Wireless Carrier Evaluation Guide

About This Document

Public safety agencies have unique needs and requirements for the voice and data services provided by wireless carriers. This guide can help you navigate the complexities of evaluating the wireless service provider options available to you. We encourage you to perform this simple due diligence to ensure that the wireless service provider you select is capable of supporting your operational needs.

How to Use This Guide

- Assemble the evaluation team. Consider the need for representation from the following groups:
  - Decision makers
  - Field users
  - IT department
  - Procurement/finance department
  - MN DPS-ECN regional interoperability coordinator
- Use this guide as a high-level decision-making tool for evaluating wireless carrier service. The checklist on the next page lists five key factors that should be considered as part of the evaluation:
  - Coverage
  - Service plan
  - Devices and applications
  - Network considerations
  - Customer service and support
- Review the content listed under each section of the checklist.
  - Each item in the checklist is hyperlinked to additional background information, potential questions to ask, and other important considerations.
- Schedule a meeting with representative from the wireless carrier(s) to gather information and answer the questions listed under each section of the checklist. The check boxes can used to track and compare the responses provided by two different carriers.
- Once completed, the results of your evaluation can be used to gain leverage with a carrier to get them to improve coverage, pricing, or other aspects of their services. Share the results of your evaluation with the carrier(s) to address any areas of concern or deficiencies that you have identified.
  - *"What can you do about these coverage issues?"*
    - The carrier may acknowledge the issues you find and take steps to address those gaps.
  - *"Do you have a plan in place to address my customer service issues? If so, when will it be fixed?"*
    - Provide the carrier with an opportunity to fix the problems. Try to get them to commit to it in writing with penalties or service credits. The carrier may also claim that they do not see a problem in these areas — for example, they may claim they do not have coverage problems in a particular area. In that case, ask for evidence to support those claims.

Wireless Carrier Evaluation Checklist

Evaluation Categories and Sub-Categories	Carrier A	Carrier B
1 Coverage	☐	☐
1.1 Coverage Maps	☐	☐
1.2 Operational Area Analysis/Testing	☐	☐
2 Service Plan	☐	☐
2.1 Service Plan Features	☐	☐
2.2 Service Plan Costs	☐	☐
2.3 Costs Associated with Switching Carriers	☐	☐
3 Devices and Applications	☐	☐
3.1 Device Compatibility	☐	☐
3.2 Device Upgrades	☐	☐
3.3 Device Incentives	☐	☐
3.4 Device Applications	☐	☐
4 Network Considerations	☐	☐
4.1 Technology	☐	☐
4.2 Public Safety Priority	☐	☐
4.3 Network Hardening	☐	☐
4.4 Network Operations and Security	☐	☐
4.5 Other Network Capabilities	☐	☐
5 Customer Service and Support	☐	☐
5.1 Network Health/Outages	☐	☐
5.2 Emergency Deployable Assets	☐	☐
5.3 Continued Partnership	☐	☐

NOTE: Click on the hyperlinks for additional information on each topic.

1 Coverage

If wireless coverage is not available where you need it, field users cannot communicate with one another and/or access the applications and information they depend on. Carrier coverage maps depicted in a sales brochure do not generally reflect real-world experience and may not represent how the network is used (voice, data, multimedia, etc.), what kind of equipment is used to access it (air card, smart phone, tablet, etc.), and in what environment it is used. It is important to do your homework to understand the realities of service provider coverage.

1.1 Coverage Maps

- Examine the coverage maps provided by the carrier(s).
    - *Where do they provide service and where are their coverage gaps?*
    - *Who provides service over most of the area where you need it?*
- Ask the carrier to provide a copy of their indoor coverage maps. They represent a more realistic depiction of where you can expect reliable wireless service.

1.2 Operational Area Analysis/Testing

- Conduct independent testing across your entire jurisdiction (including the fringe areas where service might be weak) to verify coverage and data-transmission rates.
    - *Does the device indicate that it is connected to the network?*
    - *Can you send and receive a text? Picture? Video stream?*
    - *Does the network give you enough data transmission speed to support your applications (CAD, mapping, streaming video, etc.)?*
    - *Is there adequate coverage in key locations (LEC, fairgrounds, schools, hospitals, courthouses, etc.)?*
        - If a carrier lacks coverage in a critical location, ask if they will implement an in-building distributed antenna system (DAS) at no cost to you to resolve the problem.

