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Opportunities and Business Models for Public Wi-Fi Services

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Wi-Fi is pervasive in consumers' lives – currently, more than 75% of U.S. broadband households use Wi-Fi for connectivity in the home.

The steady increase in Wi-Fi usage in the home and with mobile devices is driving the growing popularity of Wi-Fi at public venues, and businesses are investing in Wi-Fi service or upgrading existing infrastructure to improve the customer experience.

Consumers' use of Wi-Fi also impacts mobile operators, who are increasingly relying on residential and public Wi-Fi hotspots to offload cellular network traffic. At the same time, new entrants may leverage public Wi-Fi networks to offer lower-cost mobile services that can undermine the mobile operators.

This whitepaper examines consumer mobile and Wi-Fi data usage trends and the business models and monetization strategies of public Wi-Fi providers. It also presents a case study of how a large stadium uses its public Wi-Fi network to enrich fans' experiences.
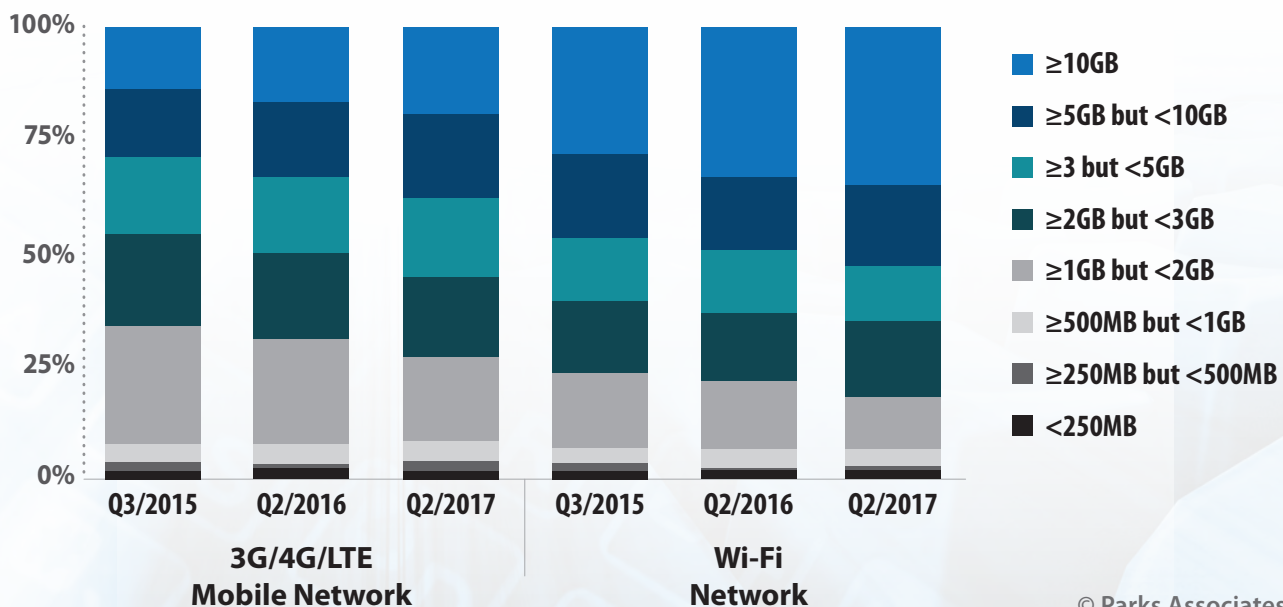
Consumer Mobile and Wi-Fi Data Usage

Consumer usage of mobile data is continuously increasing year-over-year.

Data consumption on average in U.S. broadband households is about 26GB per month, a 65% increase from 2015 – 18.5GB of that data is on Wi-Fi, while 7.5GB is through 3G/4G/LTE.

Mobile Data Consumed by Network (2015-2017)

Smartphone Users in U.S. Broadband Households Who Consume Data and Know Their Usage

Legend:
- ≥10GB
- ≥5GB but <10GB
- ≥3 but <5GB
- ≥2GB but <3GB
- ≥1GB but <2GB
- ≥500MB but <1GB
- ≥250MB but <500MB
- <250MB

3G/4G/LTE Mobile Network: Q3/2015, Q2/2016, Q2/2017
Wi-Fi Network: Q3/2015, Q2/2016, Q2/2017

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Public Wi-Fi Supplements Consumer Mobile Data Usage

Public Wi-Fi hotspots are an important connectivity option for on-the-go consumers.

