Business Update: OnGo NHNs

A Breakthrough in Indoor Wireless for Any Venue

November 2021

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1   Executive Summary

Mobile devices are everywhere. But that doesn't mean that users can get great service wherever they need it. Indoor wireless coverage—especially in small to medium-size properties—lacks the performance that users have come to expect. And that's becoming a bigger problem for venue owners.

Without good indoor wireless coverage, venue owners risk complaints (from users, staff, guests and vendors) and even lost business. The stakes have gotten higher as user expectations intensify and bandwidth demands continue to skyrocket.

This Business Update from the OnGo Alliance (formerly the CBRS Alliance) is for venue owners looking for an indoor wireless solution that delivers high performance without high costs and complexity. Since the COVID-19 pandemic, even large venues are looking for more affordable, less complex solutions.

A Neutral Host Network (NHN) enables venue owners to provide wireless services from multiple operators. Today, most NHNs are based on Distributed Antenna System (DAS) technology, which is not a viable option for many venue owners to consider, especially for small to medium-size venues.

The OnGo NHN is a standards-based solution based on the Citizens Broadband Radio Service (CBRS) spectrum band. Recently made available by the Federal Communications Commission (FCC) for commercial use, the CBRS band enables massive cellular bandwidth and the affordability of Wi-Fi. OnGo technology make it possible for venue owners of any size to deploy a multi-operator wireless indoor network that offers affordability, performance, flexibility, security and more.

CBRS is often called "The Innovation Band" because it enables venues to use wireless in ways that simply weren't possible or even imaginable with technologies like DAS and Wi-Fi. It completely changes how any property—all industries, geographies, property types and sizes—can deploy and leverage indoor wireless networks. CBRS also makes it easier for venue owners to support the services and applications that users want. Once deployed, an OnGo NHN gives venue owners the ability to add new services, such as connecting IoT devices to their high-performance wireless network. Examples of IoT initiatives include systems for safety, security, energy efficiency and facilities management.

OnGo NHNs are for You

Affordable, high-performance indoor wireless coverage is needed by venues of all sizes in multiple industries:
- Commercial office spaces
- Retail
- Government buildings
- Schools
- Hospitals and clinics
- Hotels and hospitality
- Sports and entertainment venues
- Transportation hubs

Another important consideration for venue owners is having a robust ecosystem of partners that can support their deployments. This is where the OnGo Alliance plays an important role, providing a central resource of OnGo experts.

Choosing an OnGo NHN also provides flexibility in financial and operational models that simply weren't available with traditional NHN solutions based on DAS. Venue owners can choose familiar models like a managed service, which enables them to outsource most or all of the activities of an OnGo NHN, governed by a Service Level Agreement. Or a venue owner can choose to own, operate and manage the OnGo NHN themselves. Or a venue owner can choose a hybrid model.

Finally, venue owners should feel comfortable that any indoor wireless model they adopt today will serve them well into the future. An OnGo NHN is a standards-based, vendor-agnostic solution with a clear path to 5G. Which means OnGo technology provides the flexibility to adapt to evolving architectures. OnGo NHNs enhance the business and operational value of venues today and ensure a sound foundation for tomorrow.

2 What's Stopping Great Indoor Wireless Coverage?

You could say that what's stopping the best indoor wireless coverage is literally walls, ceilings, floors, windows, equipment and furniture.

In short, there are a lot of obstacles inside and around a facility that can weaken or block radio frequency (RF) signals. Not all wireless technology can overcome these physical obstacles. If you add in big spaces, large distances and high-density usage, indoor wireless performance is going to suffer badly, which, for users, can mean:

- Trouble connecting and staying connected
- Lower performance
- Latency-sensitive and high-bandwidth applications may not perform well or even work at all

When wireless coverage is poor, the user experience suffers. Note that users can encompass many different groups relying on mobile devices, including:

- Students, patients, tenants, customers, etc.
- Visitors and guests
- Employees
- Vendors

2.1 Quality Wireless Is Crucial for Venues of All Sizes

Wireless communication is considered a "fourth utility," as essential as heat, water and electricity. Poor wireless—slow, spotty, unreliable, and not secure enough—can have a negative effect on your business, including:

- Complaints
- Churn
- Inroads by competition
- Security breaches
- Reduced productivity and efficiency

What's in a Word?

