



White Paper

## Cisco Unified Wireless Network: Reducing Large-Scale Enterprise Wireless LAN TCO

### SUMMARY

This white paper discusses the Cisco® Unified Wireless Network; in particular the Cisco Catalyst® 6500 Series Wireless Services Module (WiSM) and how it compares to separate, non-unified wireless LAN switch solutions in terms of total cost of ownership (TCO). This paper examines in detail how an integrated approach can save significant costs in ongoing operations, support, and lost productivity over a five-year period.

### CHALLENGE

As IEEE 802.11-based wireless LANs enter their sixth year of deployment, the evidence of their maturation as a mainstream enterprise networking technology is clear. Increasingly Enterprises of all sizes are embracing the competitive and productivity benefits of wireless LANs. In a 2005 Sage Research survey of more than 600 companies with 1000 or more employees, nearly 60 percent indicated that they will deploy or expand their wireless LAN infrastructure in the next 12 months. This was second only to intrusion detection technologies in importance. This growth catalyzes the need for wireless networks to meet the scale, resiliency and security of wired networks.

Wireless LAN deployments have evolved from workgroups to campuswide networks. To manage these larger-scale installations, enterprises have shifted from standalone intelligent access points to centralized wireless LAN controller solutions (sometimes referred to as wireless switches) to simplify configuration and management. Centrally managed solutions offer dramatically simplified deployment through automatic discovery and configuration of access points. Wireless operation is also streamlined—data gathered from the access points can be analyzed by the central controller and used to adjust the RF environment, avoiding holes and dead spots that otherwise would cause degradation or outage of the network.

The benefits of a centrally managed wireless LAN are clear. Centralized management will increase in importance as wireless LAN deployments grow exponentially larger, driven by the adoption of advanced applications such as voice-over-WLAN and location-based services. These advances services enabled by the wireless LAN will compel pervasive deployments across the enterprise to allow seamless coverage and fast, secure roaming for latency-sensitive voice applications. Now, the new challenge facing enterprises as they move from campus deployments toward pervasive, companywide deployments is how to minimize total cost of ownership of the wireless LAN network.

### THE NEXT REVOLUTION IN WLANS: UNIFICATION WITH LAYER 2 AND 3 SWITCHING AND ROUTING INFRASTRUCTURE

Integrating advanced services into the networking infrastructure is not a new concept. Cisco Systems® has led the industry by integrating key advanced services into its Layer 2 and 3 switching and routing platforms, including voice over IP (VoIP), integrated security, management and application-oriented networking. Integration on the Cisco Catalyst 6500 platform offers several benefits, including simpler deployment, streamlined management, faster upgrades, and perhaps most importantly, superior reliability. Integration also provides additional cost reductions by providing a shared infrastructure for the backbone, power, and cooling.

From standalone access points to centralized wireless LAN controllers, wireless LAN technology and network architectures have evolved significantly. The next natural phase of advancement now centers on integration with the Layer 2 and 3 switching infrastructure. Pervasive wireless LAN deployment across the entire enterprise is motivating this evolution to integrate wireless-specific capabilities within the Layer 2 and 3 wired infrastructure. Integrating this functionality uses the bandwidth, security, redundancy, and management capabilities of the network and provides a strong platform for expansion. Cisco is the first to introduce this next-generation wireless LAN solution with the Cisco Catalyst 6500 Wireless Services Module (WiSM).

The Cisco Catalyst 6500 Series WiSM delivers centralized security policies, wireless intrusion prevention system (IPS) capabilities, award-winning RF management, quality of service (QoS), and Layer 3 fast secure roaming for WLANs. The Cisco WiSM provides the control, security, redundancy, and reliability that network managers need to scale and manage their wireless networks as easily as they scale and manage their traditional wired networks (Figure 1).

**Figure 1.** The Cisco Unified Wireless Network: Cisco Catalyst 6500 Wireless Services Module



The Cisco WiSM smoothly integrates into existing Cisco Catalyst 6500 Series enterprise networks. It communicates using the emerging Lightweight Access Point Protocol (LWAPP) standard to establish secure connectivity between access points and modules across Layer 3 networks. This protocol enables the automation of important wireless LAN configuration and management functions for cost-effective wireless LAN operations.