Consumers who are accustomed to home Wi-Fi connectivity but do not have a premium mobile data plan (i.e., an unlimited data plan or a plan with a sizeable data quota) rely on public Wi-Fi hotspots offered by venues such as restaurants and cafes, libraries, stadiums, hotels, and airports. Even those with a premium mobile data plan may use public Wi-Fi hotspots for faster speed and better coverage, particularly where 3G/4G coverage is spotty or signal strength is weak, such as underground facilities, crowded public venues, or environments where cellular communications are prohibited (e.g., during a flight).

The number of public Wi-Fi hotspots is increasing, driven by venue owners' recognition that Wi-Fi has become a utility that consumers have taken for granted. A venue with public Wi-Fi can draw in customers, whereas one without tends to annoy patrons and turns away potential customers.

Public Wi-Fi Services

Cafés

- **Cafés offer basic connectivity to their customers** so they will remain in the store and continue to buy food and drink products
- **Connectivity is offered free-of-charge**, and may or may not include an ad-supported splash page – some cafés, such as Starbucks, will partner with a Wi-Fi network managed service provider to offer a branded SSID
- **Smaller cafés typically will not have their own IT departments**, and may require both equipment and professional staff to manage the network

Hotels

- **Hotels offer basic connectivity** to their guests to compete with other hotels, but will also offer speed and bandwidth upgrades as an additional revenue source
- **Basic connectivity is usually offered free of charge**, with higher speed service charged on a per-day basis – access to the premium service may be offered as a perk to loyalty program members
- **Hotels will typically have their own IT departments**, but these may or may not be qualified to handle Wi-Fi deployment and management. Consequently, outsourcing Wi-Fi network management to a third-party is common in the hospitality industry

Airports

- **Airports are not concerned about competing** with one another for customers: Wi-Fi is instead offered as an additional source of revenue and to improve overall travel experience
- **Connectivity can be free-of-charge, or consumers have to pay a fee.** To reduce Wi-Fi traffic jams, airports usually limit free Wi-Fi time to 30 minutes or one hour per device ID. Some smaller airports choose to outsource Wi-Fi service to third parties such as Boingo Wireless
- **Airports will typically have their own IT departments**, which may or may not operate the Wi-Fi network; airports require Wi-Fi equipment capable of supporting extremely heavy loads, as well as an extensive Internet backbone

Airlines

- **Airlines offer in-flight Wi-Fi service** as a differentiator, and also a source of in-flight revenue
- **Access to an airline's own website is usually free** to consumers; unrestricted Internet access may be sold on a per-hour, per-day, or even a monthly basis. Airlines have the option to partner with sponsors to offer unrestricted Wi-Fi free-of-charge, but this practice is rare
- **Wi-Fi connectivity on airlines requires a specialized satellite** Internet connection capable of supporting very high speeds

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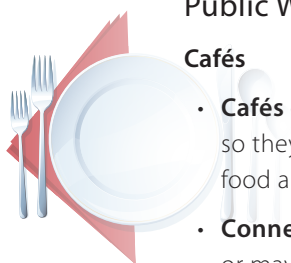
Business Models behind Free or Sponsored Public Wi-Fi Services

Network operators and venue owners approach public Wi-Fi in different ways. Mobile network operators view Wi-Fi mainly as a solution to offload traffic, while cable MSOs use free access to premium Wi-Fi hotspots as a value-add for their customers.

> MNOs and cable MSOs do not generate revenue from these use cases.

These use cases, however, do not generate revenues for either MNOs or cable MSOs. As a result, some operators – such as Sprint and T-Mobile –decided several years ago to stop owning and managing their own Wi-Fi networks. Other operators – such as AT&T and Boingo Wireless – have successfully monetized their Wi-Fi networks by selling premium Wi-Fi access as a service to consumers or offering wholesale access and roaming agreements with other Wi-Fi network operators or aggregators.

Many venue owners, particularly those owning large ones, approach Wi-Fi access in a similar way as cable MSOs – it is a value-add for their customers but not necessarily a revenue-generating service on its own. As a result, venues providing public Wi-Fi access to consumers bank more on improved user experience/satisfaction as ROI metrics than charging consumers directly for Wi-Fi usage.

Low willingness to pay is also attributed to the reality that consumers have options other than a paid public Wi-Fi service: they can use their 3G/4G data plan or keep looking for a free hotspot until one pops up. Even in scenarios where paid Wi-Fi services are able to overcome initial reluctance to pay, this "success" is only marginal.

> The direct-charge model faces an uphill battle with consumer acceptance, partly due to the fact that consumers are used to Wi-Fi being "free."

