The Business Case for Neutral Host Networks

A Win-Win for MNOs and Venue Owners

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

Small Cell and DAS networks have become important and fast growing complements to deploying new spectrum and adding additional macro towers, as the US mobile operators are focused on densifying their networks in urban areas. Small Cells are becoming more common as an attractive option to increase capacity and extend coverage outdoors, and distributed network solutions are becoming increasingly popular for enterprise buildings and high traffic indoor venues. Although these markets are in their infancy, they are poised for rapid growth.

The development of Neutral Host networks in high traffic venues is one of the most important trends in the broadband wireless industry today. As mobile operators expand and densify their 4G LTE networks, the need to provide in-building networks to supplement the outdoor macro network becomes more critical. Several key trends contribute to the needs for improved wireless networks in-building:

- Eighty percent of MNO mobile traffic is generated indoors
- The expansion of BYOD usage in enterprise environments means that excellent mobile service is now a mission-critical requirement
- Quality wireless service has become an expected feature in dense environments such as stadiums, shopping malls and airports.

Mobile operators want to provide improved coverage and meet ever-increasing capacity needs in key venues such as airports, shopping malls, enterprise buildings, college campuses, stadiums and arenas, convention centers, hotels, transit systems and other high traffic venues with dense user populations. Venue owners have become more focused on the need, and the value of providing excellent wireless service throughout their venues. In many cases, this could be the difference between a renter coming to a building or a patron deciding whether to visit a venue.

Most mobile operators have plans to expand their coverage into individual venues, but prioritizing their economic and personnel resources to deploy in hundreds of separate venues can be challenging. Although many MNOs look to deploy their own solutions in a venue, the cost for providing this additional coverage may not justify the benefit for the improved service. And if one MNO deploys in a venue, this still leaves the majority of users from all of the other operators under-supported in those venues. In many cases, it is either undesirable due to appearance, or impossible due to limitation of physical space for 3 to 4 MNOs to each deploy their own infrastructure in a building. Neutral Host networks can help solve this problem.

BUSINESS CASE FOR DISTRIBUTED NETWORKS DEPLOYMENTS

Wireless 20/20 has been examining the role of Small Cell and DAS as critical elements of mobile network densification. As depicted on Exhibit 1, our focus has been on the business case for various distributed network solutions in large venues such as stadiums, college campuses, enterprise buildings, hospitals, airports, shopping malls, train stations, subways and convention centers with a high density of broadband users. Our research has been designed to understand whether third party Neutral Host provider could provide a common shared infrastructure that can support all operators in a venue, with economics that favor both the venue owners and MNOs.

Wireless 20/20 showcased its new WiROI™ Neutral Host Network Venue Business Case Analysis Tool at the Tower & Small Cell Summit, co-located with CTIA Super Mobility 2015. Leveraging the in-depth knowledge garnered from over 100 engagements with 3G/4G operators worldwide, Wireless 20/20 has been using the new WiROI™ Neutral Host Venue Tool to analyze a wide range of distributed network solutions for various venue environments:

- compare and analyze network technology options like Wi-Fi, DAS, and LTE Small Cells
- conduct a complete ROI analysis for venue owners, MNOs and Neutral Host providers
- model the SLAs and cost savings under various business scenarios
- simulate various methods for monetizing the investment in venue networks
- help MNOs and venue owners analyze how to best partner with Neutral Host operators

Figure 1
Multi-Carrier DAS Solutions for High Traffic Venues

VENUE-LED DEPLOYMENTS

Some venue owners have been investing in DAS and fiber network deployments to monetize these business opportunities and create new revenues by offering a common all mobile carriers. For example, the San Francisco 49ers recently commissioned DAS Group Professionals (DGP) to re-deploy what may be the largest DAS network at Levi's® Stadium for during the football offseason. DGP selected the JMA Wireless Teko DAS platform for this ambitious renovation to double the capacity of the less than one-year-old DAS solution to assure major wireless carriers that Levi's® Stadium would have enough cellular capacity for the NFL's Super Bowl 50 in February 2016. DGP deployed more antennas to increase coverage and support more cell sectors inside Levi's® Stadium and increased the DAS footprint outside the stadium in adjacent parking lots. For its first-ever Monday Night Football game when the 49ers unexpectedly defeated the Minnesota Vikings, Levi's® Stadium DAS saw 874 GB traversing the AT&T cellular network and an estimated 1 TB or more was used by Verizon Wireless, Sprint and T-Mobile customers. An additional 2.87 terabytes of data crossed the stadium's Wi-Fi network, demonstrating that wireless data usage inside NFL stadiums is only continuing to grow, with no end yet in sight.