The Cisco WiSM extends the Cisco Catalyst 6500 Series' rich, intelligent network services to the wireless edge. As an integrated part of the widely deployed series, the Cisco WiSM uses the full range of Cisco Catalyst 6500 Series hardware- and software-based intelligent switching services. It supports interoperability with Cisco Catalyst 6500 Series integrated services modules such as the Firewall Services Module (FWSM), Intrusion Detection Services Module (IDSM), Network Analysis Module (NAM), and IPSec VPN Services Module (VPNSM).

The Cisco Catalyst chassis may hold one or more Cisco WiSM modules, Supervisor Engine 720 modules, redundant power supplies, and cooling resources, in addition to the other integrated services modules listed above. Modules communicate across a fully redundant backplane, enabling hot swap capabilities and easy serviceability.

This next-generation solution represents a dramatic shift in benefits to the enterprise, not just an altering of the physical topology of the wireless LAN. The remainder of this paper will demonstrate the significant TCO benefits of an integrated versus an overlay solution.

## **ACQUISITION COST IS A FRACTION OF THE TOTAL COST OF OWNERSHIP**

It is important to understand that the initial acquisition cost of IT technologies typically represents only 20 percent of the TCO over a five-year period. The remaining 80 percent of the cost—the ongoing upgrades, maintenance, and support—are often overlooked during the initial phases of a new technology rollout. While parallel infrastructure may be appropriate for smaller pilot deployments of new technologies, the financial implications of the ongoing cost of ownership to maintain these parallel infrastructures cannot be ignored for widespread deployments of mature capabilities. TCO can be broken down into two main categories: direct costs and indirect costs. Within each of these are subcategories that can be readily analyzed.

## **THE DIRECT COSTS OF DEPLOYING A NON-UNIFIED SOLUTION ON A LARGE SCALE**

Deploying a large-scale wireless LAN using a non-unified architecture currently involves many discrete steps which may require weeks to work through in order to bring the network online.

A site survey to determine the number of access points begins the process. Whether done manually or through RF planning tools, this step is critical in determining the quantity of access points needed. This in turn drives the number of wireless LAN switches required. For each switch, power and cooling requirements must be calculated. Identifying the appropriate points in the network to cable the switches in is the next challenges. Rack space may be at a premium, causing switches to be located in disparate areas, creating more complexity. Sourcing of additional racks may be required if sufficient open space in existing racks is not available. This creates not only additional outlays for the racks themselves and the cost of the floorspace, but entails ensuring that the wiring closet or data center can supply sufficient power and cooling for the additional equipment.

Installation begins by physically cabling the WLAN controllers into the infrastructure. This involves connections not only downstream to the wired switching infrastructure or directly to access points (if powered over Ethernet), but also upstream to the wired infrastructure, including crucial security components such as firewalls, VPNs, IDSs, and other network components.

Next is configuration. Important wireless parameters such as the mobility groups and access control lists (ACLs) must be decided upon and entered. Considerable time is also added for overlay solutions to configure the physical interfaces to the wired infrastructure, in particular existing security systems such as firewalls and ACLs.

Another consideration of non-unified solutions is the cost of maintenance, both direct purchase price of contracts and the labor involved. Multivendor solutions require separate contracts with each party for support. These costs can increase rapidly depending upon the vendor's support program, but typical charges of 12 to 18 percent of the total acquisition cost per year are normal for access to software upgrades, telephone and e-mail support, and equipment replacement. Three to four software upgrades a year must be planned for due to the continued rapid evolution in wireless LAN capabilities and standards, causing further reconfiguration and taking the network offline, losing valuable productivity.

## **THE INDIRECT COSTS OF UNPLANNED DOWNTIME**

The above direct costs are straightforward to measure and understand. However, they typically represent the smaller portion of TCO. The larger consequence of an overlay solution is the increased unplanned downtime created by additional hardware and network complexity. As carefully as organizations plan rollouts, purchase management tools, and invest in training for their IT staffs, unplanned downtime will occur simply because of the complexity of the network. Two types of downtime can occur: degradation and complete outages. While the former may sound less impactful, both can be deadly to enterprise productivity and revenue. In the case of a hotspot wireless LAN network, a service provider whose network is down might cause dissatisfaction for a business traveler that tries to access it but finds it is not available. While frustrating, the traveler is likely to try again the next time the service is needed. However, that same business traveler would probably switch to another service the connection was repeatedly slow.