People don't always agree on terminology and definitions. Even a term as basic as "wireless" may be used differently by different people. Because this update focuses on the business impact of OnGo, we decided to simplify some technology descriptions.

CBRS: A lightly licensed spectrum (band) that provides a combination (compared to other wireless technologies) of 1) affordability, 2) carrier-class performance, and 3) a foundation for innovative services.

Neutral Host Provider: A company that deploys and operates Neutral Host Networks (NHNs) as a service.

OnGo technology: This is a general term that describes any products or services offered by members of the OnGo Alliance. These developments are all based on innovations that are possible with the CBRS band.

OnGo NHN: At the top level, an OnGo NHN is a private LTE network based on the CBRS band and 3GPP (see 3GPP below). Because of the neutral host model and standards, an OnGo NHN can connect both private and public networks. (See private LTE network below.)

Operators: We use "operators" as an umbrella term to encompass all types of wireless network providers, including carriers, mobile network operators, service providers, cable operators and others. We've avoided the use of acronyms (e.g., MNO, MVNO, MVNA, MVNE, etc.) because there are so many, with more emerging every day.

3GPP: 3GPP is a standards organization that develops protocols for mobile telecommunications, notably 4G LTE and 5G NR. OnGo technology is based on 3GPP standards.

Private LTE network: The lines may be blurring a bit, but we're using the term private network to differentiate it from public network. In this paper, we're specifically referring to private LTE networks, which are based on the LTE standard (which stands for Long Term Evolution) published by the 3GPP standards group, that provide services to a limited number of users.

Wireless: We use "wireless" as an umbrella term to encompass any non-landline term, including mobile, cellular, DAS, Wi-Fi, small cell and others.

3 The Benefits of Neutral Host Networks

3.1 How a Neutral Host Network (NHN) covers indoor wireless needs

Technology terminology isn't always self-explanatory. But a Neutral Host Network (NHN) actually sounds like what it is: a standards-based network that can be shared by multiple operators within a single building or campus.

These are some of the ways that NHNs can make it easier for venues of all sizes to offer indoor wireless:

- Sharing infrastructure enables cost-effective business models
- Reducing the burden on venue owners by working with one neutral host instead of multiple operators
- The potential for venue owners to generate revenue by charging for venue access to operators and neutral host providers

The NHN is an excellent model for enabling multiple operators to provide coverage and services within a building. However, the traditional neutral host model has been out of reach for a lot of venues. Below we address some of the reasons.

3.2 The limitations of current technologies for indoor wireless

Until now, there have been two wireless technology options to address poor wireless coverage and capacity: cellular and Wi-Fi.

Cellular: Operators can set up either small cells or Distributed Antenna Systems (DAS). Unfortunately, both are usually cost-prohibitive for small and medium-sized venues. Small cells are also operator specific. DAS-based NHNs, while able to support multiple operators, are time-consuming and complex to deploy. Which is why these systems are typically found only in very large venues. But even large venues are always looking for a better solution that is less complex and more economical. And the COVID-19 pandemic has certainly amplified this need.

Wi-Fi: Most Wi-Fi technology struggles in large venues, high-density environments, or properties that present a lot of interference challenges. In addition, channel conflicts and handoffs are a frequent problem, especially for roaming. And it's almost impossible to resolve the problem of channel conflicts when Wi-Fi signals from different vendors penetrate walls and floors. Once deployed, Wi-Fi can also be difficult to manage and scale in an NHN multi-operator environment.

Venue Sizes

When we talk about large and small venues, these are the general sizes:
- Small – 50,000 sq feet and below
- Medium – 50,000 to 500,000 sq feet
- Large – 500,000 sq feet and above

Small and medium-sized venues may not even try to deploy indoor wireless solutions. Instead, they rely on radio signals from outside cell towers penetrating the interior of a building. This approach is uneven at least. Today's efficient glass attenuates radio signals. And signals are weak in heavily congested areas and those with few cell towers.

4   OnGo NHNs Dramatically Change the Value Proposition for Indoor Wireless

OnGo NHNs are based on a newly available spectrum called the Citizens Band Radio Service (CBRS). Appropriately nicknamed "The Innovation Band," CBRS enables massive cellular bandwidth and the affordability of Wi-Fi. In addition, CBRS has capabilities that have never been possible with either technology.

