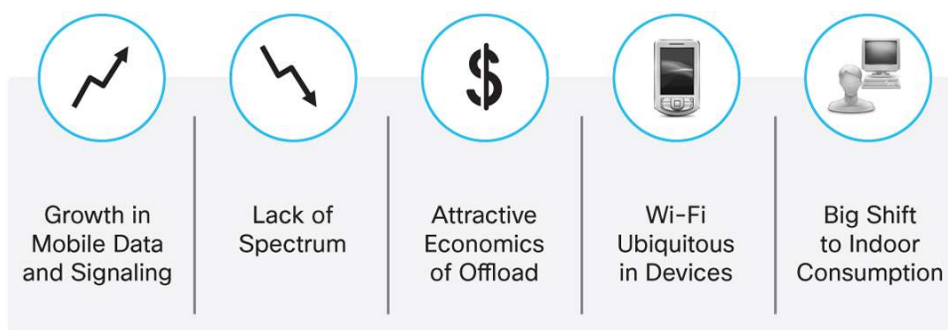


# Cisco Service Provider Wi-Fi: A Platform for Business Innovation and Revenue Generation

## Market Trends

Several trends in the market are causing operators to incorporate small cell solutions into their network infrastructure plans (Figure 1).

**Figure 1.** Small Cell Market Trends



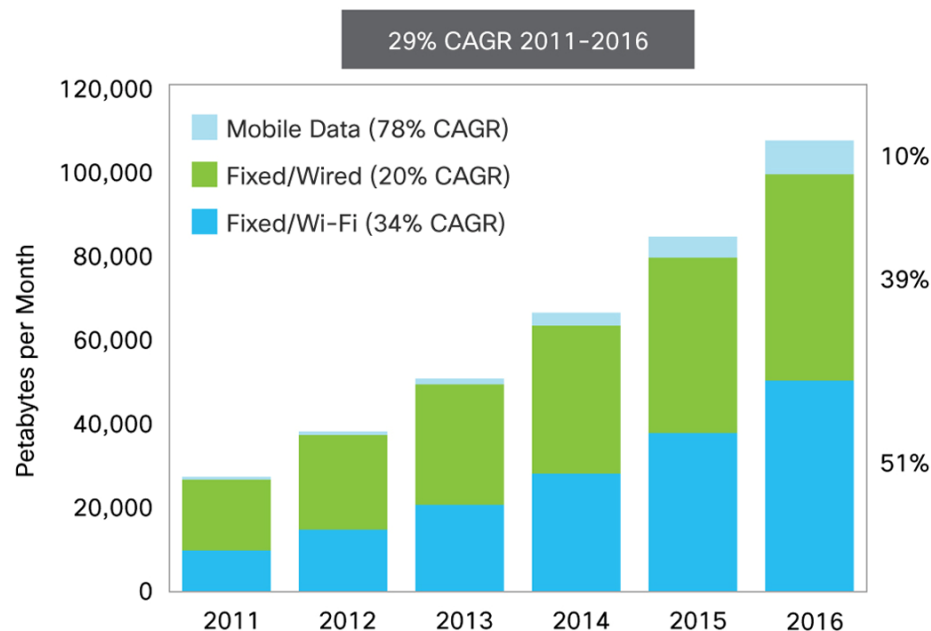
- Cisco® research shows that providers can expect mobile data traffic to increase 18-fold over the five years between 2011 and 2016. Analysts also point to the exponential growth in signaling traffic helping drive the data growth.
- Coupled with this growth in traffic is the lack of available new spectrum and the difficulty for operators to quickly and cost-effectively add new macrocell sites. In this environment, small cell solutions become very attractive.
- Distinctions between consumer and business services on mobile devices have become blurred. Small cells can help deliver those services transparently across third- and fourth-generation (3G and 4G) cellular networks and Wi-Fi.
- Wireless usage is shifting indoors. Network analytics show that the majority of mobile data usage - close to 80 percent - is indoor and nomadic, rather than truly mobile. Macro networks were built for voice on the go. Small cell networks are designed to address modern mobile data traffic patterns.
- Small cells offer new monetization opportunities by taking advantage of the intelligence inherent in the network, including policy, hyperlocation, context, application, and device information. Businesses can use this information to engage with their customers in new ways, including through augmented experiences, location-based content, and personalized loyalty programs.