Compile your results and determine which carrier best serves your jurisdiction. Carefully consider your coverage needs – identifying the best provider might not be as easy as it seems.

- *If Carrier A provides quality service for 90 percent of your operational area and Carrier B provides quality service for 80 percent of your operational area, is the additional area served by Carrier A important to you?*
- *Does Carrier B have excellent coverage in some other key areas that offsets the difference?*

2 Service Plan

The features and costs associated with your current wireless service plan and/or transitioning to a new service provider should be evaluated on a regular basis.

- *A comparison of carrier service should include a clear understanding of all the cost-related variables. This is especially true when considering a new carrier to help ensure that switching has an adequate return on investment.*

2.1 Service Plan Features

There are many aspects to a carrier's service plan to consider as part of the evaluation process:

- Assess the usage needs of your personnel and devices to help determine what type of service plan is best for your agency. For example, if your agency employs a mobile streaming video

system for situational awareness, that device might consume dozens of gigabytes per hour, and exceed the service plan's data usage caps in just a few days.

- Evaluate the terms of the service plan.
  - o *Does the carrier require a year's contract, or do they offer plans that enable termination or switching on a monthly basis?*
  - o *Ask the carrier about the fine print with regards to contract term, penalties, or other factors that may prevent you from making changes to meet your operational needs.*
  - o *Ask your carrier if you will have the ability to switch service plans as needed if your usage rate starts to skyrocket to contain costs.*
- "Unlimited" service plans may have usage limits (i.e., the carrier may throttle your users after reaching a certain usage threshold).
  - o *Ask the carrier if they have voice and/or data usage caps and if they throttle users beyond that point.* This will help you better understand how heavy users in your organization would be affected.
- Understand that, while "pooled" service plans may save you money if you have a number of devices with low data usage, this type of plan may result in additional fees if you exceed the pooled usage limit.
- Evaluate the optional features and services associated with the service plan.
  - o *Is tethering (creating a Wi-Fi hotspot from your device) an extra charge, or is that already included in the plan?*
  - o *Are there other costs associated with any special features that you use frequently?*
  - o *Does the carrier offer push-to-talk (PTT) applications and service as part of the base user fee?*
  - o *Does the carrier offer mobile device management (MDM) for no additional charge?*
  - o *Ask the carrier if international roaming is included in their service plan at no additional charge. If not, ask about their roaming fees.*
- Evaluate the carrier's offerings for bring your own device (BYOD) users. These are the personal devices of users employed by your agency. Because your agency may not pay for service for some personnel, but these individuals still use their devices for work, the BYOD subscription options may play a vital role in your decision. Find out what incentives your carriers are offering for your BYOD users.

2.2   Service Plan Costs

Evaluate the overall costs of the carrier's service plan.

- *Does the carrier offer contract pricing and/or other special pricing packages/incentives?*
- *What are the carrier's monthly service costs (including service cost, insurance, device payments, roaming fees, application charges, taxes, and fees)?*
- *Are there any one-time device costs or activation fees?*
- *Is tethering (creating a Wi-Fi hotspot from your device) an extra charge, or is that already included in the plan?*
- *Are there other costs associated with any special features that you use frequently?*
- *Does the carrier offer PTT applications and service as part of the base user fee?*
- *Does the carrier offer MDM for no additional charge?*
- *Ask the carrier if international roaming to your favorite countries is included in their service plan at no additional charge. If not, ask about their roaming fees.*

2.3 Costs Associated with Switching Carriers

If you are considering transitioning to a new wireless service provider, the following costs should be considered:

- *Are there any early termination fees?*
- *Are there any costs associated with new equipment acquisition, installation, and/or deployment?*

3 Devices and Applications

The prospect of changing service providers presents unique challenges and opportunities with regards to devices (e.g., smartphones, routers, hotspots, tablets, etc.) and their associated applications.