CARRIER-LED DEPLOYMENTS

A few mobile carriers have taken the initiative to deploy and operate a multi-carrier DAS solution in other sports stadiums, especially when the stadium carries the operator's brand. For example, AT&T increased cellular-network capacity at AT&T Stadium more than 50 percent in preparation for the 2014-2015 NFL season when the operator secured naming rights for the home of Dallas Cowboys football. AT&T Stadium has become a showcase for AT&T wireless services, with the cellular-network capacity of 17 macro cell sites. AT&T Stadium also has an extensive Wi-Fi network to optimize the fan experience. AT&T has recently upgraded its DAS deployments in several collegiate stadiums, including Ben Hill Griffen Stadium at the University of Florida, Martin Stadium at Washington State University, and the University of Kentucky's Commonwealth Stadium. AT&T also installed Neutral Host DAS deployments at the University of Kansas' Memorial Stadium and at Ross-Ade Stadium at Purdue University.

AT&T has gone to great lengths to convince its competitors and the industry that its Antenna Solutions Group deployed DAS networks as a Neutral Host provider just like a tower company would or a third-party DAS provider. This may change as AT&T's ASG is no longer a separate standalone business unit within AT&T that proactively markets and leases DAS space. A new model may be emerging as AT&T and Boingo Wireless recently partnered to upgrade the DAS network serving Soldier Field, the home of the Chicago Bears. AT&T and Boingo Wireless co-designed this DAS solution to be Neutral Host while optimizing coverage and capacity inside the stadium and in the outdoor areas including the parking lots. Boingo is responsible to market the DAS services to other mobile operators, as one of the leading independent Neutral Host providers of cellular and Wi-Fi network connectivity at sports and entertainment venues.

NEUTRAL HOST DEPLOYMENTS

The challenge of keeping pace with mobile data growth has driven many stadium and other large public venue owners to turn to Neutral Host DAS and Small Cell networks, owned and operated by third-party providers to support multiple carriers in these high-traffic areas. Neutral Host providers have an important opportunity to serve a wide range of venue types beyond stadiums, including universities, enterprise buildings, hospitals, shopping malls and convention centers, when property owners are restrictive and prefer one infrastructure for all mobile operators.

Figure 2 shows how a single Neutral Host service provider that can deploy a shared infrastructure can be beneficial to the venue owner, the MNOs and the Neutral Host provider. For venue owners, they can have an excellent wireless infrastructure which can be used to their benefit. For example, an excellent in-building wireless service for all operators may be one of the key decision criteria for a company to locate to an enterprise building. In addition, the venue owner can generate a significant revenue source from the rental of space and utilities for the wireless service. In the case of the Neutral Host model, they can derive this revenue through only one agreement, and not have to deal with multiple operators. Some venue owners, they will not allow multiple infrastructures to be deployed, mandating that a Neutral Host operator deploy one multi-operator network in their building.

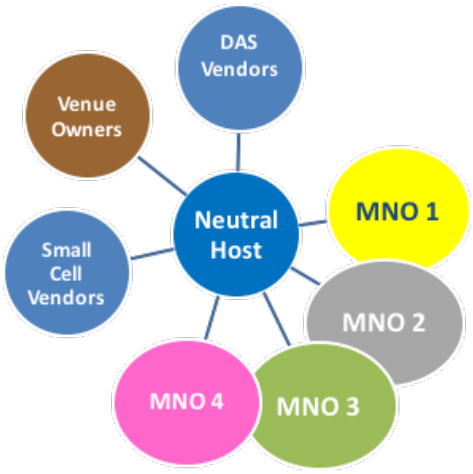

Figure 2
Neutral Host Model for Multi-Carrier DAS Solutions

Figure 3 depicts the typical elements of a Neutral Host Agreement with MNOs. For the MNOs, the Neutral Host option enables them to expand their in-building coverage while saving money and accelerating the rate with which they can cover additional key locations. Most operators have a long list of buildings that they would like to cover. A Neutral Host deployment allows them to save the upfront money that they would invest in their own venue infrastructure, and save even more of the operating costs by sharing those costs with other operators. By working with Neutral Host operators on some venues, they can focus their own resources on other locations, and extend their coverage at a faster rate to more buildings.

