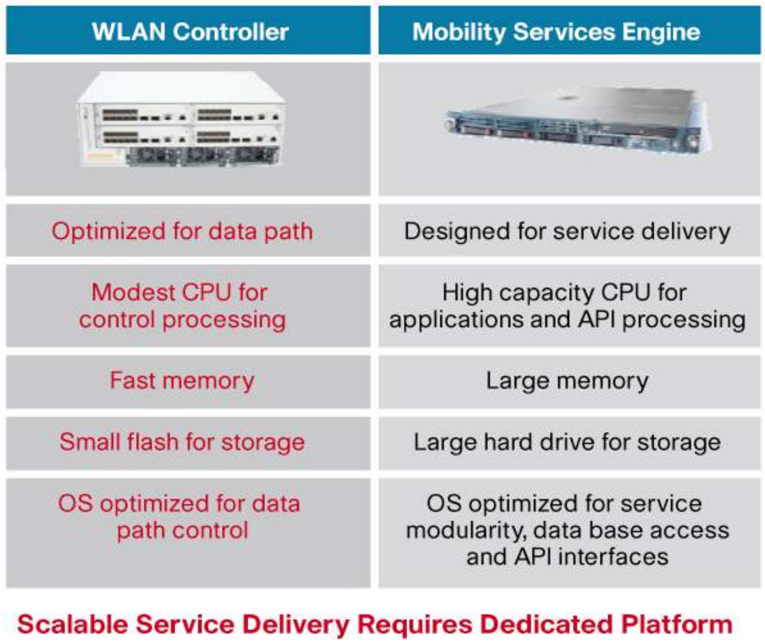



## The Limits of Conventional WLAN Architectures

Existing wireless LANs are optimized for the delivery of wireless data. The use of a WLAN controller helps to ensure scalable, high performance wireless connectivity. However, existing WLAN equipment including WLAN controllers are not well equipped to deliver the services that the business requires to support the full breadth of emerging mobility applications. WLAN architectures excel at delivering reliable, pervasive wireless connectivity, which is especially important for mobile data applications such as e-mail, Web browsing, and file transfers. The architectures are largely designed to optimize throughput of wireless packets while ensuring a low-operational impact for deploying and managing elements such as mobile devices and wireless access points.

As the central part of existing WLAN architectures, the WLAN controller delivers real-time management and network optimization for all network elements. Its primary function is to centralize the management and policy enforcement for network operations. The WLAN controller is not optimized as a service delivery platform. Existing controllers are designed to provide a high-performance data path and have only a modest CPU for control processing. At best, they have limited memory and storage space and generally rely on an operating system that is optimized for data path control. Figure 2 highlights the limitations of WLAN controllers in delivering scalable mobility services.

**Figure 2.** Limitations of WLAN Controllers in Mobility Service Delivery




Additionally, traditional WLAN architectures are incapable of delivering the support for mobility applications that businesses demand. First of all, alternative WLAN offerings have no ability to incorporate other network access technologies, but are limited to Wi-Fi only. These networks are closed platforms that have no standard interface to support third-party development of applications. A significant number of development cycles is therefore required for any new application or service to be integrated into the network. Second, the architectures of WLAN only networks have no ability to centrally manage multiple network environments, nor can they deliver scalable services and applications across a variety of networks.

Only by evolving to a mobility network where applications and services are separated from the control plane, can IT truly deliver the services required. A true mobility network centralizes services delivery, allowing for a modular approach to services enablement. In this way, services can scale across multiple places in the network and over a variety of networks.

As an extension to existing wireless networks, the Cisco Mobility Services Engine integrates directly with the WLAN controller and allows the controller to fully dedicate its resources to the consistent and reliable delivery of packets, while allowing service enablement and scale to be handled by the Mobility Services Engine. In this way, the business can adapt more rapidly to shifts in application requirements.

In summary, the mobility service architecture is preferable to existing WLAN architectures because it has the following attributes:

- Unification of services across multiple networks (for example, Ethernet, Wi-Fi, cellular)
- Support for an open API for the development of enterprise applications
- Ability to manage services across multiple networks
- Support for software modularity, leaving the controller to process traffic

- Services-oriented hardware platform
- Platform that scales for application evolution (investment protection)

### Mobility Services Software

The Cisco Mobility Services Engine is a platform that is designed to support a variety of services, loaded onto the platform as a suite of software. The following takes a closer look at the characteristics of a mobility service followed by several examples of mobility services that can be delivered as part of the mobility services architecture.