CBRS is a lightly licensed band that covers the 150 MHz spectrum in the 3.5GHz range. Once reserved for government agencies and fixed satellite station operators, the Federal Communications Commission (FCC) recently made CBRS available for commercial use.

In addition to using CBRS, OnGo NHNs are based on standards defined by the 3GPP, which develops protocols for mobile telecommunications worldwide. Among other things, standards ensure compatibility and interoperability, which gives venue owners greater flexibility in choosing ecosystem partners (see Figure 1).

The CBRS Spectrum Access System

The key reason that CBRS is getting so much attention as an innovative wireless technology is the newly created Spectrum Access System (SAS). The SAS automates spectrum access for networks in the CBRS band, which provides significant advantages:

- Eliminates the planning complexities of the licensed wireless bands used by operators
- Makes it easier for companies to share access to a high-performance wireless spectrum at low or no cost
- Grants access to licensed spectrum in hours, rather than months
- Reduces interference between CBRS networks
- Provides built-in security and privacy controls

Agreements between OnGo NHN operator and mobile operators

| Operator 1 | Operator 2 | Operator 3 |

OnGo Neutral Host Network

Mobile operators and subscribers maintain their relationships
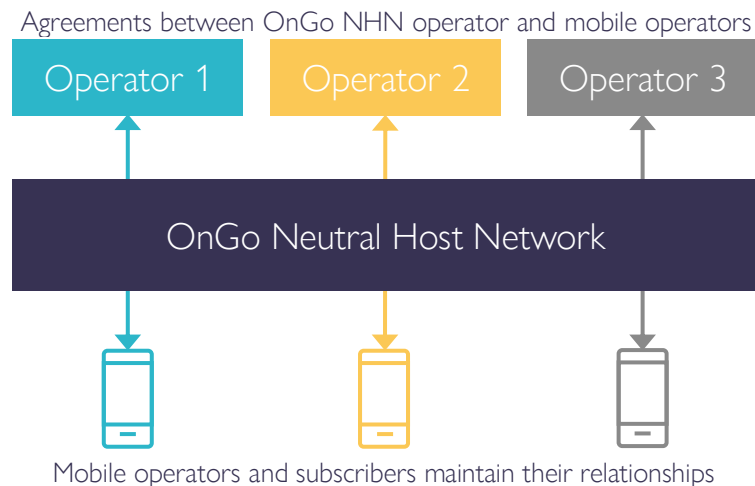
Figure 1:   This is a high-level operational overview of an OnGo NHN—a single shared network that provides services to the subscribers of multiple operators. OnGo NHN extends high-performance wireless into areas of a venue with poor or no coverage. OnGo NHN eliminates the time and cost of acquiring traditionally licensed spectrum. Services are provided seamlessly, and the relationships between the operators and their subscribers is unaffected.

OnGo NHNs dramatically change the value proposition for indoor wireless coverage (see Figure 2). Following are some examples of how venue owners can maximize the value of their properties with OnGo.

Figure 2: This diagram illustrates the key capabilities of an OnGo NHN, starting with how it dramatically changes the value proposition for indoor wireless coverage for venues owners. An OnGo NHN delivers high performance without high costs and complexity. OnGo technology makes it possible for venues of any size to deploy a standards-based multi-operator indoor wireless network. An OnGo NHN can also make a venue more attractive to operators, which, in turn, gives venue owners more choices for building a partner and vendor ecosystem.

4.1   New Services Deployed Faster

An OnGo NHN can be deployed in a fraction of the time of a DAS network, because CBRS is not burdened by time-consuming spectrum access, approval and certification. It requires minimal effort to expand/scale an OnGo NHN, such as integrating a Private LTE network. This translates to faster-time-to-value (new services, revenue streams, etc.) for venue owners.

One big area of interest to venue owners is connecting IoT devices to their high-performance wireless networks, such as:

- Safety and security systems, such as surveillance cameras, connected smart door locks, motion sensors and access controls
- Energy management and building maintenance systems

4.2   Lower Costs

OnGo networks cost less than DAS networks with the same or better performance[1]. Examples of lower costs include:

- Deployment in a fraction of the time translates to lower deployment costs
- Smaller footprint and energy costs reduce the total cost of ownership

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[1]   Up to 68% less, per an analysis by Mobile Experts [7]

4.3   Improve the User Experience

There are several reasons why OnGo NHNs enable a giant leap forward in meeting user expectations, even while demand keeps growing, including support for:

- High-bandwidth applications, including streaming video, gaming and low-latency applications, such as conferencing
- High-density areas, so that users don't have trouble connecting and using applications even in crowded environments
- Providing a seamless experience as mobile users move throughout the property.

