Wi-Fi for Service Providers

Challenges and Opportunities for Carrier-Class Operations

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Mobile network traffic is growing dramatically: according to the Cisco Visual Networking Index, it is expected to increase 26-fold between 2010 and 2015, reaching 6.3 exabytes per month by 2015. Global mobile traffic will grow three times faster than fixed IP traffic over this period, representing 8 percent of total IP traffic by 2015. Because of this, mobile operators are trying to align this phenomenal network demand with revenue growth.

Wi-Fi represents a significant business opportunity for service providers (SPs): Many fixed, mobile, or integrated SPs around the globe are either planning on or already investing in Wi-Fi services. Although commercial Wi-Fi hotspot services operated by specialized providers have existed for more than 15 years, Wi-Fi is a relatively new business for the majority of SPs and has not reached the level of maturity of other well-established "carrier-grade" communications services; in particular, unlicensed frequencies and less-developed service management capabilities impose operational challenges.

To learn more, the Cisco® Internet Business Solutions Group (IBSG) interviewed 14 SP executives worldwide to understand the trends in Wi-Fi operations and the current challenges SPs face. The study, "Service Provider Wi-Fi Operations: Initial Findings," revealed that while SP executives are well-aware of the rapid adoption of Wi-Fi and initiatives launched by their competitors, they are trying to gain a better understanding of the implications of Wi-Fi for their operations.

The study's findings reveal the main drivers of Wi-Fi and the opportunities that will enable SPs to create a carrier-class Wi-Fi experience. Key insights include:

- **Basic Wi-Fi service coverage expansion is still the main driver**—Even among established Wi-Fi SPs with a large number of hotspots, the average yearly increase in access points is 14 percent.

- **Value-added Wi-Fi services are evolving and have clear operational implications**—Even with a limited portfolio, more than 50 percent of SPs already offer some value-added service (VAS) over Wi-Fi, and their operations are significantly different from those of SPs that do not offer VAS.

- **Investment in high-quality site survey and installation pays off**—Both well-designed and installed sites usually generate fewer operational problems and therefore reduce the frequency of costly field technician visits.

- **Level of end-to-end automation in Wi-Fi operations is still low**—Few SPs claim to have full automation for service activation, modification, or cancellation. While the simple nature of current Wi-Fi services may not demand high-level automation, a lack of integration between Wi-Fi network management systems and existing IT systems is the basis for low automation. In addition, many hotspots are designed in a heterogeneous, non-standard way, and sometimes with multiple vendors and technologies.

This situation can further complicate implementation of a comprehensive, automated solution.

- **Controller-based architectures may offer more robust management capabilities—** The study showed that SPs with VAS services delivered over Wi-Fi often have a controller-based network environment. Value-added services are typically delivered under service-level agreements (SLAs) and require better management of the underlying infrastructure. Such SPs regard controllers as key architectural elements.

Wi-Fi Operations: Current Landscape

To identify where opportunities exist for creating a carrier-class Wi-Fi experience, it is important to understand an SP's current business architecture and how services are brought to market. A go-to-market (GTM) strategy and the bundling of Wi-Fi services with business or consumer services dictate how Wi-Fi service fulfillment and assurance will operate. An efficiently run Wi-Fi operation is based on streamlined processes with well-defined key performance indicators (KPIs) supported by workflow automation. KPIs ensure that services are delivered at the right level of quality.

Business Structure

Based on feedback from the study, SPs currently use three organizational models—each with its own aspects. The first two are basically different variations of an integrated approach, where each variation takes advantage of the existing capabilities of the department in which they reside:

1. Wi-Fi Integrated with Mobile
- Wi-Fi capabilities are intrinsic to the mobile business unit (BU).
- Wi-Fi services are bundled with a mobile subscription to offer a full-service package and improve customer "stickiness" (loyalty).
- Wi-Fi engineering and operations use tools and processes from the mobile environment.
- Wi-Fi subscription management is integrated with the mobile subscription management platform.
- The central helpdesk handles Wi-Fi-specific customer calls.