A mobility service is a software instance running on the MSE and has the following characteristics:

- The service acts across multiple access networks, including Wi-Fi (802.11) and wired (802.3) networks.
- The service provides a value-added function across multiple network elements.
- The service provides an interface to external applications using a mobility service API.
- The service provides visibility into the network that applications and servers would not otherwise easily obtain.
- The service can be combined with other mobility services to achieve higher-order functions.
- The service can be deployed across multiple MSE to scale the function it provides.

The value of the mobility services architecture is realized through the suite of software that is supported on the Mobility Services Engine. The MSE itself is purely an extensible platform that can support a variety of different software instantiations based on the business need. The flexibility of the MSE platform means that services can be deployed in a one to many or many to one configuration. In this way, organizations can scale a single service across multiple MSEs that may be spread across the enterprise, or conversely, deploy several services on a single MSE for a single office location. While any number of services may be delivered on the MSE, an example of services includes Context Aware software, Adaptive Wireless IPS, Mobile Intelligent Roaming and Secure Client Manager. Each of these services is designed to provide intelligence from the network to help optimize a specific application. Table 1 summarizes the key definitions and functionalities of these services.

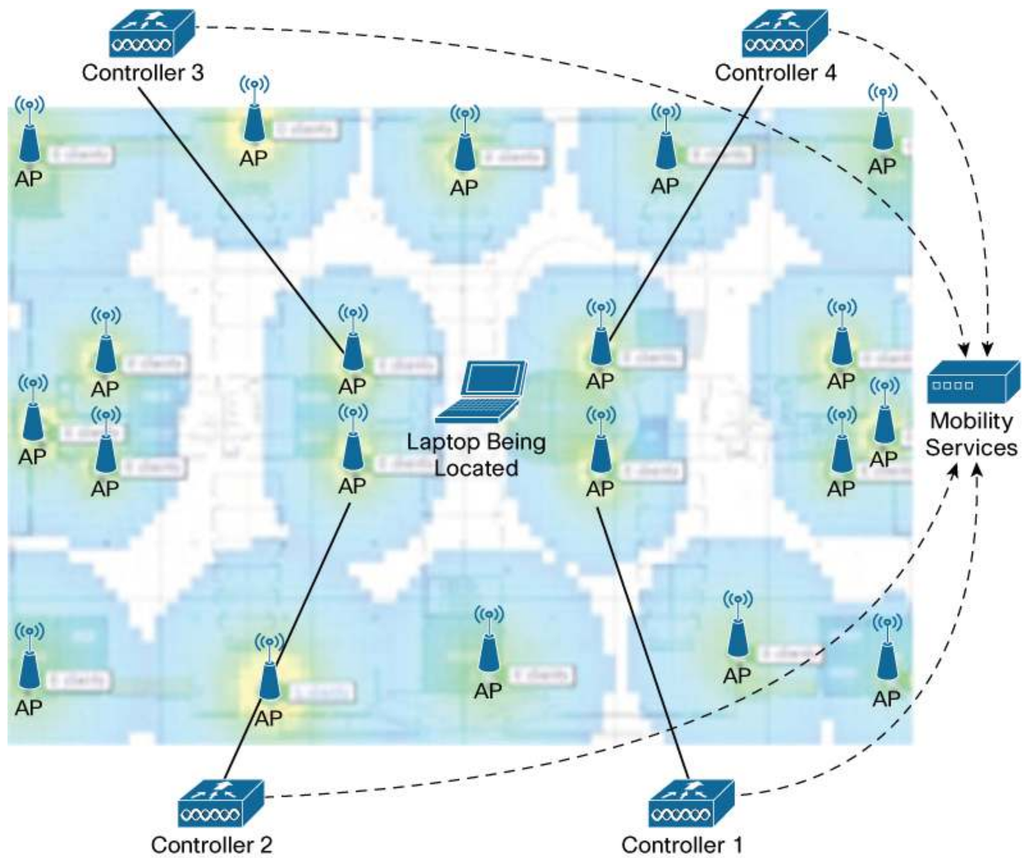
**Table 1.** Summary of Mobility Services Software Suite

| | Context Aware | Adaptive Wireless IPS | Mobile Intelligent Roaming | Secure Client Manager |
|---|---|---|---|---|
| **Description** | Optimize business process with context such as location and telemetry | Mitigate wireless threats with integrated intrusion prevention | Deliver handoff for mobility applications across public and private networks | Simplify device provisioning and management for the wave of new mobile devices |
| **Applications** | Asset Tracking<br>Condition Monitoring | Regulatory Compliance—PCI, HIPAA, SOX | Dual Mode Voice and Data Applications | Secure Connectivity |
| **Primary Industries** | Healthcare<br>Manufacturing | Retail<br>Financial Services<br>Healthcare | Enterprise<br>Healthcare<br>Education | Retail<br>Healthcare<br>Enterprise |

#### Services Centralization Optimizes Performance

Having the service run on the Cisco Mobility Services Engine rather than on each individual switch or wireless controller provides for a more scalable network design. This is because of the way in which information is sourced from the wireless controllers and wireless access points. In a typical enterprise wireless deployment, there are many access points deployed in a physical space such as a floor. For redundancy and scalability, these access points are connected to a number of wireless controllers rather than a single wireless controller, as shown in Figure 3. While the chart is an exaggeration (no business would deploy only a single access point per controller), it illustrates the point that controllers may receive network intelligence in an uncoordinated fashion.