Detailed studies on the costs of downtime—both loss of revenue and loss of employee productivity—have been completed by multiple analyst organizations. A 2005 Infonetics survey of large enterprises in North America reveals just how costly downtime can be (Figure 2).

**Figure 2.** Annual Productivity and Revenue Losses due to Network Equipment Downtime

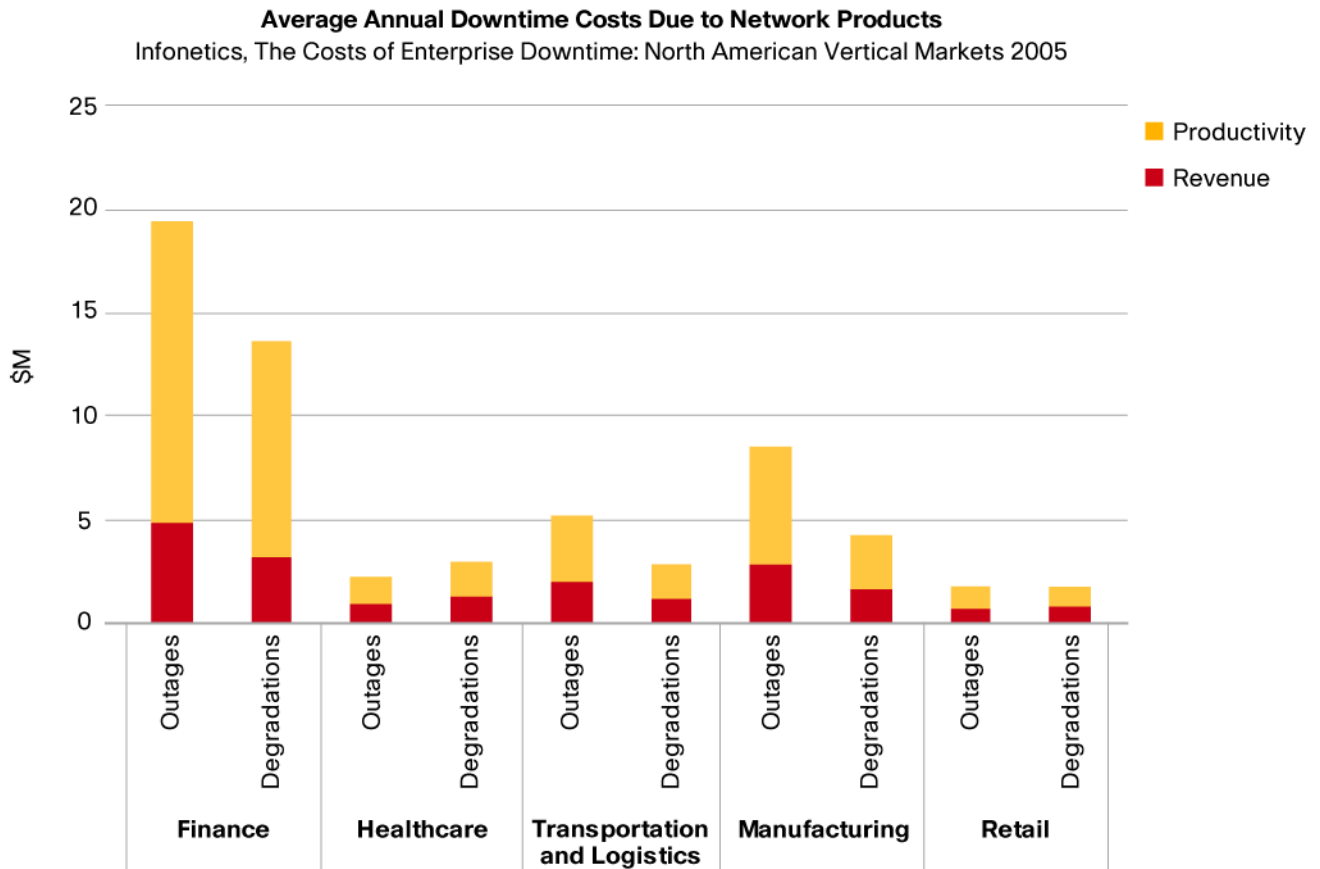


Figure 3 demonstrates that downtime costs due to network equipment failures run into the millions annually for all major verticals. These numbers do not include cabling issues or human error, which can also be attributed to the network complexity caused by overlay solutions, and can thus increase the financial impact of downtime.