2. Wi-Fi Integrated with Fixed Broadband
- Wi-Fi capabilities are intrinsic to the fixed broadband BU.
- Wi-Fi services are bundled with a fixed broadband subscription to improve customer stickiness and provide complete offers.
- Wi-Fi department uses tools and processes from the broadband environment for both delivery and assurance of the Wi-Fi service.
- Wi-Fi subscription management is integrated with the broadband subscription management platform.
- Central helpdesk handles Wi-Fi-specific customer calls. In certain cases, a subset of the central helpdesk is dedicated to Wi-Fi-related customer calls.

3. Wi-Fi as a Stand-Alone Entity

- Wi-Fi service delivery and operations are done by a separate department or entity with its own capabilities, systems tools, and operational processes specifically designed to address the requirements of the Wi-Fi business strategy.

- This type of entity can be a fully autonomous Wi-Fi service factory or service supplier responsible for its own P&L and services strategy, and have its own sales and GTM approach to drive success. In terms of integration, system tools and operational processes are loosely integrated with those of the SP mother company (or not integrated at all).

Wi-Fi Networks and Services

The study found that 43 percent of respondents' Wi-Fi network architectures contain controller elements. These architectures are usually the basis for new deployments. For older deployments, there is a trend to introduce controllers as Wi-Fi networks grow and/or as the services portfolio expands to include VAS (36 percent of respondents have mixed architectures).

Regarding VAS, 60 percent of participants said they offer some type of VAS on top of Wi-Fi Internet access. Service providers with larger Wi-Fi investments/deployments typically offer VAS to differentiate themselves and increase Wi-Fi revenues. Mobile data such as 3G offloaded to Wi-Fi, VPN connections, and applications such as hosted email are some of the services offered by SPs.

Fifty-nine percent of the surveyed SPs offer basic SLAs; most of them are for private hotspot services/availability for business customers. None of the study's participants reported having end-to-end SLAs (guaranteed bandwidth, latency, and so on).

An element that drives scalability and efficiency is the level of standardization in the way hotspots are designed and implemented. With only 29 percent of the SPs reporting some level of standardization, there is not enough data to derive a sure conclusion. But, based on data gathered during the study, a standardized design generates about 30 percent fewer trouble tickets than does a complete custom design.

Service Fulfillment Practices

Automation

Service fulfillment automation is not always available or necessary: The level of automation required is often depicted by parameters such as service and product standardization, availability or lack of the right operations support systems (OSS) and network management systems (NMS) tools, and the level of integration of these tools in wider business processes. Automation, however, requires budget allocated only to those services that have a strategic position in the overall service portfolio. For Wi-Fi, this is not always the case.

In general, the degree of process automation embedded in the delivery and activation of Wi-Fi services is not high. Less than 20 percent of surveyed SPs have fully automated service activation and cancellation capabilities, and less than 10 percent have fully automated service modification.

Also, 75 percent of participants do not let customers perform self-installations. However, when permitted, self-installation applies to simple/small hotspots, such as home Wi-Fi.

Activities

Site-related fulfillment activities such as time and resources required to realize site surveys and installations depend largely on the site's size and inherent complexity. According to the survey, average installation and site survey times were 10.4 hours and 6.4 hours, respectively. Another important factor is the approach to hotspot standardization. For 29 percent of the SPs that practice this, site survey and installation times were less than the above-mentioned averages: 55 percent and 41 percent, respectively.

Costs

Scaling hotspot deployment can be costly. Therefore, SPs typically outsource truck-rolls to control field activity costs. Variations in truck-roll costs are triggered by different elements such as commercial agreements with field partners, reasons for site visits (audit, installation, and support), optimization of the field intervention process, and SPs' internal field technician labor costs.

Of the 14 surveyed SPs, seven responded to questions about truck-roll costs: three reported costs between US$225 and $350 for small to medium-sized hotspot deployments (in line with the industry average for delivery of other simple and standardized services); the other four reported truck-roll costs between $500 and $1,500. Cost variation between the two groups is due to site complexity, which sometimes requires multiple site visits before the hotspot can be fully implemented and the service activated.

