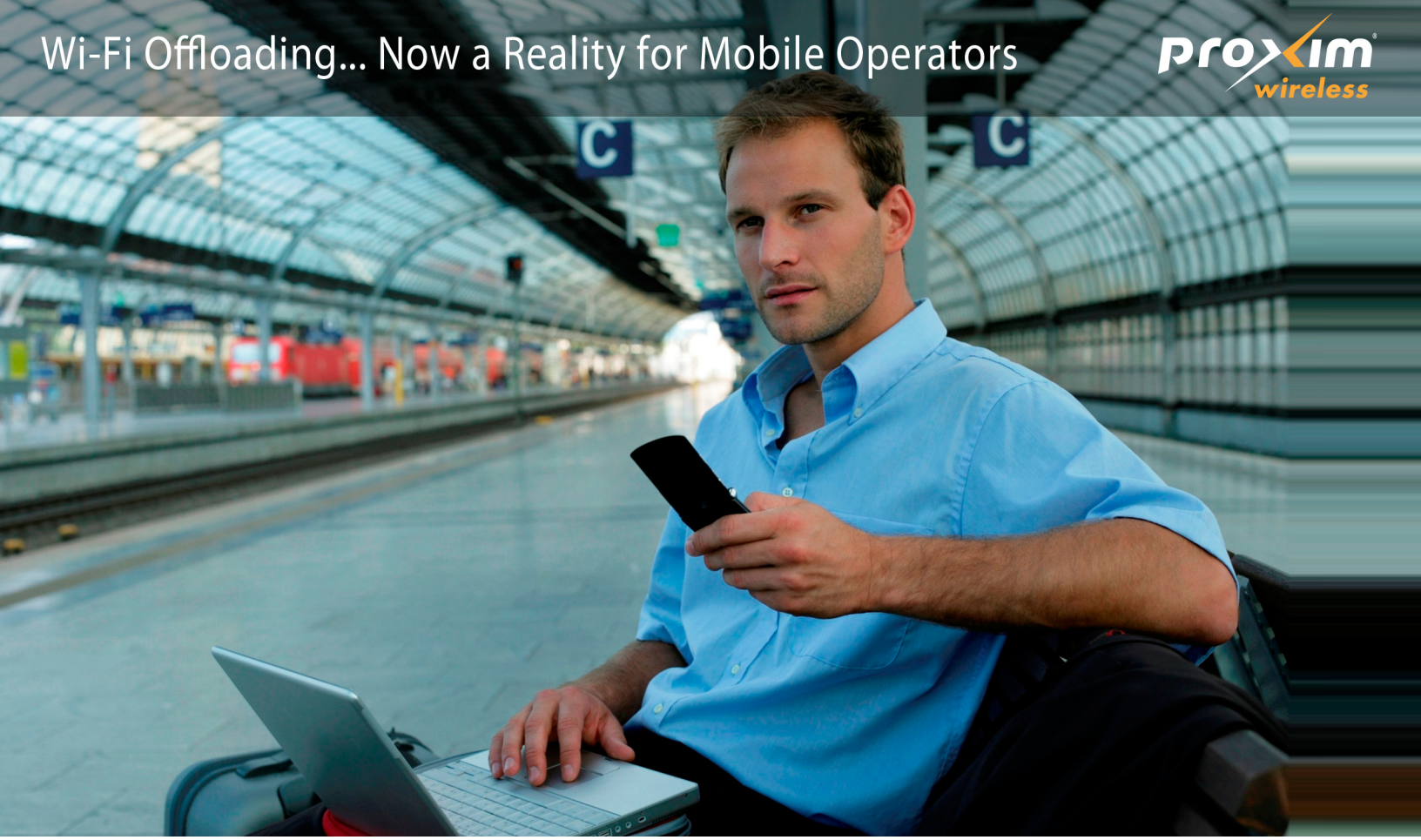
White Paper

Mobile Data Offloading Through Wi-Fi

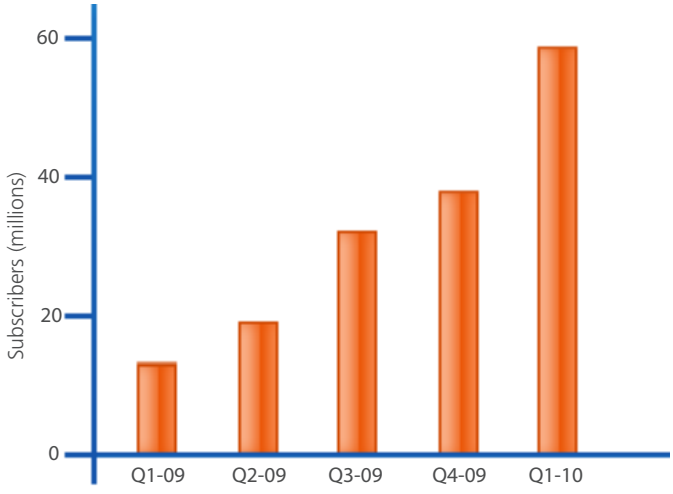


Unprecedented Explosion of Mobile Data Traffic - A Business Problem and a Great Opportunity for Carriers

Over the last couple of years, the explosion of Wi-Fi® enabled smartphones and 3G capable laptops coupled with the consumer and business demand for bandwidth hungry, real-time video and data applications have spiked the data traffic on mobile networks across the world, exponentially. According to Pyramid Research, the smartphone shipment is forecasted to grow from 232m units in 2010 to 532m in 2014. As a result of these new smart devices that put tons of new data-intensive applications in the hands of millions of cellular users, data traffic on today's 3G networks has increased drastically, to the point where data traffic is outpacing new revenue for the carriers. With analysts predicting that the global mobile data is set to double every year until 2013, the situation would aggravate further - creating a problem as well as an opportunity for carriers.

As most of the available capacity of these mobile networks has already been absorbed by the growth of 2G/3G data, operators around the world are facing the glut of mobile data on their networks due to the capacity constraints of these networks. This creates a very serious problem – 3G networks that are completely overloaded (especially in metro areas) that degrade the experience of the millions of smarthphone users, and carriers that are not recouping anywhere near as much in revenue as they are being forced to provide in network capacity.

Due to the degradation of 3G data services in overloaded areas, many people are already turning to the built-in Wi-Fi capabilities of all of these smartphones as the only way to provide acceptable browsing, video-streaming, and other data-intensive application experiences. AT&T has said that the number of people connecting to its 20,000 plus domestic hotspots has seen growth rates of 34% and 69% in Q1 of 2009 and 2010 respectively. So what does this all mean?



Graph: Wi-Fi hotspot growth of AT&T
Source: AT&T, 2010