For non-unified networks, a large portion of outages can be attributed not only to the network complexity, but also to the time spent by administrators troubleshooting the true source of performance issues or equipment failures. With multiple vendors, more often than not it is up to the administrator to prove the source of the problem. Simply tracking it down may result in hours of cable tracing and multiple phone calls to vendors. The costs multiply exponentially—not only is the network down, causing productivity and revenue losses, but additional losses occur from IT administrators’ inability to work on productivity-enhancing IT projects.

## A SAMPLE WIRELESS LAN CASE STUDY

The TCO model used in this white paper is based on a large manufacturer in North America. This large Fortune 100 company has one headquarters office with multiple plants spread throughout the United States. Headquarters includes approximately 5000 employees with office space and manufacturing. Other plants range from 1500 to 2500 employees.

Employees use laptops; in the manufacturing areas, business-specific devices such as barcode scanners and portable printers are used. Cisco Wireless IP Phone 7920s are used in the manufacturing areas as well. The enterprise expects to adopt voice-over-WLAN capability for office areas within the next 12 months.

The IT department is centralized at the headquarters site with the plants having reduced IT staffs. The network is IP-based and QoS is enabled. Remote employees access network resources through IPSec VPNs.

### Customer Requirements

The customer requires that all applications supported on the wired network be supported on the wireless LAN network. In the corporate office, the wired network is not being replaced, but augmented with the wireless network as an extension. In the plants, the wireless network will be primary in the manufacturing areas due to the difficulties and expense of hard wiring. Reducing complexity of moves, adds, and changes, as well as being able to quickly reconfigure a manufacturing line, is fueling the enterprise's desire for the speed and flexibility of a wireless network. The desire for wireless VoIP stems from the need to quickly and easily reach engineering, manufacturing, and other process managers as they move between their offices and the manufacturing floor. Cellular coverage is poor inside the manufacturing plants, so wireless VoIP is the preferred solution. Additional requirements are:

- Support for Windows 2000 and XP laptops
- Support for wireless barcode scanners, portable printers, and Cisco IP Phone 7920s in manufacturing areas
- Support for wireless VoIP phones using Session Initiation Protocol (SIP) in the next 12 months
- Rogue access point mitigation
- Support for guest access at the headquarters location