Operators are looking at both licensed and unlicensed (Wi-Fi) technologies to meet this demand. One option is increasingly of interest: Wi-Fi small cells. Wi-Fi has become ubiquitous in nearly all personal mobile devices, including smartphones, tablets, cameras, and game consoles. And Wi-Fi technology is improving every day. Robust carrier-grade Wi-Fi networks have the ability to outperform 4G networks and are secure, and now next-generation hotspots offer roaming that is as transparent as cellular roaming. To meet the spectrum challenge, Wi-Fi provides 680 MHz of new spectrum to operators.

As Figure 2 shows, soon Wi-Fi will surpass wired traffic. According to the Cisco Visual Networking Index™ (Cisco VNI™), by 2016, 51 percent of IP traffic will be delivered over Wi-Fi networks, with about 10 percent of mobile data delivered over cellular networks.

**Figure 2.** The Growth of Wi-Fi Traffic by 2016

### Global IP Traffic by Local Access Technology By 2016, Fixed/Wi-Fi Traffic Surpasses Fixed/Wired Traffic



Source: Cisco VNI Global Forecast, 2011-2016

In fact, Wi-Fi has created a large market opportunity for operators, and that opportunity is attracting increasing competition. As a result, as providers attempt to secure locations and launch services, the race to capture this opportunity will go to the swift.

Given this scenario, there are four important ways Cisco can help service providers capture the Wi-Fi opportunity with Cisco Service Provider Wi-Fi (SP Wi-Fi), a carrier-grade solution for mass-market deployments.

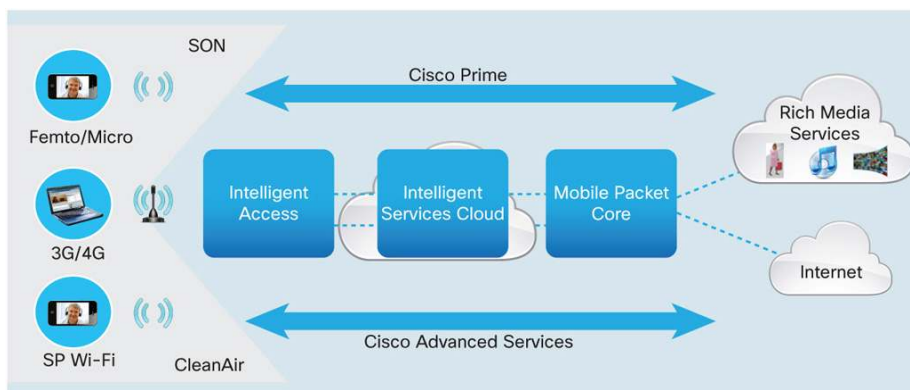
- **Carrier-class solution by design:** Cisco SP Wi-Fi is tailored to meet the needs of service providers, providing cost-effective small cell coverage and capacity to meet the scale and quality required by mobile data users today. Cisco has been designing service provider Wi-Fi networks for years, and our advanced products reflect the attention to design detail needed in real-world deployments.
- **Comprehensive capabilities to reduce business risk:** Cisco SP Wi-Fi is more than just a set of technologies; it is a solution ready for rapid, large-scale deployment. The technology architecture is transparent, secure, scalable, and manageable. The business architecture allows operators to use Cisco's expertise to finance, deploy, and start new services quickly.
- **Unsurpassed Wi-Fi expertise:** Cisco makes the most widely used Wi-Fi access points in the world, with over 15 million Wi-Fi access points deployed. Cisco has the most experience delivering the widest range of Wi-Fi solutions to the widest variety of customers. Cisco helps enterprises and service providers every day to simplify the user experience as mobile devices blur the lines between business and consumer services.