Simply put, the increase in smartphone usage and the subsequent explosion of data traffic on 3G networks has caused an immediate need for carriers to offload the data traffic from the 3G network, so that both voice and data services perform optimally. And due to the built-in Wi-Fi capabilities of the millions of smartphones on the market, users are often turning to Wi-Fi hotspot services to fill in the gaps when the 3G network can't cut it.

And as we've seen from AT&T's purchase of hotspot provider Wayport, Verizon's partnership with hotspot provider Boingo Wireless, and Wi-Fi bundling offers from Vodafone and Orange with mobile subscriptions, it seems that carriers are embracing the need to utilize Wi-Fi as a way to lessen the strain on their 3G networks. And while the carriers will still proceed in their plans to roll out 4G (to stay ahead of the competition), offloading data traffic from LTE networks will be an issue as well, so the 3G data offload networks put in place now will continue to serve as an ongoing solution for ensuring optimal voice and data communications moving forward.

Though AT&T and Verizon's partnerships with Wayport and Boingo (respectively) are a good first step, but that alone will not be enough to solve the 3G offload problem. Wayport and Boingo's hotspot networks do not provide ubiquitous Wi-Fi coverage in even the largest metro areas, meaning that in order to provide effective 3G offload, the carriers must hope that customers stay within the designated hotspots (which, most do not).

Why Wi-Fi is the Right Technology

Operators have been considering a number of approaches to alleviate the mobile data congestion. Options such as Femtocells and deploying additional network infrastructure are available to meet the increasing demand for network capacity. But, these options are not cost-effective, scalable and viable considering the pace at which the demand for data services is growing. Considering that the bulk of the demand for high-speed data services is created by Wi-Fi enabled smartphones, mobile data offloading through Wi-Fi would be a 'cure-all' for operators, as it has many competitive advantages as shown in the following table.