Of the SPs that outsource capabilities, 100 percent do so for field activities related to support and maintenance; and 25 percent outsource for initial design, build, and test activities. Even with an outsourced strategy for field technicians, the majority of SPs make sure that the partner field force is Wi-Fi trained, while others provide training themselves to ensure that the partner is fully up to speed on the context and scope of the SP's respective Wi-Fi network(s) and related services.

Service Assurance Practices

A reliable service assurance process is critical for delivery of qualitative services. This process is no different for Wi-Fi, but it does present challenges primarily because Wi-Fi is based on an unlicensed spectrum, which—according to the SPs surveyed—does not always guarantee quality and therefore cannot support SLAs. Service providers said that there are too many variables outside their control that can impact the quality and stability of a Wi-Fi hotspot. The most common Wi-Fi failures are:

Wi-Fi Access:
- Access point (AP) hardware failures
- RF interference or limited radio coverage
- Installation issues such as incorrect configuration and lack of adequate power or outlets
- Prepaid system failures due to service, software, or registration issues
- AP connection failures

AP Access and Authentication:

- Wrong ID, password, and choice of Internet service provider
- Configuration settings—smartphone, PC, Mac, and software incompatibility

Wi-Fi services are largely scalable. Based on learnings from the study, a more robust site survey—including logging hotspot failures and Wi-Fi degradations—and service design can address many technical issues. Respondents said that they now spend more time during site surveys and are considering a more rigid approach to hotspot design. Service providers that offer managed Wi-Fi services said they proactively go on-site to anticipate potential service degradations or failures. These SPs are driving service quality to support corporate brand awareness strategies.

With the insertion of new authentication technologies, SPs will be better positioned to address their Wi-Fi access concerns. Furthermore, process automation and standardization become important in addressing scalability. Through careful consideration of all aspects of hotspot design, SPs can reduce the risk of failures considerably, thereby improving overall service availability and quality.

Driving customer experience starts with the delivery of qualitative services, but when things go wrong, it is important to have the right support mechanisms in place. Helpdesk capabilities form an intrinsic part of customer experience. Sixty-six percent of the SPs surveyed take an integrated approach and use the existing central helpdesk for Wi-Fi services. The remaining SPs have developed a Wi-Fi-specific helpdesk equipped with dedicated tools and procedures to quickly handle customer calls.

Monitoring and controlling end-to-end performance of Wi-Fi services is critical to driving the user experience. To this end, SPs reported using a wide variety of KPIs to monitor performance in real time, near-real-time, or on a weekly basis. These KPIs can be grouped into two main categories: network and service. Some SPs said that they monitor more than 50 KPIs, but not all of them do it with the same rigor or have the ability to correlate network KPIs with customers and services. So far, none of the surveyed SPs monitors the load or usage of the Wi-Fi frequency spectrum on an ongoing basis.

A good business strategy is often based on understanding the challenges. This is no different for Wi-Fi. Service providers are confronted with technical, operational, and GTM challenges that could undermine their chances for success.

Technical

- Frequency Overload—improving frequency usage in public places for 2.4 GHz and 5 GHz
- Connectivity—getting network connectivity in place for the AP (DSL, leased line, etc.)
- AP Failures—combating hardware and software failures that lead to stability issues
- Outdoor Deployment—finding the right location (placement, electricity, connectivity, radio signal reflections) is key
- Other—switching off AP (manually) and stealing AP