- Innovative technologies:** Cisco is pioneering Wi-Fi innovation by addressing challenges of automatic roaming with Cisco Next Generation Hotspot built into our SP Wi-Fi solution. Cisco CleanAir® and Self-Organizing Network (SON) technologies provide reliability and manageability, including simplified subscriber and session management with standardized mobile packet core integration. We solve our customers' problems with a standards-based approach, and then add value with innovations like CleanAir technology and zero-touch provisioning. Cisco Connected Mobile Experience, with location-based context-aware information, allows service providers to better engage with their customers and provide new monetization opportunities with new business services. Cisco's end-to-end Wi-Fi solution is the ideal infrastructure to help you take full advantage of today's wireless market opportunities.

### Cisco Service Provider Wi-Fi

Cisco can provide you with a truly carrier-grade, end-to-end Wi-Fi infrastructure that is scalable enough to support exponential traffic growth from millions of users, is able to deliver a transparent mobility experience for the end user, and is built on open standards, so that you can count on it working with the network you have today, as well as the network you will have in the future. Cisco Service Provider Wi-Fi is part of an integrated small cell architecture (Figure 3).

**Figure 3.** Cisco Small Cell Solution



The Cisco SP Wi-Fi solution includes:

- A complete portfolio of intelligent access points, including the Cisco Aironet® 1550 Series for outdoor and metro deployments and the Cisco Aironet 3600 Series for indoors. Cisco's unique offer is silicon-level integration for crucial network functions, including interference mitigation, resource management, band selection, and video optimization.
- An Intelligent Services Cloud (ISC) for critical network management, subscriber management, and policy control. This includes the Cisco Wireless Controller, the Cisco Mobility Services Engine with built-in analytics, and the Cisco Intelligent Services Gateway (ISG). The Cisco Intelligent Services Cloud gives you the flexibility to deploy, operate, and manage networks with hundreds of thousands of access points, and to analyze the location and context data gathered by the network that can quickly be turned into new service offerings. The capabilities of the ISC translate into reduced operating costs and new revenue streams, including zero-touch provisioning for "hang-and-go" deployments, centralized interference mitigation and troubleshooting for ease of network maintenance, and business intelligence for marketing promotions and other context-based delivery of content.

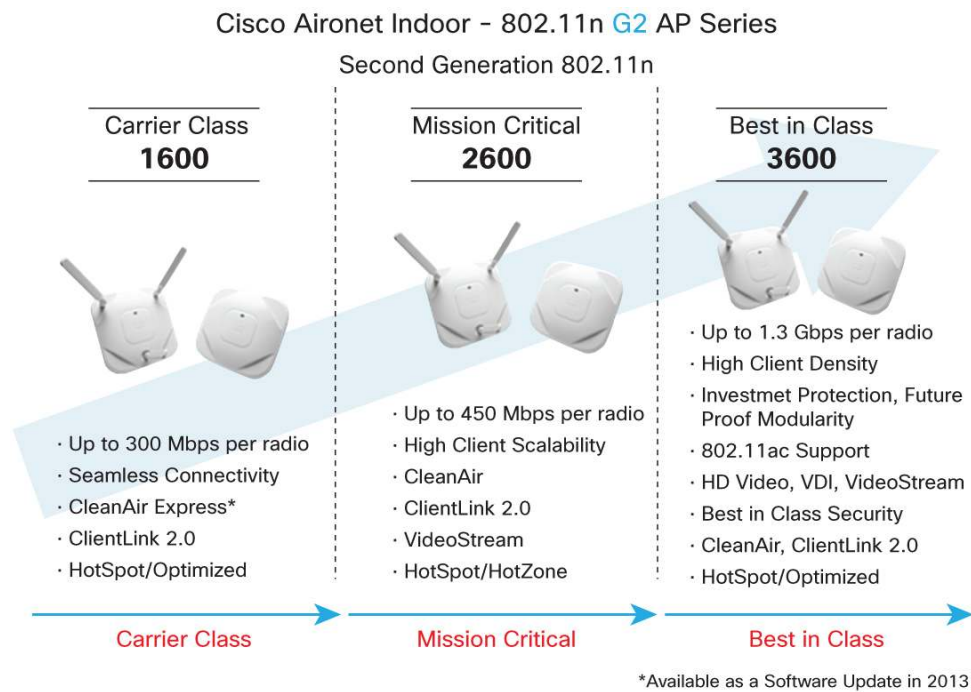
- A mobile packet core with the award-winning Cisco ASR 5000 Series provides standards-based functionality that allows operators to transparently and securely integrate Wi-Fi, femto, and macro radio networks in the Cisco Small Cell Gateway. The Cisco ASR 5000 Series includes common subscriber management, policy, and authentication functionality, delivering transparent service integration to Wi-Fi users. The Cisco ASR 5000 Series, which powers the Cisco Small Cell Gateway, is in deployments today, providing the multivendor interoperability that operators require.