Figure 3
Typical Elements of a Neutral Host Agreement with MNOs

In cases where a single infrastructure is mandated, working with a Neutral Host operator may be the only way for MNOs to gain access to these venues. For the Neutral Host operator, these technical and business challenges create a new business opportunity. Neutral Host operators can deploy an in-building infrastructure that allows them to sell service to all MNOs. If the Neutral Host operator can provide service to the MNOs at a price that enables the MNOs to save money over deploying and running the system themselves while allowing the Neutral Host operator to turn a profit based on the cost to deploy and operate the in-building system, then a win-win business model can be created.

TOWER COMPANY NEUTRAL HOST DEPLOYMENTS

For some tower companies, indoor Neutral Host DAS deployments are a highly complementary opportunity to their primary multi-tenant tower business. For example, American Tower has focused on deploying Neutral Host DAS, with more than 300 deployments in venues throughout the US and around 150 more worldwide. American Tower believes an indoor DAS system can perform like a tower on a commercial basis, and has achieved an average of 2.5 tenants per network deployment in stadiums, shopping malls, hotels, convention centers and casinos.

Crown Castle has been investing in fiber optic networks to drive significant growth through Small Cell deployments. As a result of the acquisition of the NextG, 24/7 Mid-Atlantic Network and Sunesys Quanta fiber assets, Crown Castle owns or has rights more than 15,000 miles of dense fiber in the top 10 US metropolitan areas, including New York, Los Angeles, Chicago, Philadelphia, Atlanta and Dallas-Fort Worth. Crown Castle has approximately 15,000 outdoor Small Cell nodes deployed along these routes, and is now well positioned to address the desire for dark fiber backhaul solutions for Small Cell deployments by MNOs such as Verizon Wireless. By making these acquisitions, Crown Castle also bolstered its dark fiber capabilities to compete against other providers of fiber optic Small Cell backhaul services. Crown Castle is competing with Zayo and Level 3 Communications which have acquired some attractive independent metro dark fiber assets to provide Small Cell backhaul. Lightower Fiber Networks recently acquired Fibertech to expand its fiber footprint in the Northeast, Mid-Atlantic and Midwest regions.

Crown Castle is also one of the largest independent Neutral Host DAS operators in the US, with about 10,000 nodes and 26 venues in operation or under construction. Crown Castle invested nearly $100 million on the construction of new sites in the third quarter of 2015, and most of that was spent on Small Cells rather than cell towers where new construction is leveling off. Crown Castle believes there are going to be hundreds of thousands of Small Cells over time, and Small Cells will be the next iteration of the shared wireless infrastructure business.

There is something of a land grab happening right now, similar to the tower business in the past. However, it has been much more challenging to add highly profitable additional tenants onto existing Small Cell deployments than a traditional tower or Neutral Host DAS. Carriers using different spectrum bands and different macro networks may find it hard to identify commonality in deployment, if space is even available. Despite these challenges, Small Cells represent a form of incremental capacity that operators like Verizon and Sprint need and are embracing.

INDEPENDENT NEUTRAL HOST DEPLOYMENTS

Several MNOs are now actively examining the economics of next generation active DAS and Small Cell networks deployed by independent Neutral Host providers among their options to address the data capacity challenge. The leading independent Neutral Host DAS and Small Cell network solution providers are Boingo Wireless, ExteNet Systems and Mobilitie.

Boingo Wireless deploys and operates DAS, Small Cell and Wi-Fi networks to provide mobile Internet access in a wide range of venues including stadiums, airports, military bases and universities. Headquartered in Los Angeles, the publicly traded company is the world's leading airport Wi-Fi and DAS provider, managing Neutral Host networks in nearly 60 airports, representing more than 50% of top 50 airports in North America and more than 30% of the top 30 airports worldwide. Boingo has recently upgraded many of these airports with innovative S.M.A.R.T. Wi-Fi networks to offer tiered services at multiple speed options up to 20 Mbps, depending on the traveler's needs. Boingo also utilizes a unique monetization engine as a platform to drive revenue through advertising, location-based data analytics, and consumer products like IPTV, high-speed broadband, carrier and Wi-Fi offload. Boingo has Wi-Fi offloading deals with several MNOs like Sprint, where the carriers' handsets are configured to auto-authenticate with Boingo Wi-Fi hotspot connections at no additional charge. Boingo expects to achieve profitability while continuing to invest in infrastructure, and does not expect to raise additional capital through a stock or debt sale in 2016.