4.4   Easier network management

OnGo NHN simplifies management overhead for the venue owner, including:

- Operators can support BYOD for subscribers without deploying special authentication systems (regardless of the operator)
- Eliminates the need to manage subscriber identification modules (SIM cards) by using existing operator SIM cards
- IT-friendly infrastructure options
- Operators provide voice and messaging services

4.5   Carrier-grade security

An OnGo NHN uses the same hardware-based security (SIM cards) used by the carriers, which means an OnGo NHN has carrier-grade security at a minimum.

Note: See Appendix B for more details on in-depth discussions with venue owners about their requirements for indoor wireless solutions.

4.6   Broad User Device Support

Because OnGo uses open standards, adding OnGo to end-user devices (handsets, smartphones and other devices) is simply a matter of enabling the CBRS band. Most devices on the market today already support OnGo, and many older devices support it as well. Visit the OnGo Alliance for a constantly updated list of OnGo devices [4].

OnGo NHN Makes Venues More Attractive to Operators

Choosing an OnGo NHN reduces the complexity of coordinating multiple wireless networks and working with multiple operators. It can also make a venue more attractive to operators, which, in turn, gives owners more choices for building an ecosystem. With OnGo NHN, while maintaining control of their subscribers, operators can:

- Reach new subscribers in properties that were not economical to support with DAS
- Increase capacity at high-density locations
- Integrate easily with other operators with 3GPP standards-based protocols
- Establish SLAs with confidence using embedded QoS and KPI metrics
- Offload their cellular infrastructures

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5 The OnGo Alliance Helps Venue Owners Build a Trusted Partner Ecosystem

OnGo networks change the value proposition for indoor wireless coverage for venues of all sizes. But there's yet another layer to this value proposition: the OnGo Alliance.

Our purpose: The OnGo Alliance, formerly the CBRS Alliance, created OnGo to commercialize the use of 3GPP technologies using the CBRS band. Alliance members are also developing specifications, devices and services for deploying and supporting OnGo networks.

Today, the OnGo Alliance is an ecosystem of 190+ companies. It's a diverse group of experts that includes Managed Service Providers, Mobile Network Operators, product and services companies and Systems Integrators.

Following are some of the ways that the OnGo Alliance supports venue owners.

5.1 Choices in Products and Services

A large ecosystem of OnGo network providers means that venue owners have more choices in vendor selection. OnGo makes multi-operator and multi-vendor integration less complex, which translates to lower costs and fewer headaches for venue owners and their staff.

5.2 Trusted Products and Services

The OnGo Alliance defines the technical requirements for deploying OnGo NHNs and certifies devices for compliance. Our rigorous certification program includes:

- OnGo Certification Process
- OnGo Authorized Test Laboratories
- OnGo Certified Devices [3]
- FCC Authorized End User Devices [4]

6   OnGo NHNs Provide More Business Model Choices

With OnGo NHNs, the venue owner has the flexibility to choose from multiple financial and operational models. This is a significant innovation in mobile telecommunications, as these familiar models were often unavailable with traditional NHN solutions.

OnGo NHNs enable venue owners to customize their solution to their own capabilities, needs and service strategy.

6.1   OnGo NHN-as-a-Service

OnGo NHN-as-a-Service is an outsourcing model. A neutral host provider (which could be an operator) performs most or all of the activities for a successful NHN network. The neutral host provider is governed by an SLA created in concert with the venue owner.

Key benefits of this model:

- Reduced need for internal network expertise
- Flexible CapEx and OpEx models
- Minimal management overhead

6.2   Venue Owned, Operated and Managed

In this model, venue owners deploy, operate and manage the OnGo NHN themselves, relying on their own capabilities and expertise. Note that this doesn't preclude the venue owner from taking advantage of the OnGo Alliance ecosystem for products and services.

Key benefits of this model:

- Direct control of configuration and services
- Use existing cabling and IT infrastructure to reduce installation costs

6.3   Hybrid Model

In this model, venue owners can maintain ownership of the OnGo NHN capital and outsource operations and management. As with the OnGo NHN-as-a-Service model, these outsourced engagements are usually covered by SLAs.