Across all of these components, you can use the Cisco Prime™ platform, a unified network management solution that supports an intuitive user experience as it integrates operations across Cisco products, technologies, and networks.

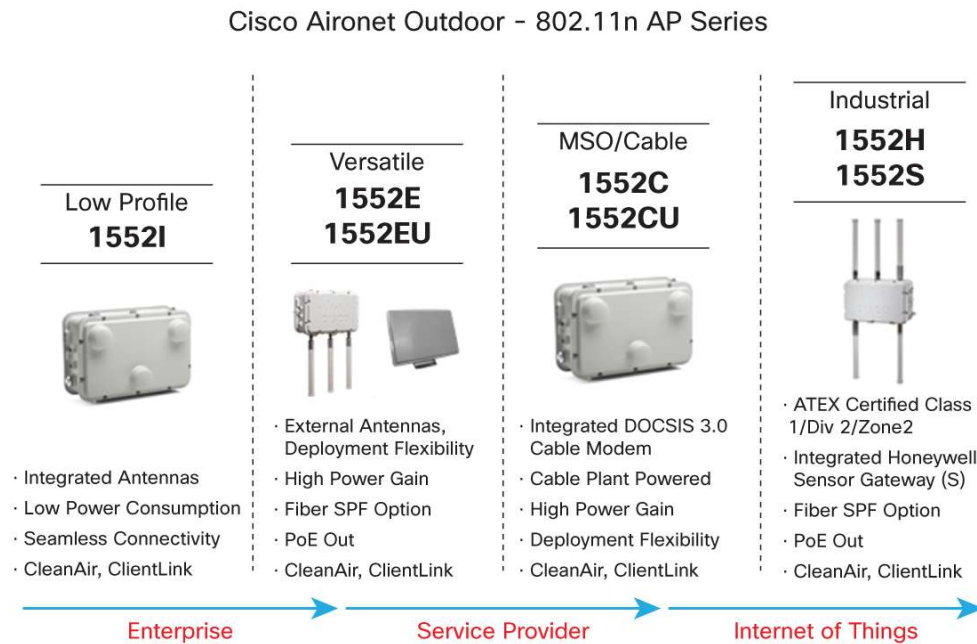
### Intelligent Access Portfolio

Now let's take a closer look at some specific solution components and their benefits (Figures 4 and 5), starting with how Cisco is incorporating intelligent radio innovations into every access point in our portfolio to help maximize throughput and improve coverage under a wide range of conditions.

**Figure 4.** Portfolio of Indoor Intelligent Access Points



**Figure 5.** Portfolio of Outdoor Intelligent Access Points



Cisco offers a range of intelligent Wi-Fi access points to meet every deployment need, both indoors and out. With over 10 years of experience in designing and deploying Wi-Fi networks, Cisco provides products that have gone through generations of development to reach the sophistication delivered in the portfolio today. Our access points include essential features that are unique to Cisco: features that make a difference in carrier-grade deployments.