As a solution to mobile data offloading, Wi-Fi doesn't just provide a stop gap for operators, but also supplements LTE deployment in the long term, by taking off significant load from the network. As Wi-Fi has many unique advantages as illustrated below, it has become a natural choice for operators as a preferred technology for mobile offloading.

Femtocell Vs Wi-Fi		
Technology Attribute	Femtocell	Wi-Fi
Spectrum Size & Cost	✗	✓
Network Capacity	✗	✓
Data Rate	✗	✓
Security	✓	✓
QoS	✓	✓
Standards Based	✓	✓
User Experience for Data Services	✗	✓
Scalability	✗	✓
Total Ownership Cost	✗	✓

Table: Technology Comparision

Vast Unlicensed Spectrum

Wi-Fi operates in unlicensed ISM 2.4GHz and 5GHz bands, while Femtocells operate in licensed 900MHz and 1800MHz frequency bands. The following table summarizes total available spectrum for Wi-Fi and Femtocell deployments.

	Frequency Band	Spectrum Availability
Wi-Fi	2.400 to 2.483 GHz	83MHz
	5.250 to 5.875 GHz	505MHz
Femtocell	900MHz	35MHz + 35MHz
	1800MHz	75MHz + 75MHz

Table: Spectrum Size

As shown above, operators have larger 'free' spectrum available to cater to any size of Wi-Fi deployment, unlike Femtocells, which use costly and limited spectrum that requires careful channel planning. As a result, Wi-Fi networks are very cost-effective and they can be deployed rapidly without expensive installation costs.

High Quality of Service and Advanced Security

Since the introduction of the 802.11 WLAN standard more than a decade ago, it has gone through a series of amendments to support quality of service(QoS) through Wi-Fi Multimedia(WMM) for delay-sensitive voice and video applications, along with the state-of-the-art, standard-based business-grade security(WPA2). As a result, QoS and security support in Wi-Fi is comparable to that of 2G/3G networks. The WMM enabled Wi-Fi networks offer a prioritized treatment to multimedia applications such as VoIP, video streaming and interactive gaming, to support the jitter and latency requirements of these applications. The WPA2 is based on IEEE 802.11i and it provides 128-bit AES-based encryption using Pre-Shared Key (PSK) or 802.1x RADIUS authentication, which is ideal for operators to provide Authentication, Authorization and Accounting (AAA) services.

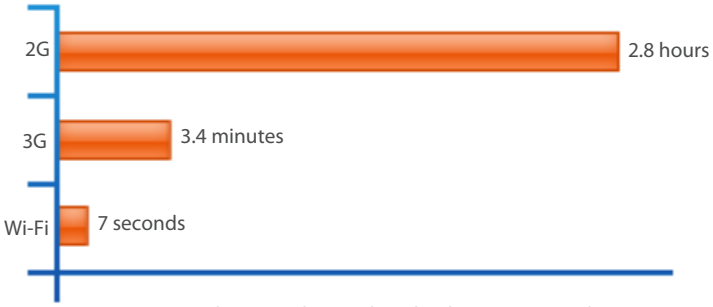
Unmatched Data Rates and User Experience

When it comes to network speed, Wi-Fi is the only wireless technology that can deliver data rates as high as 600Mbps. The following table provides a comparison of data rates and application level throughputs for Wi-Fi and mobile networks.

	Femtocell (HSPA)	Wi-Fi (802.11n)
Data Rates	14Mbps (3GPP release 5)	600Mbps
Throughputs	12Mbps	350Mbps
Modulation	OFDM	DSSS, and OFDM

Table: Network Speeds of Femtocell & Wi-Fi

So, what does it means to consumers and business professionals in terms downloading music or streaming video, or transferring a big file? Let's take a look at the graph to figure out the time it takes to download a 5-minute long high quality video on Wi-Fi, 2G and 3G networks.