Scenario 1	Scenario 2
Public Wi-Fi is the only Internet-access option, and consumers have to choose between no access and paid access. In-flight/on-cruise Wi-Fi service best illustrates this scenario.	Public Wi-Fi is used as the replacement of mobile 3G/4G services. Such Wi-Fi first or Wi-Fi-only services are usually priced at substantial discounts to 3G-4G services to lure cost-conscious consumers.
• At sky-high or on the open sea, consumers have no access to Internet except what airline/cruise companies offer.	• Mixed results so far for these services focused on Wi-Fi.
	• Cablevision's Freewheel service was shut down less than a year after launch.
• On average, about 7% of flyers pay for in-flight Wi-Fi services compared with 40% of those flying JetBlue. JetBlue bucks the industry practice by offering free Wi-Fi service to everyone during flight.	• Independent service providers such as FreedomPop and Republic Wireless have had some success. Parks Associates estimates 1.5 million consumers were on such Wi-Fi-first or Wi-Fi-only service plans in the U.S. at year-end 2016.
	• Comcast recently launched its Xfinity-Fi mobile service using a combination of public and home Wi-Fi hotspots, along with Verizon'scellular service as "gap-filling" solutions.

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Lacking a scalable model to charge consumers directly for public Wi-Fi services, public venue owners have to find ways to pay for the cost of their public Wi-Fi investment. Behind a free Wi-Fi service is a complex value chain that involves Internet service providers, Wi-Fi equipment vendors, venue owners, and various types of monetization partners. **How to finance the Wi-Fi investment and then make money from it vary by public venue types and the financial positions and business priorities of the venue owners.**

Public Venue Wi-Fi Service Value Chain & Players
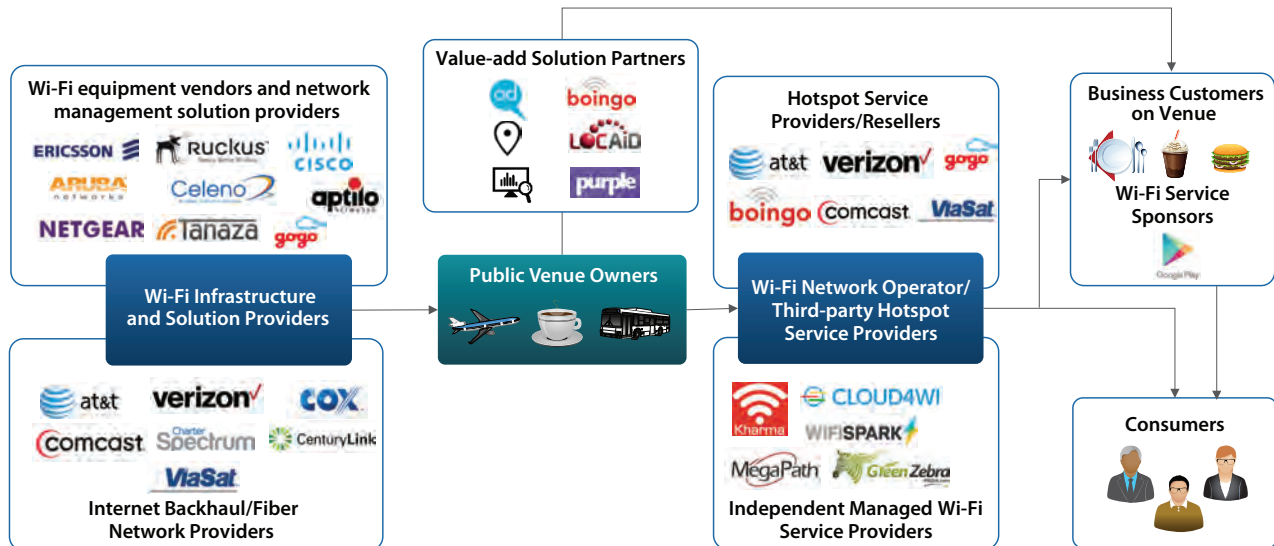
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Options to Fund & Monetize Public Wi-Fi Network

There are multiple ways that venue owners might choose to finance and monetize their Wi-Fi network, depending on their level of interest in building and maintaining their own network.

Different types of venue owners require different types of products and services in regards to their Wi-Fi networks. These products and services range from the Internet backbone service (fiber network), to network switches, to access points, and may include network management functions and operational support. System integrators usually provide not only technology consultation, but also help public venue owners identify the best technology partners.