- **Cisco ClientLink** is an innovative radio resource management technology that employs beamforming to dramatically improve throughput, network coverage, and overall system performance. Cisco ClientLink also helps solve problems related to mixed-client networks by making sure that all clients, from new tablets and smartphones to earlier devices, operate at the best possible throughput. Cisco ClientLink performs real-time adaptation of the beam on a per-packet and per-client basis, for optimal performance with throughput improved up to 65 percent resulting in battery savings on mobile devices up to 35 percent.
- **Cisco CleanAir** technology tackles the number-one issue operators faced with Wi-Fi in the past: interference. Unlicensed spectrum only becomes a carrier-grade asset when it can be managed. Cisco CleanAir technology automatically mitigates the impact of wireless interference, optimizes network performance, and reduces troubleshooting costs. Cisco CleanAir technology uses sophisticated spectrum intelligence to monitor the airwaves; detect, locate and classify interference; alert operations; and automatically reconfigure the network to avoid problems. Cisco CleanAir technology also gives access to real-time and historic information about devices and assets located anywhere in the wireless network, so providers can enforce policies and improve network performance based on intelligent information. As an example of the efficiencies afforded by CleanAir technology, one operator tested their network with and without CleanAir enabled and saw ping times decrease by a factor of 5 and UL speeds double with CleanAir turned on, surpassing 3G network performance even on the busy 2.4-GHz band.

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With Cisco CleanAir technology, your retail customers can be assured of highly secure credit card transactions, your hospital customers can improve efficiency with wireless patient care and the highly secure transfer of confidential medical records, and your enterprise and business customers can use Wi-Fi voice services to improve campus security.

- **Cisco BandSelect** further optimizes RF utilization and supports higher user densities by moving 5-GHz-capable clients like the Apple iPhone 5 out of the congested 2.4-GHz channels into the higher-capacity 5-GHz band. Both of these advanced features, and our Cisco SP Wi-Fi solution as a whole, are based on the 802.11 standard to support almost any Wi-Fi enabled device available today. Independent, third-party tests show these innovations can help increase total network capacity by 27 percent and deliver an up to 65 percent increase in device throughput. And most importantly, these higher data rates are delivered with fewer dropped packets (see [Miercom Report 090112B](#)).
- **Cisco VideoStream** enhances the delivery of video over Wi-Fi for a higher quality end-user experience. Most importantly, VideoStream brings both bandwidth efficiency and security to real-time video services, services that are in high demand from your enterprise customers that use interactive multimedia collaboration and communications solutions, and services that are in high demand from Cisco Connected Stadium Wi-Fi customers who expect easy access to the full range of high-fidelity video content.

### Cisco Next Generation Hotspot

We cannot leave a discussion about the Cisco intelligent access portfolio without mentioning our pioneering innovation: Next Generation Hotspot. One of the biggest drawbacks to Wi-Fi adoption has been the lack of a transparent connection when moving from one access point to another. In most cases, the user is asked to re-authenticate as he or she moves across wireless networks, and often this includes having to reenter billing or subscriber information.

For a wireless business to thrive, customers need an experience more akin to using a mobile phone, which transparently and invisibly transfers the signal from one cell tower to the next to provide uninterrupted services. Working with the Wi-Fi Alliance and the Wireless Broadband Alliance, Cisco is leading the development of a set of new standards, called Wi-Fi CERTIFIED Passpoint, to give users a transparent mobile experience with Wi-Fi. A Next Generation Hotspot network is built on Wi-Fi CERTIFIED Passpoint products for frictionless roaming.