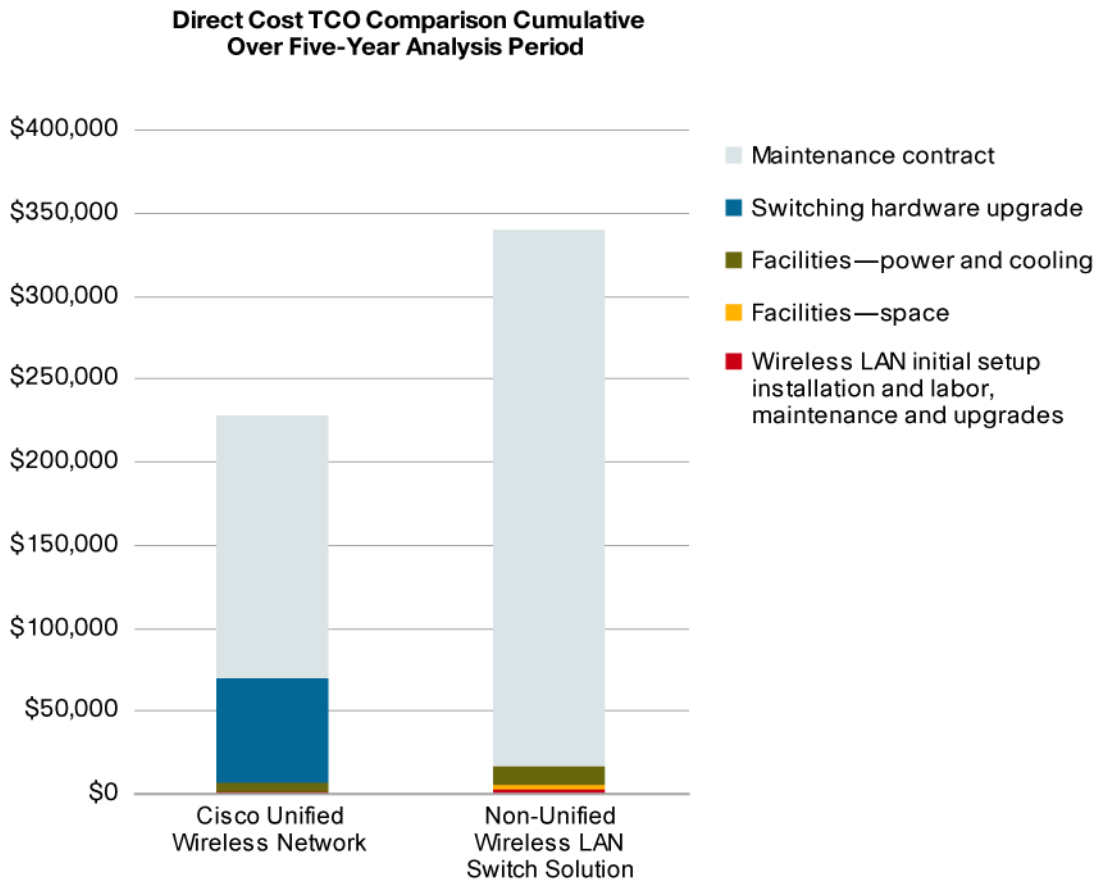
### TCO MODEL DETAILS

Two solutions are considered: a non-unified wireless LAN controller solution and the Cisco Unified Wireless Network solution. Because the network is expected to provide pervasive wireless coverage over time, a TCO analysis is performed to determine the true costs over a five-year period. Using an RF planning tool, an initial deployment of 500 access points is estimated for the headquarters site and several of the manufacturing plants. Thirty percent growth each year is anticipated as a result of the roll out of voice-over-WLAN in the next 12 months, as well as bringing wireless into additional manufacturing plants. The enterprise already has an extensive wired infrastructure composed of Cisco Catalyst 6509 switches. However, these switches do not support the Supervisor Engine 720 module (on average, there are four available slots in each switch). IT administrators familiar with wireless technology will manage the installation. Burdened salary for the administrators is approximately US\$91,000 annually.

### Direct Costs

Direct costs used in the TCO model include the initial time for cabling and configuration, maintenance and upgrades, and facilities space and cooling. As can be seen in Figure 3, the Cisco Unified Wireless Network solution delivers a 33-percent cost advantage, primarily due to the high outlays for annual support and maintenance contracts of the other solution examined.

**Figure 3.** TCO Comparison of Solutions over Five Years

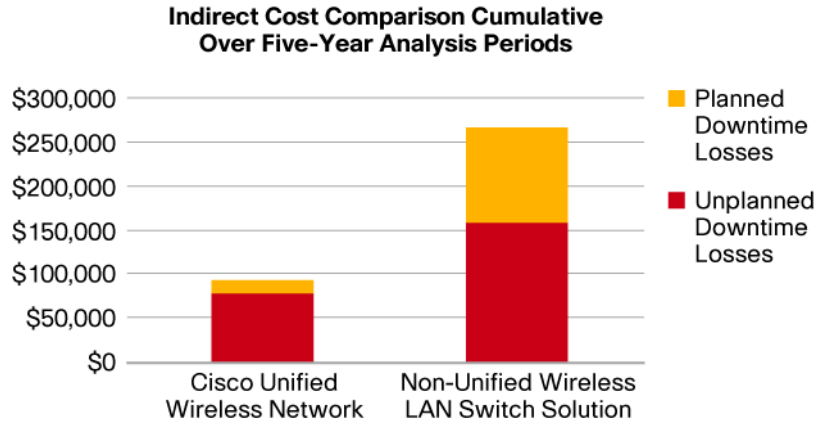


Although purchase of a Cisco Catalyst Supervisor Engine 720 Module is required to upgrade the Catalyst 6509 Switch to support the WiSM, the Cisco Unified Wireless Solution still has a substantial cost benefit.

## INDIRECT COSTS

Indirect costs are even more striking between the two solutions (Figure 4).