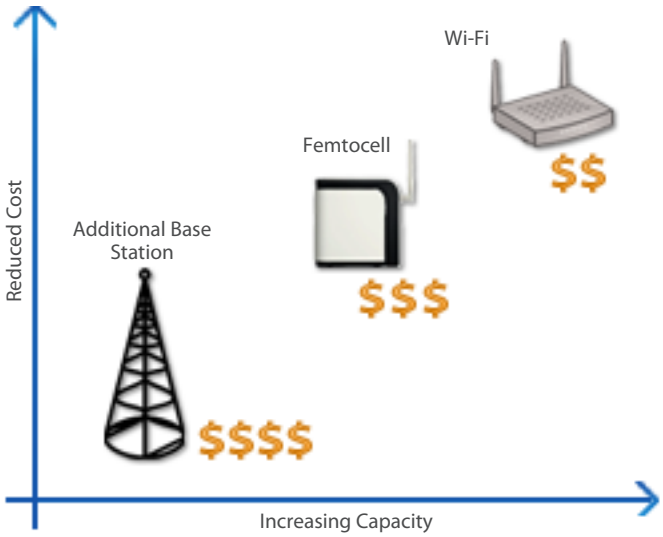


Graph: Time taken to download a 5 minutes video

Typically, users of 2G/3G networks need a lot of patience to download just a video or any multimedia application. Unlike on mobile networks, where application timeouts are very common, the users on Wi-Fi based networks experience consistent application connectivity, as the MIMO capable Wi-Fi networks provide the most reliable signal quality and connection.

Reduced Total Ownership Cost

Over the last decade, Wi-Fi technology has evolved and matured, bringing down the equipment cost significantly. In addition, with data rates of 600Mbps and availability of more than 500MHz of unlicensed spectrum, Wi-Fi offers huge network capacity compared to 2G/3G, thus requiring less equipment to serve a given subscriber base. Also, the Wi-Fi networks can be easily and cost-effectively scaled without requiring much investment in site surveys and channel planning. As a result, Wi-Fi offers huge CapEx and OpEx benefits for operators.



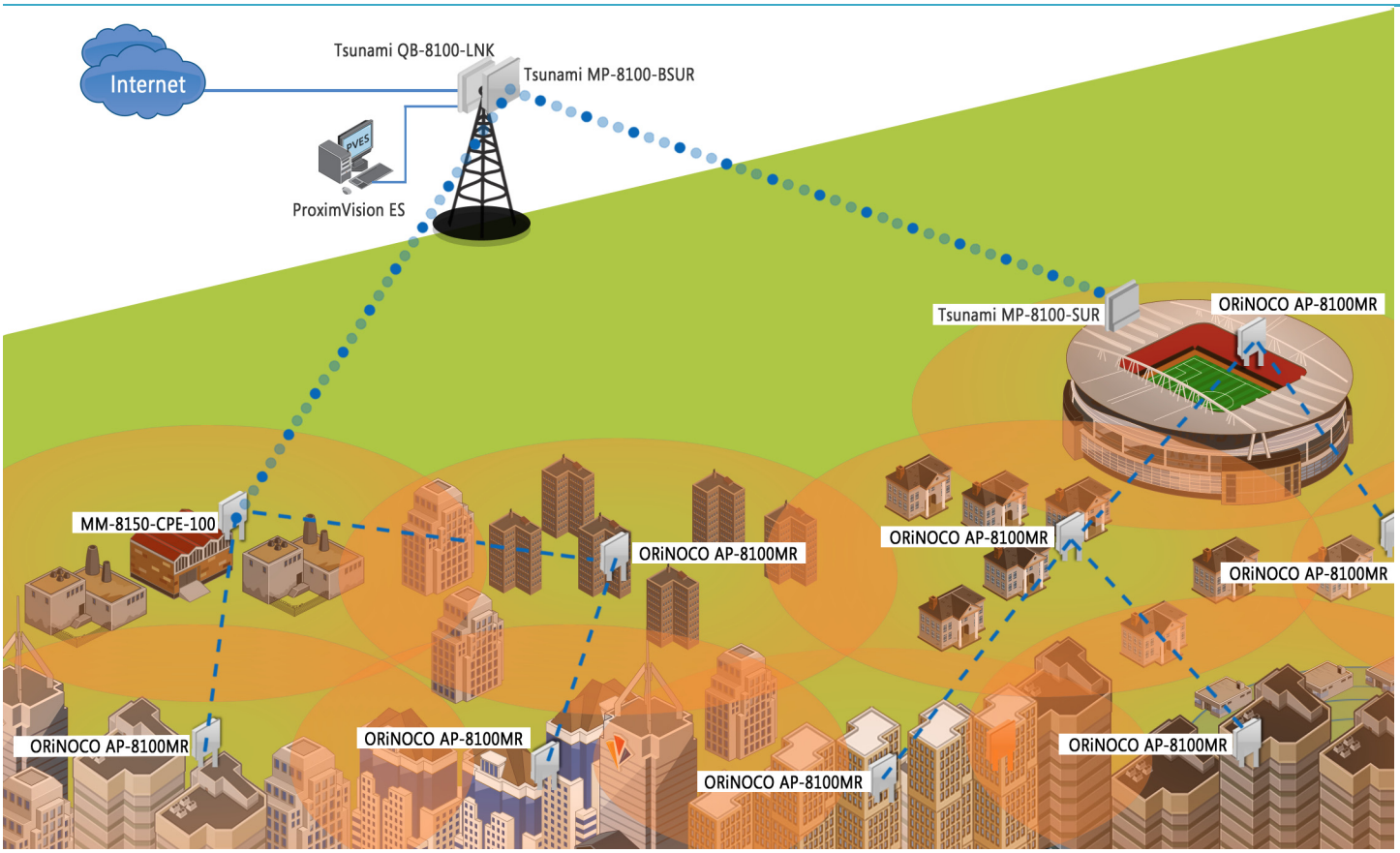
Graph: Cost & Capacity Advantage of Wi-Fi