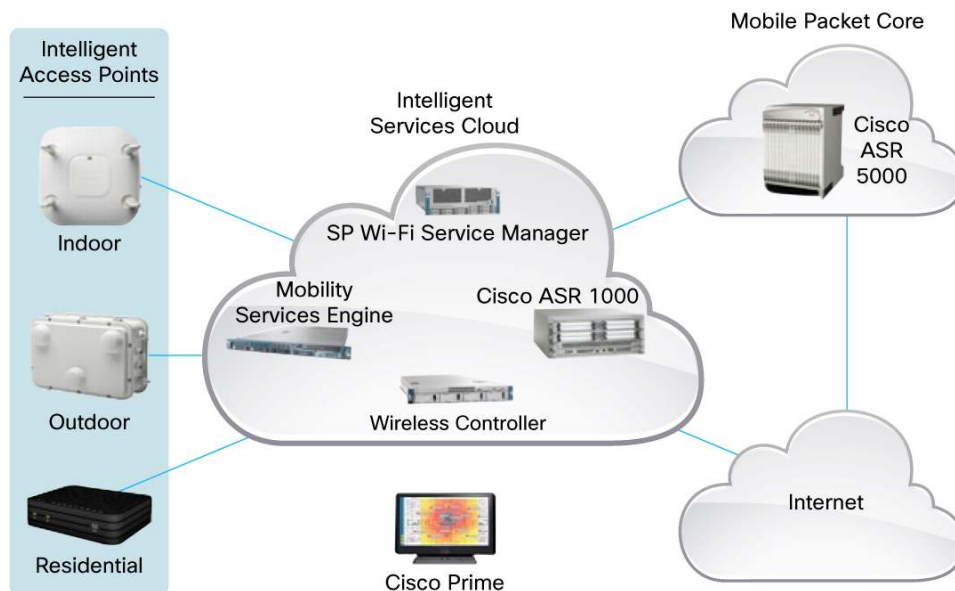
And with the Cisco intelligent access portfolio, delivering Next Generation Hotspot capabilities will be done with a simple software upgrade. With Cisco Next Generation Hotspot, operators can offer automatic and secure Internet access. Customers will be able to experience the best of what Wi-Fi can offer, including automatic discovery and selection of their preferred Wi-Fi network, the use of mobile credentials stored in their mobile devices so that no passwords are required, privacy protection through the use of sophisticated encryption methods, and protection against fraud by requiring authentication between the mobile device and the Wi-Fi network. Cisco's SP Wi-Fi solution is shipping with Next Generation Hotspot capability today.

### Intelligent Services Cloud Delivers the Connected Mobile Experience

Cisco Next Generation Hotspot is the start of a secure and transparent Wi-Fi experience, but Cisco takes this a step further with the Connected Mobile Experience provided by the Cisco Intelligent Services Cloud. Delivering secure mobility through Wi-Fi requires a holistic approach, with comprehensive and automated security and management functionality running from the data center, through the mobile core, to the network edge and point of access. Cisco ISC provides the network management, analytics, policy control, and security that differentiates the Cisco SP Wi-Fi solution from access-only products (Figure 6).



**Figure 6.** Cisco Wi-Fi Solution



- The first cloud feature is the **Cisco Prime**. This first-of-its-kind platform offers converged wired, wireless, and security policy management in a single solution for faster troubleshooting and more efficient network operations. It provides complete visibility into endpoint connectivity, regardless of device, network, or location. Automated wireless configuration and management functions provide complete visibility and control from the Network Operations Center.
- Next is the ability to cost-effectively manage and secure the wireless networks with the **Cisco 8500 Series Wireless Controllers**. The Cisco Wireless Controllers provide real-time communication between Cisco Aironet intelligent access points, Cisco Prime, and the Cisco 3300 Series Mobility Services Engine (MSE). Integrated Cisco CleanAir technology protects 802.11n performance with forensics and policy enforcement capabilities to create a self-healing, self-organizing wireless network. The controller scales to manage thousands of access points while delivering centralized security policies, wireless intrusion prevention system (IPS) capabilities, and RF management for improved quality of service (QoS).
- The next two elements of the Intelligent Services Cloud provide the monetization engine for the solution. The **Cisco 3300 Series MSE** delivers mobility services in a centralized and scalable fashion across wired and wireless networks. The Cisco MSE supports an open API for easy integration with mobile applications and services. Application developers can create multimedia applications that take advantage of the location, context, and device information in the network for new service offerings in retail, health, hospitality, and transportation. The possibilities are endless.
- The **Cisco SP Wi-Fi Service Manager for Cisco Prime** gives operators comprehensive network control, service differentiation, and deep packet inspection capabilities. The Cisco Service Manager delivers network optimization, offers a cost-effective method of offloading large amounts of mobile data, and can quickly deploy value-added services such as automated subscriber authentication and authorization, self-branded web portals for subscriber access control, and tiered services based on policy rules.

- The **Cisco ASR 1000 Series** with the **Cisco Intelligent Services Gateway (ISG)** rounds out the functionality in the cloud. The Cisco ISG enhances the user experience by supporting identity management, dynamic bandwidth control, and self-care provisioning that allows customers to change their own settings. With the Cisco ISG, differentiated and personalized services can be offered by applying policy based on who the subscribers are, where they are, and what level of service they paid for. With these combined capabilities, service providers can rapidly define and deliver new service plans; simplify management; accelerate time to market; increase revenue through market segmentation; improve customer satisfaction with personalized, tiered, and interactive services; and reduce operating costs.