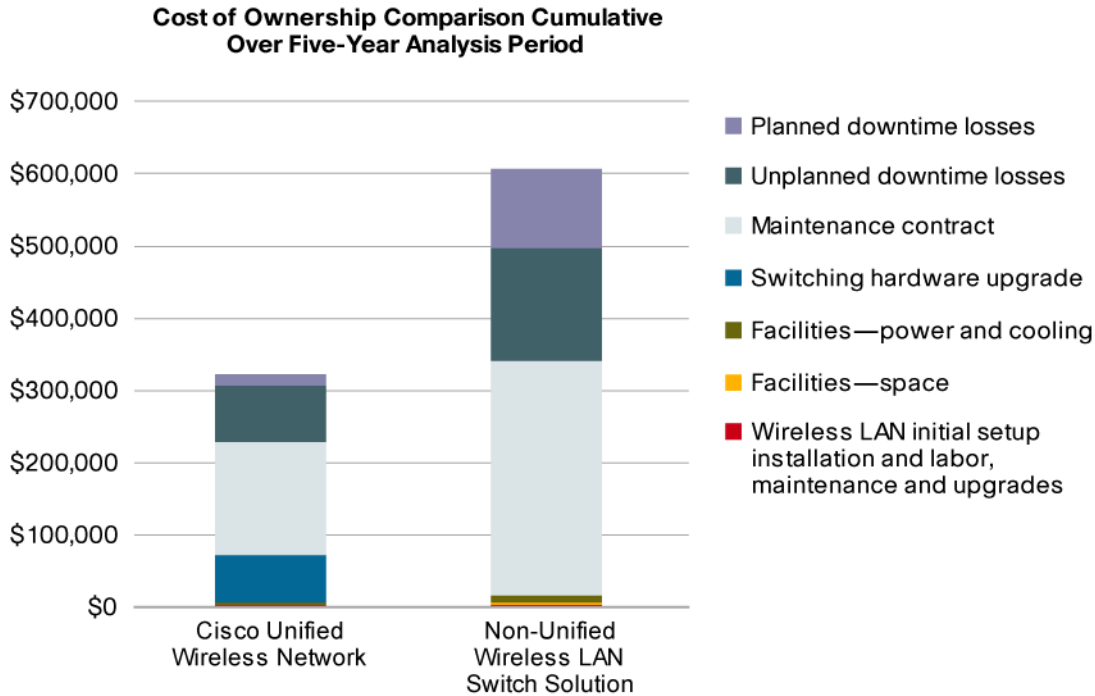
**Figure 4.** Indirect Cost Comparison



Using a conservative model that only incorporates productivity losses, the integrated Cisco solution provides more than a 2:1 cost advantage. Planned downtime is dramatically lower with the Cisco solution. Because of integration with the Cisco Catalyst 6500 platform, the Cisco WiSM can receive software upgrades without taking the wireless network offline. Unplanned downtime provides another striking difference in ongoing cost of ownership. Integration of the Cisco WiSM allows an improvement of network availability to 99.995 percent, due to cabling risk reduction and reduction of issue recovery time.

Figure 5 shows the TCO differences for both the direct and indirect costs.

**Figure 5.** TCO Comparison for Direct and Indirect Costs



In total, the overall benefit of integration leads to an almost 50-percent reduction in TCO as amortized over five years. This model is conservative—it does not take into account the corporate revenue gained from the increased network availability. Additional refinement of the model taking into account the number of revenue-generating employees that are affected by network downtime would further demonstrate the dramatic benefits of an integrated solution.

## CONCLUSION

Wireless LANs are here to stay in the enterprise. New applications such as location-based services and voice-over-WLAN will drive deployments to become pervasive. With large deployments, centralized management is clearly required to simplify configuration and ongoing software updates. However, as wireless LANs move into a new stage of maturity, the new challenge is managing overall cost of ownership. Integration of wireless controller capabilities into the Layer 2 and 3 switch network provides a clear opportunity to reduce these costs, both direct and indirect. Doing so delivers hard benefits to the corporate enterprise bottom line allowing investment in other more productive IT programs. Even more important are the soft benefits delivered to the enterprise’s employees, customers, and partners. Ensuring that wireless network availability is as high as possible maintains employee productivity and reduces customer and partner frustration in being unable to access employees or retrieve needed information. Ultimately, network unavailability may even impact the enterprise’s reputation and image. The Cisco WiSM allows corporations to integrate wireless LAN capability into their trusted Layer 2 and 3 switching networks, while continuing to provide all of the benefits of Cisco wireless LAN controllers.

Designed for large-scale pervasive deployments, the Cisco WiSM delivers a significant payback in terms of TCO due to improved facilities use, simplified installation and upgrades, and significantly reduced downtime. This solution allows IT managers to take full advantage of their existing knowledge, training, and infrastructure to cost-effectively implement enterprise-wide wireless LANs

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