Operator-Managed Wi-Fi Data Offloading Solution

There are several approaches for operators to offload mobile data onto Wi-Fi and these approaches vary based on the level of integration of Wi-Fi into mobile networks, time-to-deploy, and operator's control of the subscriber.

In the integrated model proposed by the 3GPP - the GSM standards group - Wi-Fi is inter-networked with the core mobile network through a bridge for controlling and managing the mobile data offloading. In this approach, operators can transparently move mobile device from the mobile network to the Wi-Fi network and seamlessly transfer the data through Wi-Fi. But, this approach calls for complex mobile and Wi-Fi network integration challenges, and expects mobile devices to be equipped with special software, which are major impediments for operators to head in this direction.

Among existing options, operator-managed Wi-Fi data offloading through an IP Gateway Server as shown below is the most viable and attractive deployment option for offloading data from mobile networks. This 'no-coupling' model enables operators to deploy independent Wi-Fi networks without needing any integration with mobile networks. When the mobile device detects an operator's Wi-Fi network, it can authenticate and register with the network. From then onwards, all the data from the mobile device is passed through Wi-Fi network and IP gateway with which the operator can monitor and control the subscriber. Note that, in the Wi-Fi zone, the user may not be able to access subscriber content from the mobile operator.



This approach enables operators to quickly overcome their capacity and congestion issues by engaging in inexpensive and high-speed Wi-Fi networks without delving deeper into complex integration level issues. Also, this approach doesn't require any special software in mobile devices, and still helps operators to define and enable QoS, security policies, and accounting services. In later phases, features like seamless roaming between Wi-Fi to GSM and vice versa can be considered when the interface requirements of 3GPP/UMA based infrastructure and mobile devices become clear.

Business Model

It is important at this juncture to realize the difference between the proposition of citywide Wi-Fi networks to offload 3G data traffic from carrier networks and the proposition of ill-fated "municipal Wi-Fi", which came with a mantra to provide "Free WiFi Access to All" while expecting cities to pay for the Wi-Fi networks as a service to their residents. The Municipal Wi-Fi proposition had two major setbacks. Firstly, the early Municipal Wi-Fi deployments were too costly. With the legacy Wi-Fi Access Points, as many as 40-60 outdoor access points were required to provide the coverage for a square mile. But, the latest 802.11n capable Access Points are available at the same cost of legacy APs, but, provide 2x range and 9x speed compared to legacy products. Thus they reduce the cost of deployment significantly. Secondly, it caused an inherent lack of a significant revenue stream for most of these networks, which meant that cities could not afford to deploy them due to the lack of ROI (or were forced to shut them down if they did manage to deploy them).