Key benefits of this model:

- Resource augmentation
- Direct control of service quality
- Matching CapEx and OpEx requirements of the venue

7 OnGo NHN Flexibility Supports Evolving Architectures

There are multiple ways to implement an OnGo NHN. Venue owners and operators may choose an architecture based on the requirements of a particular industry, property or application. The primary difference between different OnGo NHN architectures is what infrastructure elements are shared.

3GPP standardized architectures like Multi-Operator Core Network (MOCN) are preferred by many operators and can be readily deployed in an OnGo NHN (see Figure 3).

One of the many things that makes an OnGo NHN a sound investment for venue owners is that it can adapt to evolving architectures because it is:

- Standards-based
- Vendor and architecture agnostic
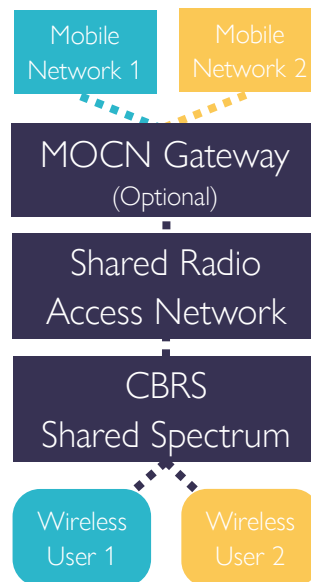- Open and flexible
- Clear upgrade path to 5G

Figure 3:   A high-level view of an OnGo NHN using MOCN, a 3GPP architecture for access-sharing when using CBRS. The radio access network and CBRS spectrum are shared by the operators over the OnGo NHN. An optional MOCN Gateway aggregates the connections to the operators' networks. This shared environment reduces costs and also enhances the user experience with seamless connectivity.

7.1 Private LTE Networks as Part of OnGo NHNs

Because OnGo uses the open standards defined by the 3GPP, it's easy to incorporate a Private LTE network as part of an OnGo NHN. A Private LTE network can be included at launch or added to the OnGo NHN at a later date at a minimal incremental cost. One advantage of a Private LTE network is that the venue owner have control of their data, allowing data analysis that can drive business intelligence.

The OnGo Alliance has a number of resources for helping venue owners of all sizes incorporate a Private LTE network, including a deployment guide and identifier management services.

8   Contact the OnGo Alliance

The OnGo Alliance is a diverse group of experts that includes Managed Service Providers, Mobile Network Operators, product and services companies and Systems Integrators. OnGo Alliance members can help venue owners design, deploy and operate their OnGo NHN. The OnGo Alliance has also developed an OnGo NHN Deployment Guide with in-depth information on deploying an OnGo NHN.

For more information, contact the OnGo Alliance.

Appendix A – Reference Links

OnGo Website. Our webpage has multiple resources about OnGo technology, including technical specifications, white papers, and webinars. https://ongoalliance.org. Some specific reference links include:

[1]   OnGo Alliance Member page, which can be used to find the service providers, systems integrators and equipment manufacturers to deploy an OnGo NHN: https://ongoalliance.org/members/

[2]   OnGo For Dummies, a short introduction to OnGo and CBRS: https://ongoalliance.org/resource/cbrs-ongo-for-dummies/

[3]   OnGo Certified Product Listing, which lists the access points that have been certified by the OnGo Alliance: https://ongoalliance.org/certification/ongo-certified-devices/

[4]   FCC Approved Devices Listing, which lists the user devices that support OnGo: https://ongoalliance.org/certification/fcc-authorized-end-user/

[5]   OnGo NHN Deployment Guide, which gives the details on how to design and deploy an NHN: https://ongoalliance.org/resource/ongo-nhn-deployment-guide/

[6]   OnGo Private LTE Deployment Guide, which gives the details on how to design and deploy a Private LTE network: https://ongoalliance.org/resource/ongo-private-lte-deployment-guide/

[7]   OnGo: New Shared Spectrum Enables Flexible Indoor and Outdoor Mobile Solutions and New Business Models, Mobile Experts Whitepaper: https://ongoalliance.org/wp-content/uploads/2018/04/Mobile-Experts-OnGo.pdf

[8]   Cost of Modeling of In-Building Wireless with OnGo, Mobile Experts Whitepaper: https://ongoalliance.org/wp-content/uploads/2019/07/OnGo-in-building-wireless-cost-model-for-office-building-final-1.pdf