ExteNet Systems is one of the market leaders in multi-carrier, Neutral Host and multi-technology distributed networks for both outdoor and indoor settings. Headquartered near Chicago, ExteNet designs, builds, owns and operates networks that support all US wireless four mobile carriers, and scale to mobile traffic growth. As a Neutral Host, ExteNet has deep relationships and ongoing activities with all four major mobile operators and its goal is to never build a network for just one carrier. By co-investing with mobile operators, ExteNet delivers much lower upfront cost than carriers could achieve building these networks on their own.

Extenet currently operates DAS systems in more than 100 different indoor venues, including the Miami Marlins baseball park and NBA Barclays Center in Brooklyn. ExteNet has deployed enterprise buildings such as the Empire State in NYC, Willis Tower and Trump International Tower and Hotel in Chicago. ExteNet also deployed an indoor DAS and outdoor Small Cell and carrier Wi-Fi network blanketing approximately 15 square miles in Las Vegas, increasing outdoor cellular coverage and capacity within some of the leading casinos and hotels on the Strip. ExteNet is working with Aldridge Chicago to deploy a distributed 4G network in the Chicago subways with all four mobile carriers participating, covering all 22 miles of tunnels and in the stations with plans for service on the trains. Verizon recently partnered with ExteNet to deploy an outdoor Small Cell network with more than 400 fiber-fed Small Cell nodes mounted on city-owned steel light posts and wooden utility poles throughout the financial district of San Francisco.

Tower Company SBA Communications had been an investor in ExteNet Systems for five years, and recently decided that neither Small Cells nor DAS deployments fit into its portfolio any longer. SBA has now exited its investment in ExteNet and is now focusing on long-term maximizing capital appreciation through its tower site leasing and site development businesses. As such, ExteNet recently completed a $1.4 billion recapitalization led by Digital Bridge Holdings (Digital Bridge) and Stonepeak Infrastructure Partners (Stonepeak). Digital Bridge is a holding company for several tower companies in the US, Mexico and Latin America, and its co-founder and CEO Marc Ganzi is now chairman of ExteNet's board. Until now, 90% of Extenet's growth has been organic through network deployments. After the recapitalization Extanet has additional funds to support long-term growth, and has expressed an interest in acquiring carrier-led indoor network deployments that can be re-purposed and modernized to support multiple carriers.

Mobilitie LLC is the nation's largest privately-held wireless infrastructure provider, based in Newport Beach, CA with regional offices across the United States. The privately held company funds, installs and operates communications towers and other infrastructure that carriers use to power their high-speed networks. Like ExteNet, Mobilitie is focused on deploying DAS, Small Cell and Wi-Fi network solutions that drive down operating costs over time for its major US MNO partners, venue owners, professional sports teams and Governments seeking ways to accommodate the ever-increasing need for seamless mobile access. Mobilitie is currently leading the effort to fund, design, and build innovative wireless solutions for some of the most complex network challenges, and has deployed more venue infrastructure and new outdoor macro networks than any other firm in the US.

Mobilitie has led some of the most important infrastructure projects in sports and entertainment arenas such as the Kansas City Chiefs' Arrowhead Stadium, St. Louis Rams' Edward Jones Dome, the Anaheim Ducks' Honda Center, Washington Wizards Verizon Center, Tampa Bay Rays Tropicana Field and Churchill Downs, home of the Kentucky Derby. Mobilitie also owns and operates the largest carrier-grade Wi-Fi network in the world, in Las Vegas, through a partnership with MGM Resorts.

Mobilitie recently closed a $325 million debt investment, led by CIT Bank, NA, and TD Securities (USA), LLC, to fund the continued exponential growth of the company's business investments. This debt funding is another in a long list of significant investment activities for Mobilitie since its founding by Gary Jabara in 2005. The company secured nearly $1 billion in previous investments from TD Securities and Shamrock Capital Growth Fund III between 2008 and 2011. Mobilitie also raised $1.1 billion by selling more than 2,300 towers and other mobile sites to SBA Communications in 2012.