For example, in a typical stadium Wi-Fi project, venue owners rely on system integrators like CenturyLink to assess how best to implement or upgrade their Wi-Fi infrastructure based on expected network traffic from stadium-goers and the types of applications they use. In most cases, they are also working on specific IT projects that benefit stadium owners and fans. In these projects, ranging from smart parking, digital signage, handheld POS, to stadium broadcasting system, a system integrator can bring in third-party partners or work with partners contracted directly by public venue owners.

Oftentimes, venue owners will partner with service providers and aggregators in order to monetize their Wi-Fi networks:

- Splash pages with advertisements

- Brand-sponsored SSIDs

- Roaming/network offloading agreements with Wi-Fi operators

Of course, the products and services needed will vary with the venues' business and organizational models – a café will require different products and services than a hotel or airline, and standalone business will have different needs than a chain, for instance.

According to Boingo Wireless, venues that are interested in providing Wi-Fi to their customers, but lack the necessary budget to do so, may benefit from arranging a financing model with a provider where the provider will fund the cost of the network buildout and follow a revenue-sharing model to cover the cost over a number of years.

In this kind of arrangement, Boingo Wireless, for example, will monetize Wi-Fi networks through advertising and branding, retail sales, Wi-Fi offloading contracts with mobile service providers, or a combination of these. Revenue is shared with the venue owner as per their agreement.

Venues that finance the installation of the Wi-Fi network on their own are commonly still interested in what is essentially "passive income" through opportunities such as Wi-Fi roaming agreements and carrier offload, and can negotiate contracts with Wi-Fi aggregators such as Boingo or iPass.

Public Venues	
Wi-Fi Network Ownership & Operational Status	**Direct or Indirect B2B Revenue Opportunities for Venue Owners**
Build & operate its Wi-Fi Network	• Receive revenue shares from LBS or Wi-Fi Analytics Partners • Wholesale access to Wi-Fi aggregators • Resale of access to onsite merchants • Sell advertising on Wi-Fi launch page • Wi-FI offload contract with carriers
Build network but outsource Wi-Fi operation to third party	• Receive revenue shares from Wi-Fi network operator that monetizes through wholesales, resale, advertising, or Wi-Fi offload contracts • Limited direct B2B revenues due to outsourced Wi-Fi operation
Let third party build and manage Wi-Fi network	• No direct or indirect revenue opportunity until venue owner reclaims the venue's Wi-Fi network ownership

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Public Wi-Fi Case Study: Stadium Wi-Fi Enables Smooth and Immersive Fan Experience

In the past three years, Stadium Wi-Fi provides an excellent example of the complexity and opportunities in venue-based Wi-Fi business. Stadium Wi-Fi data usage has increased substantially, especially in the United States. Stadium owners have responded by upgrading their in-stadium wireless network capacity and coverage through Wi-Fi and DAS installation – first through densifying their Wi-Fi access points and later through investing in higher bandwidth technology capable of providing greater connectivity with fewer access points.

> Stadium owners are using their Wi-Fi networks to differentiate – Wi-Fi is seen as the backbone of a connected stadium solution, capable of upgrading the fan experience through unique, interactive, and scalable fan experiences.

While stadium/team apps are oftentimes a critical touchpoint for these kinds of personalized experiences (and solutions providers should strive to underwrite such apps' development), IT solution providers can add intelligence to the network (analytics), build fast data processing at the edge (network planning/design), and raise network agility (future-proof the bandwidth) – solutions that support stadium owners/sports teams to roll out differentiated in-stadium fan experiences.

CenturyLink, for instance, plans to introduce CDN solutions (from its pending acquisition of Level 3) to the stadium market, which would improve the live content streaming experience and provide VR/AR-supported experiences in the future.

Another direction of fan experience improvement from stadium owners' perspective is to solve fans' pain points by making things easier and information more readily accessible inside and around stadium. Many stadiums now leverage stadium apps to provide fans with relevant information and capabilities:

- The bathroom with the shortest line
- The nearest parking spot
- Ability to order food for pickup or in-seat deliver

Behind these enhancements are technologies such as wayfinding beacon networks, Wi-Fi analytics, and all the network traffic going through a stadium's Wi-Fi or DAS networks.

A more detailed analysis of the impact stadium Wi-Fi has on the fan experience is provided through a case study of the Golden 1 Center, the home arena for the professional basketball team the Sacramento Kings.

Case Study: The Golden 1 Center

*Source: GeekWire, with photo by Alan Sheckter

The Golden 1 Center in downtown Sacramento, California, is a publicly owned basketball arena. In addition to basketball games, this venue hosts concerts, conventions, and other sporting and entertainment events. It boasts three exclusive clubs on its premium level and almost 50 loft-style luxury suites, and it seats over 17,500 basketball fans per game as well as approximately 19,000 concert-goers.