[9]   NHN Survey Presentation, from a recent meeting of the OnGo Alliance. The survey discussion begins at minute 41: https://www.youtube.com/watch?v=czfvkddrG08

[10]   Hospitality Technology Next Generation's (HTNG's) whitepaper on CBRS: https://cdn.ymaws.com/www.htng.org/resource/collection/CC1CE2B8-0377-457E-9AB0-27CFDD77E17B/2018_CBRS_for_Hospitality_White_Paper.pdf

[11]   You can also go to the WInnForum's site, if you are interested in the technical details about the CBRS band: https://cbrs.wirelessinnovation.org

[12]   3GPP MOCN Standard: https://www.etsi.org/deliver/etsi_ts/123200_123299/123251/11.04.00_60/ts_123251v110400p.pdf
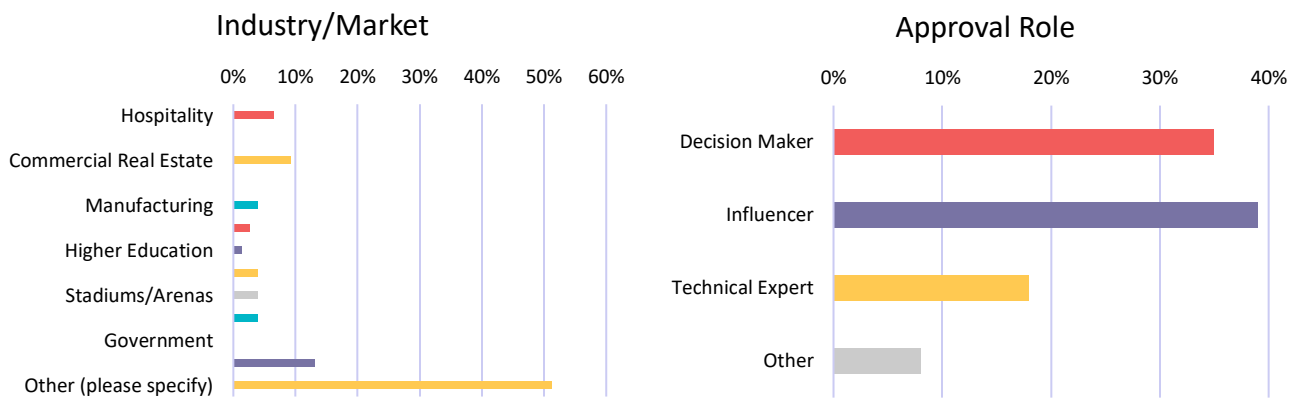
Appendix B – Venue Survey

The Alliance conducted a survey in late 2020 to gather feedback from venue owners on their pain points and expectations from a OnGo NHN solution. In this video, starting at minute 42, there is additional discussion of the survey.

The full results of the survey are available to members of the OnGo Alliance, and can be found here: https://workspace.ongoalliance.org/wg/BWG/document/5819.
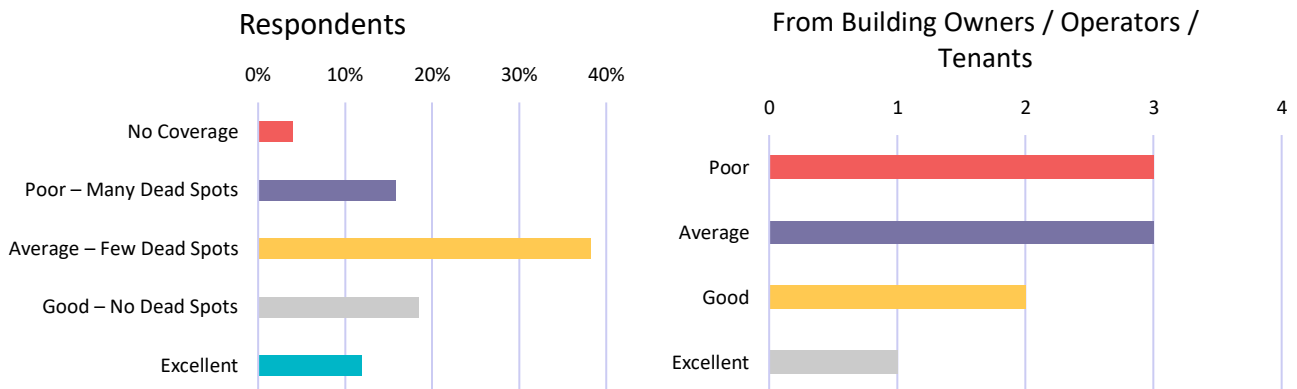
Summary:

- Data was the number one use-case identified.
- Only 50% said they desired an OnGo NHN for voice applications.
- 50% said they desired an OnGo NHN for IoT applications.
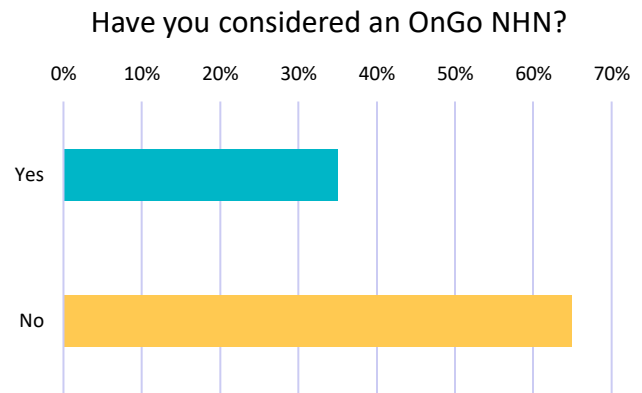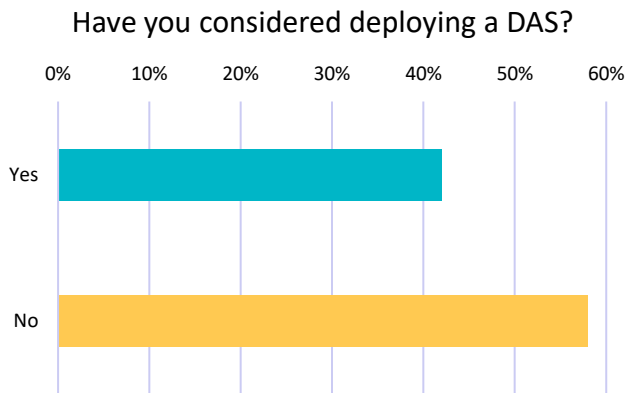- No clear preferences in terms of business models, expense models, or monetization requirements.
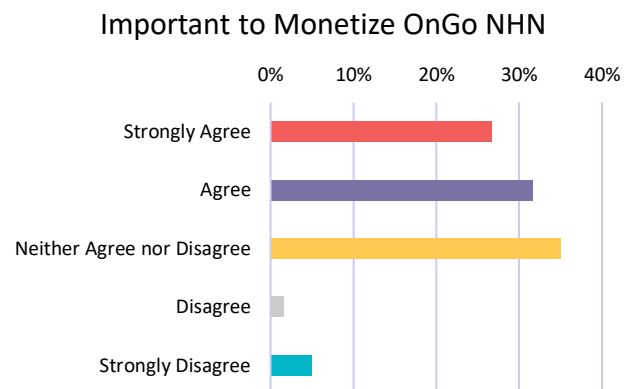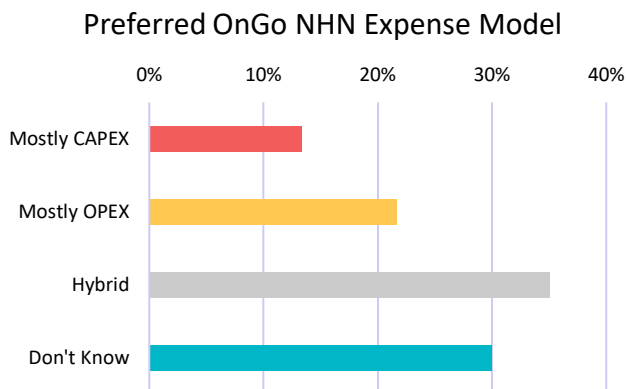
B.1   Respondent Information

Industry/Market

Approval Role

B.2   Current Wireless Coverage Quality

Respondents

From Building Owners / Operators / Tenants

B.3   Solutions Considered

Have you considered deploying a DAS?

Have you considered an OnGo NHN?