But with the new proposed business model for Wi-Fi data offloading, rather than expecting cities/municipalities to pick up the bill to provide Wi-Fi access to all, the carriers (who already have access to cell towers and costly rooftop space to deploy radios) can cost-effectively roll out citywide Wi-Fi networks for a fraction of the cost of additional 3G, or 4G network rollouts and support new users on their 3G networks, while saving cap-ex dollars. Through this model, operators not only reduce the strain on the 3G network by enabling 3G network to primarily carry voice, but add additional subscriber base and increase the potential revenues per Base Transceiver Station(BTS).

According to ConsumerReport, the average data usage of iPhone users is 273MB per month, while average voice usage is 450min/month, according to JDPower. As voice call requires 12kbps bandwidth, this translates to an average per user bandwidth requirements of 840bps and 120bps for data and voice services, respectively. It means, a carrier can, an average add 7 additional voice users for every data user offloaded from 3G to Wi-Fi. Thus, a carrier can significantly add voice subscribers to their existing infrastructure and generate additional revenues, by offloading mobile data onto Wi-Fi networks.

So, rather than spending additional billions of dollars to rush the deployment of 4G networks, carriers can continue to build out 4G networks on the current schedule while keeping customers happy in the meantime. And once 4G networks are deployed, the 4G/Wi-Fi combination (to offload data traffic from LTE networks) will continue to provide a scalable, cost effective solution with a maximum network performance to cater to any level of growth in the mobile data traffic. This enables them to stave off millions of dollars in potential lost revenue from dissatisfied customers.

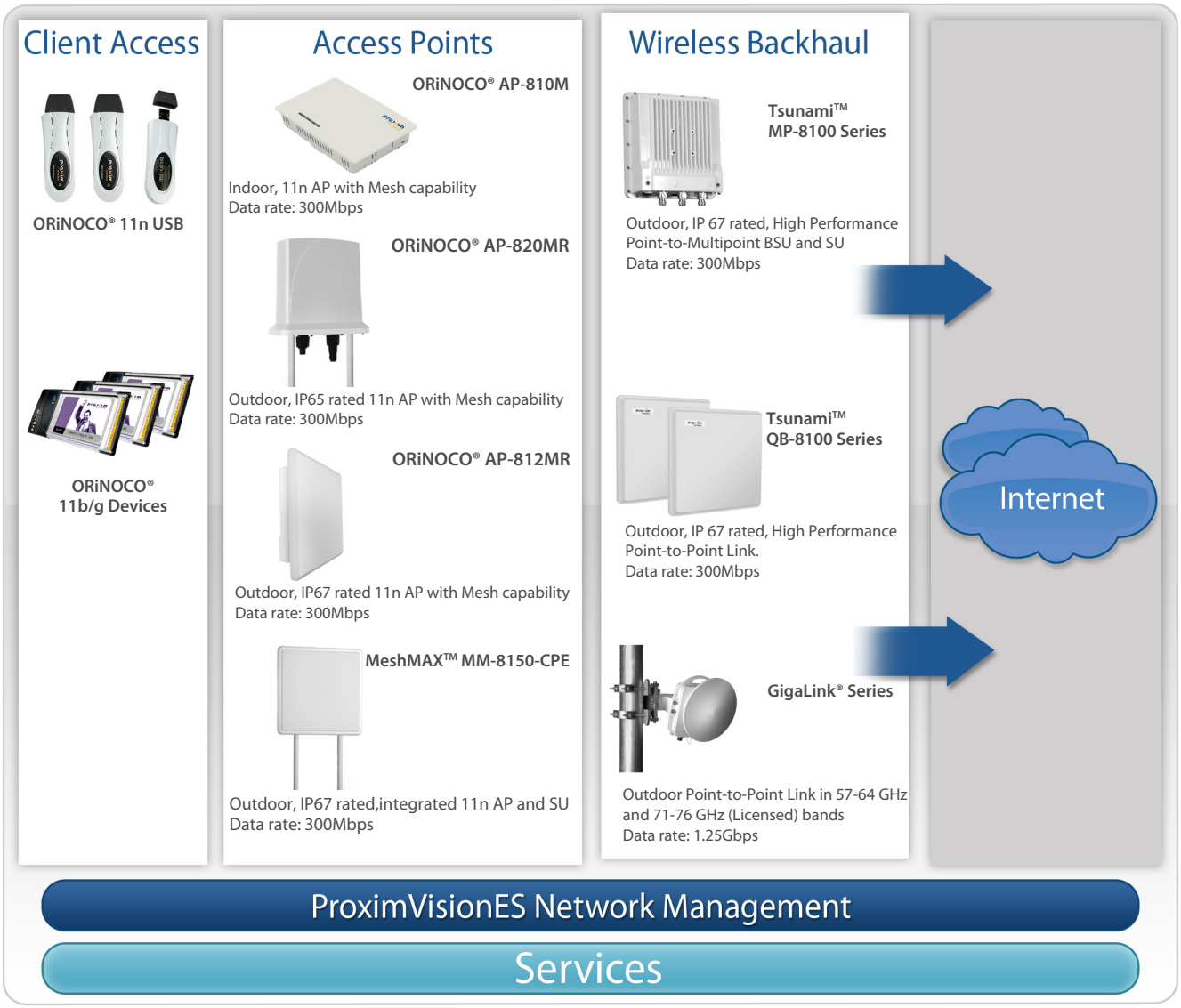
Proxim Provides "One-Stop" Shopping for Wi-Fi Data Offloading Solution