Mobilitie is reported to a primary partner for Sprint that is planning to deploy some 70,000 outdoor Small Cells over the next few years. Operators typically plan to install outdoor Small Cells on utility poles, lamp posts, church steeples and other structures that rise above most roof levels. Most of sites require zoning, permitting and negotiations with municipal authorities. A single carrier Small Cell deployment would require the acquisition of roughly the same number of discrete sites, and Sprint would have to secure the sites and negotiate terms for deployment. Alternatively, Neutral Host Small Cells serve multiple carriers and would be located, where possible, on government-owned right of ways, which are typically far cheaper than space rented from private landlords.

In New York City alone, Sprint wants to deploy 2,000 new Small Cells over an 18-month period, and is considering the use of multi-tenant locations to place their Small Cell equipment. Mobilitie may also be asked to help finance some portion of the Sprint deployment. More than 2,200 cells have already been deployed in New York, and another 8,800 applications are pending approval from carriers and Neutral Host providers like Crown Castle, ExteNet Systems and Mobilitie. Many areas of Manhattan are already saturated and the city is looking to exchange old streetlight poles for multi-tenant poles with fiber backhaul where Small Cells could accommodate all four carriers.

WIROI™ NEUTRAL HOST NETWORK VENUE BUSINESS CASE ANALYSIS TOOL

Wireless 20/20 has leveraged its in-depth knowledge garnered from over 100 engagements with 3G/4G operators worldwide, to create the newest version of the award-winning WiROI™ Venue Tool. The WiROI™ Neutral Host Network Venue Business Case Analysis Tool enables MNOs and venue owners to conduct a detailed analysis to understand whether a Neutral Host solution can be successfully deployed for a certain venue.

The new WiROI™ Neutral Host Venue Tool can be used to analyze Neutral Host networks for various venue environments, such as college campuses, enterprise buildings, hospitals, airports, shopping malls, train stations, subways, convention centers, stadiums, race tracks, and special event venues where there is a high density of broadband users. The model can be used to analyze network technology options like Wi-Fi, DAS, and LTE Small Cells, and to simulate various methods for monetizing the investment in venue networks. The result is a complete ROI analysis for Neutral Host providers, venue owners and MNOs. The new WiROI™ Neutral Host Venue Tool can also be used to model the SLAs and cost savings under various business scenarios, allowing MNOs to analyze how they can best utilize Neutral Host networks. Our analysis shows that in many cases the best and most economical solution is for a Neutral Host service provider to deploy a common and shared infrastructure that can support all MNOs in multi-tenant buildings and venue network deployments.

Figure 4

The Wireless 20/20 WiROI™ Neutral Host Venue Business Case Analysis Tool GUI

Many high density environments require improvements in coverage and capacity for MNOs during high occupancy times. Many passive DAS systems deployed by individual carriers have been overwhelmed by the tremendous growth in data traffic driven by smartphones, mobile laptops and tablets. Many venues simply cannot accommodate separate and disjointed deployments by each MNO. The WiROI™ Neutral Host Venue Tool simulates the impact of tens of thousands of users in a venue using smartphones and enables Neutral Host providers to simulate performance enhancements, revenue potential and cost effectiveness of a next generation active DAS, Small Cell and Wi-Fi network over a 10-year period.

Several MNOs are actively using the new WiROI™ Neutral Host Venue Tool to pinpoint the business models that can provide positive ROI for Neutral Host providers, while offering improved economics and speed of deployment for MNOs. These solutions offer Neutral Host mobile capacity for cellular carriers across indoor and outdoor areas of the venues. Most Neutral Host systems can be more easily scaled to address continuing traffic growth and support advanced Wi-Fi services. However, the notion that new, multimillion-dollar DAS systems will be deployed in hopes that all MNOs will participate is just not economical or viable.

Our analysis for a 12-story enterprise building, depicted in Exhibit 6, demonstrates that a Neutral Host Service Provider could deploy a multi-operator DAS network for around $200K CapEx, and turn a profit if all 4 MNOs join the network. Wireless 20/20 has demonstrated that similar successful business models can be created for hotels, shopping centers, university campuses, airports, stadiums, and other venues. A detailed business case analysis is needed to understand the key success factors for each case. But the analysis often shows that multi-operator infrastructure can be profitably deployed in most situations.