Operational

- Subscriber Management—managing different customer databases for mobile and/or broadband subscribers
- Hotspot Deployment Models:
  - Not always standardized and therefore lead to multiple truck-rolls
  - Environmental conditions are not always well known or understood, and can impact HS stability
  - Indoor AP placement is not always ideal, particularly in poorly ventilated areas, and can lead to frequent failures
  - Outdoor AP placement is regulated and is not always allowed at the highest points of interest for the SP
- Wi-Fi Hotspot for Offload—identifying both traffic concentration points in a mobile cell and the load thresholds that will trigger the offload
- Automatic Authentication—when technologies such as EAP-SIM[1] become ubiquitous, a high volume of users will move in or out of Wi-Fi coverage areas. Therefore, systems and processes must be able to support this.
- Unlicensed Wi-Fi Spectrum—this option does not easily lend itself to end-to-end SLA delivery
- End-to-End Security—ensuring end-to-end security in all Wi-Fi areas is important

Go-to-Market

- Ability to strategically bundle Wi-Fi service with VAS
- Ability to define and bring new, attractive Wi-Fi services to market
- Have users pay more for services that were once low-cost or free

Figure 1.   Internal Capabilities and Partner Support Requirements for Wi-Fi.

	Strategy	Service Definition	Plan, Design, Build, & Test	Operations (fully or partially outsourced)	Lifecycle Management	Sales
Service Provider	• Defines overall Wi-Fi service strategy and business model	• Creates high-level service definition (HLD)	• Creates low-level design (LLD) • Defines test specs • Manages planning, designing, building, and testing activities	• Helpdesk • Level 1 and Level 2 • End-to-end service management	• Oversees capacity, release, and change management • Manages inventory	• Conducts large deals / direct sales • Supports SMB / SoHo channels • Creates / supports consumer portal
Business Partner / Channel / VARs	• Provides requirements input		• Assists in acceptance testing	• Customer feedback • Problem resolution, communication, and problem escalation	• N/A	• Follows up on market requirements • Conducts joint marketing activities
Solutions Provider / Equipment Supplier	• Provides thought leadership and industry perspectives	• Assists with HLD based on technical specifications	• Assists / leads LLD • Assists in both testing and field deployment	• Wi-Fi Level 2 and Level 3 • Wi-Fi network operations • Field activities • Hardware / software release management • RMA processing		• Conducts joint marketing activities

Source: "SP Wi-Fi Operations: Initial Findings," Cisco IBSG, 2012

[1] EAP-SIM is short for "Extensible Authentication Protocol Method for GSM Subscriber Identity Module."

Service providers can overcome the majority of these challenges on their own, but some will need to rely on solution providers and other partners. Some elements necessary for the delivery of Wi-Fi services are shown in Figure 1 (previous page).

Wi-Fi Strategies: Operational Impact

What can SPs do to better integrate Wi-Fi into their operations and support customers' requirements? Cisco IBSG looked at two areas that can impact operations: value-added services and controller-based architectures.

Value-Added Services

Value-added services over Wi-Fi such as offloading, security, email, managed VPN, and content delivery networks (CDNs) are evolving and will enable SPs to differentiate themselves from the competition. As Wi-Fi becomes more pervasive and as quality improves, SPs will have the opportunity to enhance their Wi-Fi service portfolios with content-rich VAS.

Controller-Based Architectures

The study showed that nearly 43 percent of SPs' Wi-Fi networks have a controller element, with new installations based on controller-based designs. Such an architecture can deliver operational advantages when it comes to deployment times and service stability.

Among the surveyed SPs whose network architectures have a controller function, 80 percent preconfigure the access points before shipping them onsite. As a result, installation time for a controller-based environment is roughly 30 percent less than that of a non-controller-based architecture.

The study also showed that controller-based designs generate, on average, 34 percent fewer trouble tickets than non-controller-based architectures. As the number of APs increases, so too will the number of trouble tickets. Therefore, a controller-based network can help SPs ensure network service and stability.

In addition, management tools and operational processes are more established and better integrated, thereby improving SPs' ability to proactively anticipate Wi-Fi network issues before they result in service degradations or failures.

Overall, controller-based architectures provide more advanced management resources and functions.