**Figure 3.** Typical Wireless-Controller-to-Access-Point Deployment for Location Services




In the example in Figure 4, the controllers are attempting to determine the location of the laptop. Given the distributed nature of each controller, an MSE running the context-aware software is required to collect information from all controllers (1 to 4) connected to the access points located around the client, not just the set of access points connected to a single controller. In this way, the MSE is able to centralize all location information to correlate and provide a single interface via the open API to external applications.

Another benefit of the centralization of services into the MSE is that each controller is no longer burdened by applications requesting network intelligence. In the case of location as part of the context-aware software, applications can interface directly with the MSE rather than continually polling individual controllers for the location information of devices and tags. Location calculations require adequate processing power to ensure the delivery of concise location information. The MSE is a dedicated platform that is designed for this task and results in a more consistent and scalable service delivery.

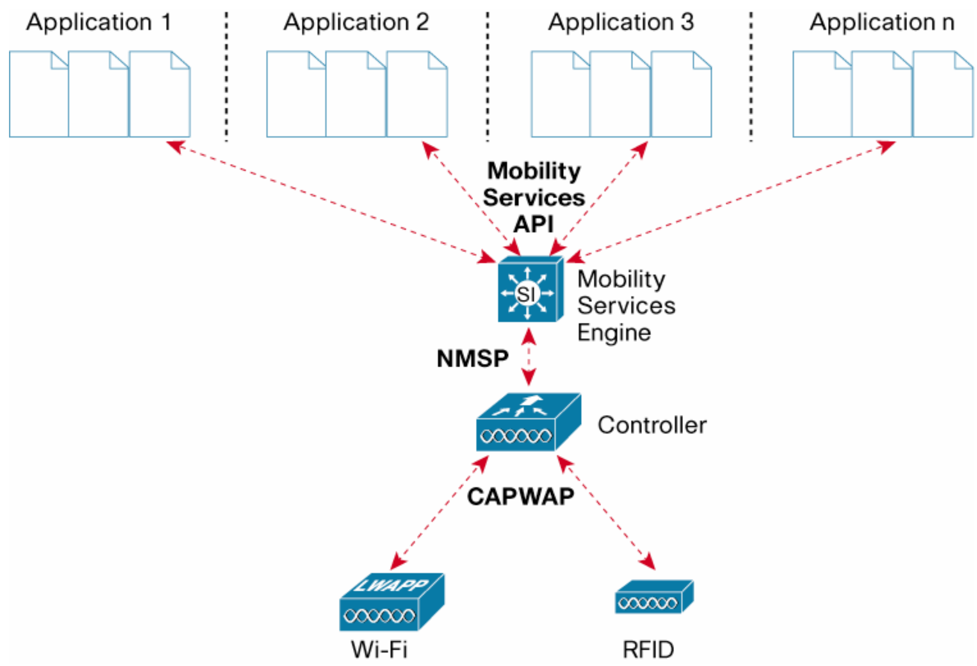
## Open Mobility Service Interfaces

One of the important design aspects of the mobility services architecture is the introduction of standardized interfaces between service components. The mobility service architecture interfaces fall into three categories, with each category representing a particular area or layer of the network. These categories include:

- **Mobility Services API:** The mobility services API is the critical interface between external applications and the Mobility Services Engine. It is both the administrative interface for management of the services and also real-time interface for consumers of the services. The main objective of the mobility services API is to greatly simplify the development of mobility applications by integrators by offering a standardized way to access network intelligence.
- **Network Mobility Service Protocol (NMSP):** NMSP provides a single, common protocol between the MSE and wireless controllers to communicate all service-level information. Each wireless controller advertises the services that it provides to any of the mobility services engines that may connect to it. When a mobility services engine connects to the wireless controller, it subscribes to the set of services that it wishes to consume information for. Information shared by the mobility controller is categorized by service and includes location measurements, statistical data, security context data, and so on.
- **Control and Provisioning of Wireless Access Points (CAPWAP):** CAPWAP is designed to provide management, control, and data plane communication between the wireless controller and the access network by standardizing the communications between the controller and the access device. The CAPWAP working group is delivering extensibility in the protocol design for future applicability to access technologies beyond Wi-Fi, like RFID. The CAPWAP working group has split the CAPWAP protocol specification into base and binding specifications to allow other wireless technologies to be added in the future without the need to modify the base protocol specification.