The ability of Cisco Next Generation Hotspots to deliver transparent Wi-Fi mobility as the user moves from one access point to another opens the door to a wide range of new types of services and experiences. Consider the possibilities provided by a mobile concierge service. As a customer enters a large retail location or a public space such as a museum, an application can be automatically downloaded to the customer's Wi-Fi-enabled device. Then, personalized maps, information, offerings, and other services can be pushed to the device as the customer approaches or enters each indoor space (Figures 7 and 8).

**Figure 7.** Personalized Location-Based Services over SP Wi-Fi



Because this is done over Wi-Fi, the service will work well indoors, and it can include comprehensive video and voice capabilities. With the Wi-Fi CERTIFIED Passpoint standard, no re-authentication is needed, so value-added services are transparently integrated as customers move through the mall or other indoor space. To this standard Cisco SP Wi-Fi adds network service discovery capability to present the Wi-Fi network and local services to users on their mobile devices.



**Figure 8.** Business Intelligence Through Analytics



The Cisco SP Wi-Fi solution includes business intelligence through context and location analytics provided by the Mobility Services Engine. The data gathered from the Wi-Fi network can be used to provide invaluable information to retailers and venue owners—information they pay to obtain today through static sensors. Reports about how people flow through the venues, where they come from, where they go to, how long they stay, and at what times of day—all of this can help businesses make informed decisions about staffing or product and ad placement, streamlining operations and turning missed opportunities into connected mobile experiences.

### Mobile Packet Core

The mobile packet core with the award-winning Cisco ASR 5000 Series provides the standards-based Cisco Small Cell Gateway that allows operators to securely integrate Wi-Fi into their network and provide transparent handoff between Wi-Fi, femtocells, and 3G and 4G networks. Again, Cisco's experience here is essential. The Cisco ASR 5000 Series has been providing Wi-Fi integration into the mobile packet core for several years.

The Cisco ASR 5000 Series acts as a common service control point that delivers transparent service integration and mobility across 2G, 3G, 4G, and Wi-Fi networks, for a single subscriber experience. The Cisco ASR 5000 Series includes common subscriber management, policy, and authorization functionality for scalable service integration. And Cisco continues to advance transparent mobility through its innovative work with both General Packet Radio Service Tunneling Protocol (GTP) and Proxy Mobile IPv6 (PMIPv6) standards-based technologies.

### Partner with the Wi-Fi Experts

Delivering comprehensive Wi-Fi services requires industry-leading technologies at the access points and powerful security, personalization, and management capabilities throughout the solution. Around the world, leading service providers are already taking advantage of the carrier-grade capabilities of the Cisco SP Wi-Fi solution. Our Wi-Fi expertise is unsurpassed, as we have deployed over 15 million Wi-Fi access points. Cisco access points are the most widely deployed in the world, which means that Cisco has the most experience delivering the widest range of Wi-Fi solutions to the widest variety of customers.

With Cisco solutions, these providers are delivering profitable new services such as in-flight Wi-Fi, retail hotspots, stadium and large venue coverage, and extensive data offload. One of the distinctive advantages that Cisco offers is the ability to use a single Wi-Fi architecture to implement solutions for all customer needs, whether residential, small or medium business, large venue, or entire metro areas. As a result, this single, flexible architecture gives you the ability to implement the widest range of business models.

The most obvious option, of course, is to offer services directly to business and home subscribers: services like the ability to do business anywhere, or to have video solutions delivered through Wi-Fi. However, this platform can also help attract a wide range of business partners. Operators can partner with each other to use the Wi-Fi network for roaming relationships or offload services. Or service providers can work with an even wider range of value-added partners who would like to embed their solutions in services delivered over the wireless network. Examples include delivering machine-to-machine communications, delivering targeted advertising capabilities, or delivering services through an application ecosystem.