Wi-Fi Evolution

The best operational practices are those that align with SPs' overall Wi-Fi business strategy. A low-end strategy could be based on a basic and usually "free" Internet access extension of fixed broadband to essentially reduce broadband customer churn. In this situation, the main focus is on expanding coverage while keeping operating expenses low.

A high-end strategy could be based on a rich services portfolio that includes VAS and enhanced quality of service to enable market leadership through differentiation and to increase revenues. Advanced network architecture and robust operational capabilities are key requirements in implementing such a strategy.

Business strategies, however, do evolve. In terms of Wi-Fi, consumer expectations tend to drive Wi-Fi's evolution. In addition to the insights discussed in this paper, a previous study[2] from Cisco IBSG identified key consumer expectations:

- **It's All About the Home.** The home is the number-one place for connecting mobile devices, and is the origin of Wi-Fi traffic (and this traffic is growing).
- **Any Device.** Almost all devices are Wi-Fi-enabled; with the exception of smartphones, Wi-Fi is the preferred way to connect to the Internet.
- **Ubiquity.** Customers strongly see the benefits of Wi-Fi. They prefer it to mobile in all attributes (especially cost and speed), and would like to have Wi-Fi everywhere.
- **"New Mobile" = Mobile + Wi-Fi.** People are interested in a combined Wi-Fi + mobile offering that provides pervasive, cost-effective, and seamless mobility.
- **Value-Added Services.** Customers are interested in new Wi-Fi services that enhance the retail experience, and provide roaming and secure access to remote content.

To address consumer requirements, SPs must make strategic moves that, in turn, will have a positive impact on Wi-Fi operations (see Figure 2).

Figure 2.   Business Strategies/Operational Impacts Driven by Consumer Expectations.

Consumer Expectations	Potential Service Provider Strategies	Impact on Operations
It's All About the Home Any Device Ubiquity "New Mobile" = Wi-Fi + Mobile Value-Added Services (VAS)	**Target Wi-Fi Use in Home** • Create solutions and incentives to encourage users to offload mobile traffic **Incorporate Wi-Fi as Integral Part of Portfolio** • Use pricing, marketing, and new solutions to create compelling integrated offers • Create new Wi-Fi business opportunities for "nomadic" devices (e.g., tablets, e-Readers) **Provide a Pervasive Wi-Fi Experience** • Invest in wide coverage, both indoor and outdoor • Establish extensive roaming agreement with other Wi-Fi SPs in-country and abroad **Explore New Ways To Make Money from Wi-Fi** • Augment typical offload business case with new and innovative Wi-Fi business models—churn, retail, managed services, and new offers **Deliver on "New Mobile"** • Align network architectures and deploy appropriate technology to deliver seamless, integrated mobile-Wi-Fi user experience	• Managed customer premise environment comprising multi-devices and IP addresses • Converged services portfolio and subscriber management • Standardization of site design and deployment process • High degree of end-to-end service fulfillment and assurance automation • Roaming management • Usage management to support multiple data and VAS plans • Expanded operations KPIs set; enhanced monitoring capabilities • Seamless, secure, and automatic user authentication and hand-off between mobile & Wi-Fi

Source: "What Do Consumers Want from Wi-Fi? Insights from Cisco IBSG Consumer Research," Cisco IBSG, 2012.

Wi-Fi presents SPs with a tremendous opportunity to grow their businesses. Therefore, they must think beyond the technology to understand the business implications, develop a comprehensive Wi-Fi strategy that can evolve with changing market conditions, and identify the true benefits through pilot programs. Wi-Fi operations must evolve in a planned way to support the overall strategy.

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[2] "What Do Consumers Want from Wi-Fi? Insights from Cisco IBSG Consumer Research," May 2012.

About the Study

Cisco IBSG interviewed operations executives from 14 SPs in North and South America, Europe, and Asia whose businesses encompass more than 230,000 total access points. Interviews were conducted over a four-month period in 2012. The study focused on network and hotspot architectural design, service portfolio, Wi-Fi operational processes (fulfillment, assurance, and performance), information and communications technology, IT tools and integration, and major challenges.

More Information

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