Figure 4 illustrates how each of these protocols is deployed within the architecture.

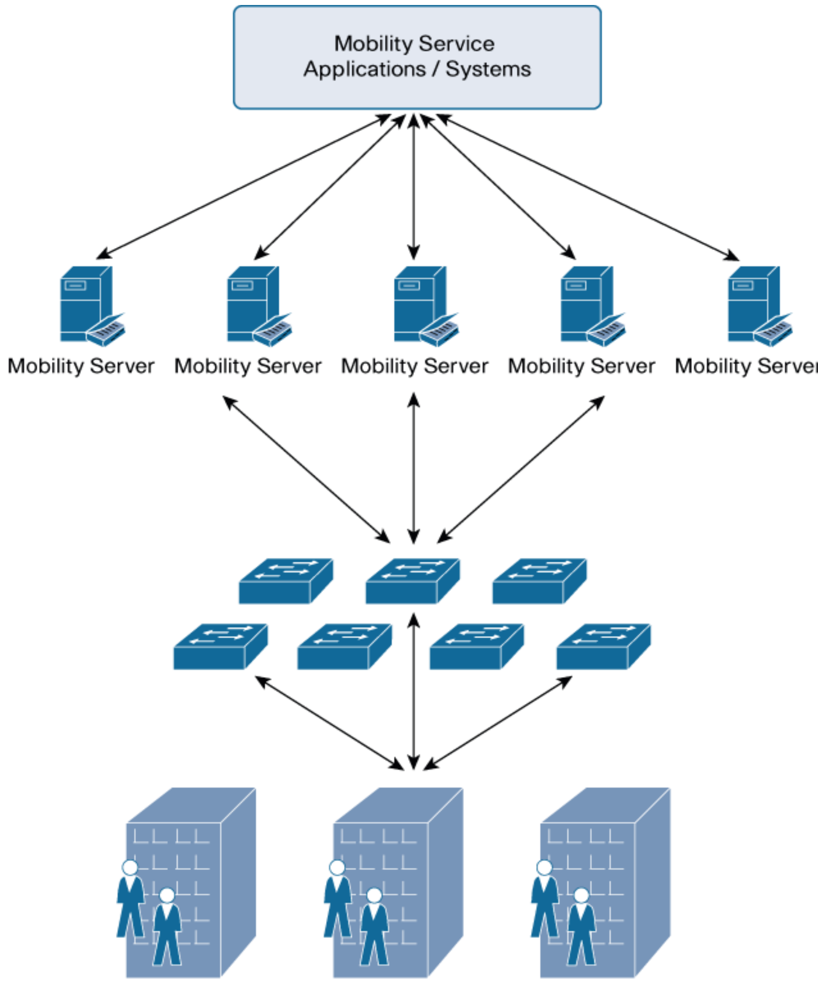
**Figure 4.** Standardization of Network Interfaces




### Architected for Scalability

The scalability of the mobility services architecture is a fundamental requirement. Scalability covers two main aspects: high availability and clustering. The architecture is designed to support high availability of services and network components. Controllers can be multi-homed to ensure redundancy or can also operate in hot-standby mode. Large or critical network environments can achieve high availability for the Mobility Services Engine by employing a clustering technique. MSE clustering, using an enterprise services bus architecture, makes it possible to increase the number of services and the size of the networks that the services run in without applications or clients knowing that those services are provided by more than one physical MSE. As shown in Figure 5, Mobility Services Engines can be clustered to support services scalability.

**Figure 5.** Scaling the Mobility Services Architecture


Mobility Service
Applications / Systems
Mobility Server
Mobility Server
Mobility Server
Mobility Server
Mobility Server

## Conclusion

To enable the transition to the mobile business, IT must respond to the emerging mobility challenges. By evolving the wireless LAN to a true mobility network, IT is better equipped to manage the wave of new mobile devices, unify multiple networks via a single control interface, and build an open platform for the development of mobility applications. The introduction of the Cisco Mobility Services Engine allows for the centralization of service enablement and delivery, leaving the wireless LAN controller to perform its primary task of efficiently managing the data plane. The Cisco Mobility Services Engine takes a modular approach to service delivery by supporting a suite of software capable of sourcing service intelligence, such as context and intrusion prevention information, from a variety of networks. The centralization of this service intelligence provides a logical opening point for an API that allows an ecosystem of third parties to develop industry-relevant solutions based on the inherent network intelligence. Only by evolving the WLAN into a true mobility network can the business put its employees, partners, customers, and assets in motion.

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