Proxim stands out in the industry by offering end-to-end wireless solutions, and providing 'one-stop' shopping to operators to deploy wireless networks. Proxim differentiates itself from other vendors with an unmatched technical know-how, right product-mix, and a full range of wireless broadband products – including indoor and outdoor Wi-Fi, Point-to-Multipoint, WiMAX, and Point-to-Point wireless backhaul solutions. Proxim has extensive experience in understanding the dynamic requirements of the fast-paced wireless broadband and telecom industry, and deploying wireless networks for global carriers and WISPs of all sizes.

Complete End-to-End Solutions

As shown below, Proxim Wireless offers end-to-end product portfolio for carriers and WISPs to deploy and manage Wi-Fi networks for offloading mobile data traffic. The high capacity, feature-rich 802.11n Access Points are ideal for carriers to cost-effectively deploy them in areas where the user concentration is high, while carrier-grade point-to-point and point-to-multipoint products enable them to backhaul the Wi-Fi traffic using high-speed wireless links.

Proxim's End-to-End Mobile Data Offloading Solution



Proxim's Proposition to Carriers and WISPs	
Salient Features	Benifits to carriers / WISPs
Dual-band(2.4 and 5GHz) Support	The dual-band Access Points provide carriers with a greater flexibility and allow them to effectively utilize the wide-band spectrum
Multiple Input Multiple Output(MIMO) Reduces TOC	Proxim's 802.11n Access Points provide features such as frame-aggregation, channel bonding and spatial multiplexing which increase the data rates from 54Mbps to 300Mbps and extended coverage. As a result, carriers need fewer APs for any given deployment – greatly reducing the CapEx and OpEx.
Seamless Mobility for Clients	Support for pre-authentication means, mobile 802.11 clients can pre-authenticate with the nearby Access Points, while connected to the existing Access Point. This allows client to roam to the new AP without going through the time-consuming authentication process during connection establishment, and thus reduces the roaming delay to <50ms to deliver a seamless and jitter-free roaming experience to the clients.
Business-grade Multimedia Hotspot Services	The 802.11e (WMM) enables prioritized treatment to voice and video traffic, which allows carriers to provide a business-grade multimedia hotspot services to consumers.
Multiple SSIDs and VLANs for Differentiated Services	Each AP supports up to 4 or 8 discrete VLANs. This allows carriers to enable separate QoS and Security profiles for each of these VLANs, and offer differentiated services to users in a single venue.
AAA Support for Subscriber Management	The 802.1x RADIUS authentication provides Authentication, Authorization, and Accounting services for carriers to provide subscriber management services.
Mesh Capability Reduces Network Management Cost	The self-forming and self-healing ORiNOCO Mesh Creation Protocol (OMCP) automatically forms Mesh network and reduces the need for Ethernet cable in complex deployment scenarios. In addition, OMCP dynamically adjust traffic routing as and when new APs are added or removed, without intervention of network administrators.
RF Management	Proxim's products offer unique features such as Automatic Channel Selection (ACS), Intelligent Dynamic Frequency Selection (DFS) Transmit Power Contro (TPC) for automatic interference-free operation.
Centralized Management	ProximVision ES provides simple configuration management, rapid network deployment, and greater ease of use in a software-based Network Management System - giving carriers a complete view of their wireless networks from a single-point