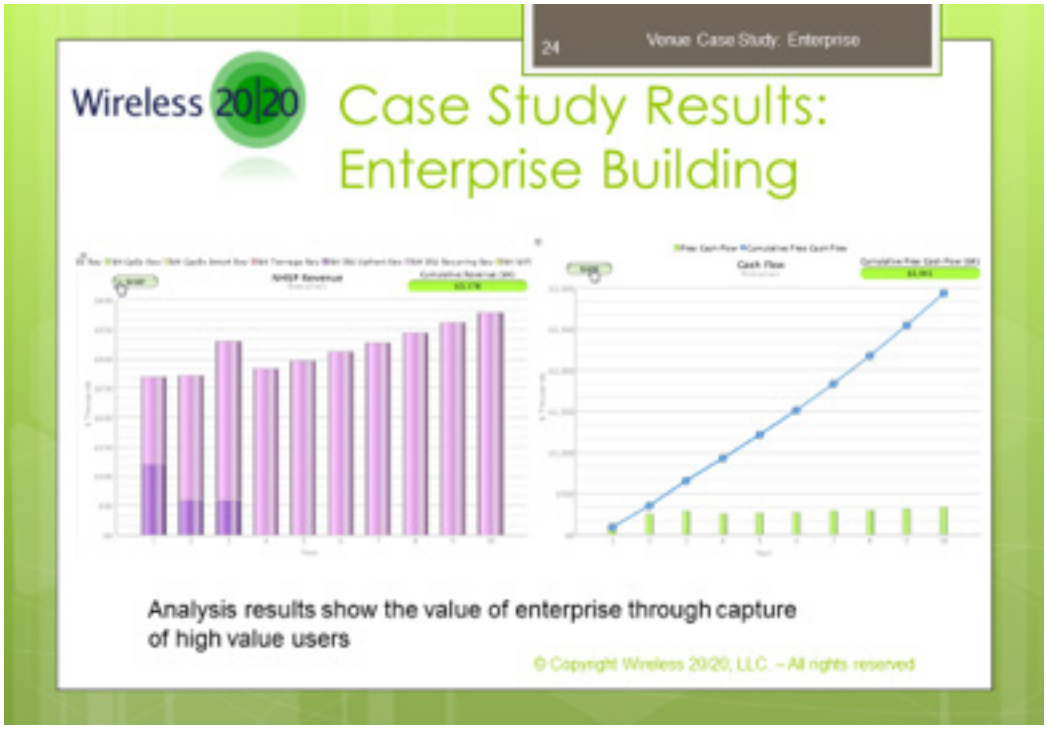

Figure 5
WiROI™ Neutral Host Model Analysis for a 12-Story Enterprise Building

CONCLUSION

The typical elements of a Neutral Host Agreement with MNOs is depicted in Figure 6. As current mobile operator networks are expanding to meet the coverage and capacity demands, the enhancement of in-building coverage is one of the key areas for improving networks.

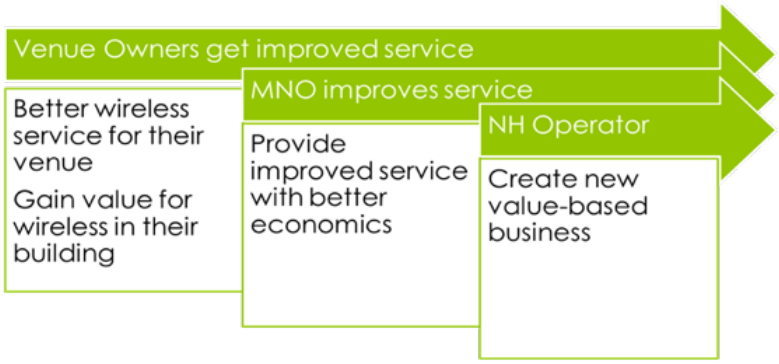

Figure 6

Neutral Host Model as a Win-Win for Venue Owners and MNOs

Venue owners, MNOs and Neutral Host service providers can all take advantage of the cost savings and efficiency of resources brought on by the sharing of infrastructure in venue environments. This creates a lasting win-win-win advantage for all industry players. As such, the trend toward Neutral Host deployments in desirable venues is one of the most important trends in the mobile industry.

Wireless 20/20

This White Paper was co-authored by Berge Ayvazian, Randall Schwartz and Haig Sarkissian, Senior Analysts and Principal Consultants of Wireless 20/20. Wireless 20/20 helps mobile operators and their vendors develop their 4G LTE launch strategies, service offerings, marketing plans, technology roadmaps and business cases. More information about the WiROI™ Neutral Host Network Venue Business Case Analysis Tool can be found at www.wireless2020.com/WiROINeutralHost/.

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