B.4   OnGo NHN Details

OnGo NHN Application Interest

Preferred OnGo NHN Business Model

Preferred OnGo NHN Expense Model

Important to Monetize OnGo NHN
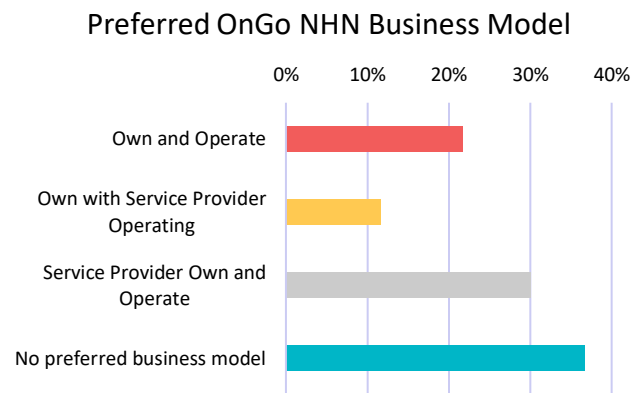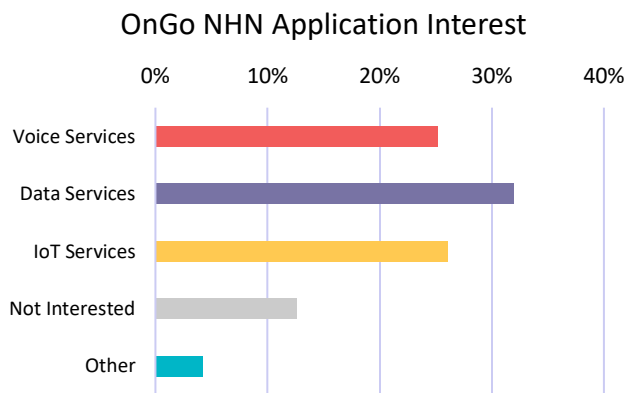
Appendix C – Glossary

Term	Definition
BYOD	Bring Your Own Device
Capacity	The total bandwidth available to users of a network.
CapEx	Capital Expense
CBRS	Citizens Broadband Radio Service
CBRSA	CBRS Alliance, former name of the OnGo Alliance
Coverage	The physical area over which wireless network provides connectivity
DAS	Distributed Antenna System
EPC	Evolved Packet Core provides network services to mobile devices in LTE
FCC	Federal Communications Commission
GHz	Gigahertz
HTNG	Hospitality Technology Next Generation
ISP	Internet Service Provider
IT	Information Technology
IoT	Internet of Things
LTE	Long Term Evolution, the 4th generation mobile technology; used in OnGo
MHz	Megahertz
MNO	Mobile Network Operator or a wireless carrier
MOCN	Multi-Operator Core Network—an NHN where a shared eNB system routes traffic to the EPC of PSPs.
MSO	Multiple System Operator—an operator of multiple cable or broadcast satellite services.
MVNO	Mobile Virtual Network Operator— a wireless carrier that does not own the physical infrastructure that provides services
NHN	A Neutral Host Network (NHN) is an LTE network that provides coverage to multiple MNOs
OnGo	3GPP technologies such as LTE and 5G NR deployed in the CBRS band
OnGo Alliance	The OnGo Alliance, formerly the CBRS Alliance, is an ecosystem of companies dedicated to commercializing OnGo technology.
OpEx	Operating Expense
Private LTE	A network that is not intended for public use, providing services to devices specifically authorized by the network owner.

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Term	Definition
PSP	Participating Service Provider, a Service Provider network that is using an NHN to provide services to their subscribers.
QoS	Quality of Service
SAS	Spectrum Access System, manages and assigns CBRS spectrum use on a dynamic, as-needed basis across Priority Access License (PAL) and General Authorized Access (GAA) users.
SIM	Subscriber Identifier Module
SLA	Service Level Agreement
TCO	Total Cost of Ownership
WInnForum	The organization that develops the standards for CBRS system elements that include the SAS, and CPI certification

About the OnGo Alliance

The OnGo Alliance believes that 3GPP-based solutions in the 3.5 GHz band, utilizing shared spectrum, can enable both in-building and outdoor coverage and capacity expansion at massive scale. In order to maximize the full potential of spectrum sharing, the OnGo Alliance enables a robust ecosystem through the management of the OnGo brand, and the OnGo Certification Program. For more information, please visit www.ongoalliance.org and learn more about the expanded business opportunities OnGo is enabling.