As we shift our focus from revenue opportunities to cost-saving opportunities, we see that carrier-grade Wi-Fi can improve the overall economics of network deployment and operations. In addition to relieving congestion and improving customer experience through offload, operators can reduce their radio access costs by at least 25 percent (in most cases) by selectively incorporating Wi-Fi into their network architectures and operations, according to the Cisco Internet Business Solutions Group (IBSG). Add to that the economies of scale operators obtain by using one foundation for all of their wireless services, taking advantage of increased resource utilization and improved return on investment. Also, Cisco management innovations such as point-and-click service enablement and zero-touch deployment will further reduce operating expenses. Finally, by using a single architecture as a service delivery platform, operators can develop best practices across their mobile and fixed organizations and design innovative services to quickly tap into new Wi-Fi opportunities.

Cisco provides not just a technology architecture, but a business architecture for Cisco SP Wi-Fi. We have a full range of expert services to help reduce risk, eliminate much of the complexity of planning and deployment, and accelerate service delivery. In this market in particular, where being first helps operators obtain hanging rights, partnerships, and territories, our approach can be a crucial differentiator in helping operators compete and win strong market share. Our Advanced Services team members are experts in the field, helping global operators every day to map a rapid path toward wireless service delivery (Figure 9).

**Figure 9.** Benefits of Using Cisco Advanced Services

#### Reduce Complexity and Mitigate Risk

- Tested and validated
- Backed by SLAs
- Pilot and production

#### Implement Your World-Class Solution

- Accelerate delivery
- Mitigate risk
- Maximize efficiency and cost
- Single point of contact for support



Cisco Advanced Services use a process that works. The process starts with a business discussion rather than a technology discussion. The first step is to envision and define the Wi-Fi services. This task requires expert analysis: of the market, of potential value-added partnerships, and of what competitors are doing. This leads to the creation of a solid business case, identifying which services to deliver and what it takes to profitably sell those services.

Next, the Assured Build process provides everything from detailed infrastructure design to demonstrating the service remotely, in the lab, and on the operator's premises. During this phase, Cisco pays special attention to establishing and training on best implementation practices. As we help build and test the service, we even offer a comprehensive proof of concept to accelerate implementation. With this program, operators can use Cisco Cloud Connect to support the pilot and production testing with Wi-Fi core functions that are implemented on a data center hosted by Cisco. This is an extremely cost-effective way to conduct trials and pilots: operators simply hang the Wi-Fi access points, and then point them to Cisco Cloud Connect to immediately begin a trial.

Cisco also provides Operation and Optimization services that help to ensure solution quality and optimize efficiencies and costs, including ongoing architectural design reviews and security audits. We provide straightforward, holistic support with one single point of contact for the entire end-to-end solution, staffed by experts available 24 hours a day, 7 days a week, and tailored to meet specific service-level agreements.

Cisco Capital<sup>®</sup> is part of Cisco's total solution, bringing a deeper understanding of Cisco products, services, and customer business requirements than is offered by banks and outside financial institutions. Cisco Capital is exceptionally well positioned to provide competitive and flexible financing. More than just a finance company, Cisco Capital is a trusted business partner and consultant, helping customers obtain the most advantageous investment solutions to support continued success. Cisco Capital can help finance all aspects of the end-to-end solution, including all hardware, software, and services, with a variety of programs, all with competitive rates and many available in more than 60 countries worldwide.

## Conclusion

Figure 10 summarizes how partnering with Cisco can help you take advantage of the unlicensed small cell opportunity today.

**Figure 10.** Capture the Wi-Fi Opportunity with Cisco SP Wi-Fi



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Operators worldwide are choosing Cisco to take full advantage of the enormous opportunities available in the service provider Wi-Fi marketplace. We provide the only carrier-grade, end-to-end solution in the market, and can help operators deliver standards-based transparent mobility and the differentiated user experience that customers are asking for as they use their mobile devices to move between consumer and business environments.

Cisco SP Wi-Fi provides more flexibility than other platforms on the market, allowing operators to use a single architecture to target the widest range of Wi-Fi opportunities and implement flexible business models, while gaining efficiencies that improve profitability and productivity. And with Cisco SP Wi-Fi, we provide an optimal implementation methodology that reduces business risk and accelerates time to market with expert services and financing at every step.



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