The stadium was financed by a public and private partnership, with its home team – the Sacramento Kings – agreeing to lease the stadium for 35 years with payments going to the city to pay off the debt and related costs. The Kings are responsible for designing, building, and managing the stadium after completion.

The stadium has its own data center with a future-proof Internet backbone bandwidth of two 100Gbps fiber networks – ensuring that its Wi-Fi network will be capable of supporting highly data intensive applications in the future.

> The density of the Kings' Wi-Fi network is also unmatched in the industry – it boasts only 17 users per Wi-Fi access point, compared to an industry standard of 25 to 35 users per AP.

The Kings have an internal IT department that contributed to the design of the Wi-Fi network and which now manages and supports the stadium's IT network, including both public and private Wi-Fi networks throughout the stadium. The department worked with Wi-Fi equipment vendors and DAS Group Professionals (DGPs) on distributed antenna design and during construction.

According to this arena's spokesperson, the Kings "engineering really want to provide an unmatched experience in the arena," and the organization relies heavily on its mobile app to offer an enhanced and personalized fan experience inside and outside the arena.

Key Enhancement: Shortening Lines

Instead of using traditional hand scanners to check attendees' tickets, the Kings have moved to an automatic turnstile system. The turnstile can accept all forms of hard card, scanning tickets on attendees' phone apps, as well as traditional paper tickets, and are enabled to support RFID and NFC in the future. One guest manager can operate two turnstiles each, processing up to two thousand guests per hour – a drastic gain in efficiency, compared to the previous rate of 345-365 per hand scanner-equipped guest manager. Like the Kings' POS systems, the turnstiles connect to – and are managed through – the stadium's Wi-Fi network.

*Source: GeekWire, with photo by Alan Sheckter

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Key Enhancement: Location-based Experiences

After guests have entered the arena, the Golden 1 Center app will offer up a host of hyper-personalized experiences. Location services enable maps that allow users to see what section of the stadium they're in, which food options are nearby, and which bathrooms have the shortest line. Seat upgrades and experience upgrades are available for guests to purchase in-app, and guests can also select their own parking spot through a partnership between the Kings and the City of Sacramento's downtown parking program.

Location-enabled services are provided through both Wi-Fi and Bluetooth beacons. When a phone is connected to a Wi-Fi access point, the AP registers its presence and, through its location architecture, estimates a rough location (typically a 5-8 meter range, sometimes going to one meter) for the device. Bluetooth beacons are far more precise, capable of pinpointing a phone's (and phone owner's) location to a sub-meter accuracy.

The Sacramento Kings partnered with Cartogram to augment their Wi-Fi network's location capabilities – Cartogram installed next-generation low-energy Bluetooth beacons (BLE beacons) throughout the arena, providing the Kings with a precise form of heatmapping that allows them to provide wayfinding within the arena, monitor pedestrian traffic flow, and perform analytics such as determining the difference between a line of people waiting for concessions or a bathroom and those just passing through an area.

> The Golden 1 Center's network likewise supports its virtual reality efforts – the Sacramento Kings were the first team to stream a game internationally, to a school in Mumbai, India, as well as to a nearby children's hospital.

When the NBA partnered with NextVR to offer one livestreamed NBA League Pass game per week in VR for the 2016-2017 season, the Golden 1 Center was the first arena to host this groundbreaking broadcast event. Additionally, the Kings are moving to have all of their games recorded courtside and simultaneously broadcast via 180-degree VR – allowing attendees with mobile VR headsets to watch the game (and replays) courtside no matter where they're sitting.

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Conclusion

New experiences such as the Golden 1 Center will increase awareness among sports fans as well as the general public and will prompt other venues to explore similar solutions. Such efforts will emerge in a variety of public spaces in response to the increasing consumer appetite for mobile connectivity, irrespective of which network – cellular or Wi-Fi – is being used.

Direct monetization of Wi-Fi is a challenge to those who own and manage Wi-Fi networks: consumers tend to view public Wi-Fi as a free resource, and the public Wi-Fi market is so fragmented on the supply side that it is difficult to build a truly large-scale public Wi-Fi network nationwide.

> These consumer perceptions are unlikely to change, meaning in the short term "free" public Wi-Fi is a market reality.

Wi-Fi service providers must aggressively pursue enterprise/business customers, focusing on creating value for customers in their respective vertical sectors. For example, a Wi-Fi service provider can offer customized proximity marketing solutions to retailers interested in boosting foot traffic and increasing shopping time. By offering such a vertical solution, Wi-Fi service providers can fully reap the benefits based on the value of their solutions to their enterprise customers.

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