Case Study

KPN – Holland's Largest Wi Fi Hotspot Provider – Continues to Connect Millions Each Year Via Proxim Wi Fi

KPN Hotspots B.V., Holland's largest provider of WiFi® hotspots, has partnered with Proxim to deliver WiFi hotspot services for nearly three years. To date, KPN has more than 2,000 of Proxim's ORiNOCO® Access Points deployed throughout Holland, providing WiFi hotspot access to millions of people each year.

In 2009, KPN announced that it ordered more than 600 additional access points from Proxim to continue the expansion of its network.

"Providing our customers with the greatest WiFi connectivity – regardless of where they go – requires the support of solid technology partners," said Thijs Gunter, Manager Technology, Wholesale Operations, KPN HotSpots B.V. "We have been using Proxim's WiFi access points as the technology of choice for all of our indoor and outdoor WiFi hotspots for the last three years based on superior performance and value when compared to the competition. As we continue to expand our network to new locations and to support more services, we are happy to expand our partnership with Proxim."

KPN currently has thousands of hotspots throughout Holland at establishments such as:

- Hotel chains – Including Van Der Valk, Holland's largest hotel chain
- Restaurants and cafes – Including the Campanile, La Place and AC Res taurants
- Gas stations – Gas stations throughout Holland offer customers the abil ity to connect and check email/Internet
- Railways and public transportation – Including NS railway stations

The planned expansion will include the deployment of WiFi hotspots at Holland's Holiday parks. KPN will be extending hotspot service to over 100 Holiday parks throughout the country, including both indoor WiFi access in the bungalows and guest rooms via Proxim's ORiNOCO Access Points radios, as well as outdoor WiFi service in common areas and parks via Proxim's Wi Fi mesh equipment.

"KPN has been an excellent partner, and their continued selection of Proxim equipment for their everincreasing WiFi hotspot network is a great validation of our products," said Ralf Labeda, Director of Sales, Northern Europe for Proxim Wireless. "We look forward to providing KPN the equipment to extend their network and offer WiFi services to their customers."

Challenge:

KPN, Holland's largest provider of WiFi hotspots, was looking for the highest performance, most cost effective way to build out their Wi Fi hotspots

- With thousands of hotspots deployed and more rolling out all the time, KPN needed a WiFi solution that was easy to deploy, sim ple to manage, and had rock solid reliability

Proxim solutions:

- Secure, easy to deploy and simple to manage Wi Fi hotspots powered by Proxim Wireless
- Over 2,000 Proxim ORiNOCO® AP access points deployed throughout Holland
- Indoor and outdoor WiFi access with a combina tion of indoor APs and WiFi mesh APs

Results:

- KPN has deployed thousands of hotspots in the last three years, all utilizing Proxim's ORiNOCO Wi Fi solutions
- Millions of people connect to KPN hotspots Through out Holland each year
- Due to the reliability and ease of use, KPN is ex panding its relationship with Proxim as the provider of Wi Fi equipment moving forward

About Proxim

Proxim Wireless Corporation (OTCQX: PRXM) (PINKSHEETS: PRXM) is a leading provider of end-to-end broadband wireless systems that deliver the quadruple play of voice, video, data and mobility to all organizations today. Our systems enable a variety of wireless applications including Point-to-Point Wireless Backhaul, Security and Surveillance, VoIP, Last Mile access, and Enterprise LAN Connectivity. We have shipped more than 1.8 million wireless devices to more than 235,000 customers in over 65 countries worldwide. Proxim is ISO 9001:2000 certified. Information about Proxim can be found at www.proxim.com. For investor relations information, e-mail ir@proxim.com or call **+1 413-584-1425**.

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