3.1 Device Compatibility

- Conduct a detailed inventory of your existing devices to assess their age, functionality and ease of transition to another carrier.
  - o *Do you want to continue using these devices? Are they the best match for our operational needs?*
  - o *Have your current devices reached the end of their operational life?* If so, it may be an appropriate time to consider upgrading your device(s) as you transition to a new carrier or take advantage of device incentives offered by your current carrier.
  - o *Are your devices compatible with service on the carrier's network?*
    - Verify device compatibility with the carrier representative(s).
    - Depending on the device, it may function on another carrier's network with the simple replacement of a subscriber identity module (SIM).
    - In other cases, your device(s) may not be fully compatible to achieve the full benefit of another carrier's service. Just because a device functions on a network does not mean you're getting the full benefit of the network (e.g. Band 14 for FirstNet). In this situation, switching out incompatible devices will affect the migration costs.

3.2 Device Upgrades

Consider the need to standardize your equipment (i.e. a single vendor device or smartphone operating system). Based on the device features and incentives offered by the carrier(s), it may be a good opportunity to upgrade or switch your equipment to better meet your operational needs (e.g. migrate from Wi-Fi hotspots to mobile routers with a roof-mounted antenna, implement the use of tablets as data sharing tools, etc.).

- If you are making the decision to change devices, you should test the coverage with that device to make sure that the additional investment will pay off as expected.
- Make sure that the carrier(s) can accommodate any special device needs.
  - o *Do you have a particular device make/model that you require?*
  - o *Do your devices need to be ruggedized?*
  - o *Are you interested in technology that allows direct device-to-device communication?*
  - o *Are you interested in devices with a PTT button?*
  - o *Is there a new 5G model that fits your operational requirements?*

3.3 Device Incentives

With competition heating up for your business, the carriers are frequently offering incentives to new or existing public safety customers. You can potentially leverage this competition to dramatically reduce the cost of your current service or reduce the cost of transitioning to a new carrier.

- Ask the carrier representative(s) what types of device incentives are available to your agency. For example, carriers may have special offers to provide public safety agencies with free device upgrades every two years.
- *Does the carrier offer a longer warranty that could reduce maintenance or replacement costs for damaged devices?*
- *Are extended warranties or no-cost device insurance included in their offering?*
- *Is the carrier offering to provide spare devices to address emergency situations?*

3.4 Device Applications

The availability of applications that are compatible with your device(s) and meet your operational needs is another key factor to consider. The device application landscape is changing dramatically, and new features for public safety users are expected to be available within the next two to three years.

- Push-to-talk (PTT): There are dozens of PTT applications available with many different features and benefits. Therefore, an agency looking to adopt a PTT solution should evaluate their operational needs and match them to the various PTT offerings available to them.
  - o Over-the-top (OTT) applications can work across different carriers but may not have priority access, and they are not standards-based, so interoperability can only be achieved if agencies use the same application.
  - o A new global standard called mission critical push-to-talk (MCPTT) has been developed to provide similar functionality and very high priority over LTE networks. However, despite it being a global standard, carriers may prohibit connections to other carriers (and prohibit calling across networks as a result).
  - o "Carrier integrated" PTT applications operate on the carrier's core network and leverage preemption and other features that may result in superior audio quality even under periods of congestion.
    - *Does the carrier offer a PTT service that is standards-based?*
    - *Is the carrier's PTT application interoperable with users on other networks in such a way that both users can enjoy the full priority services on both networks?*
    - *Does the carrier offer priority and preemption for public safety using PTT applications?*
    - *Does the PTT service support emergency and imminent peril calls for public safety?*
    - *Does the carrier's PTT solution have the ability to interface with the ARMER system? Is the solution compatible with the applicable SECB standards?*
- The 3rd Generation Partnership Project (3GPP) standards body has developed standards for mission-critical data (MCData) and mission-critical video (MCVideo) applications that are designed to support public safety missions.
  - o MCData can support a short message distribution service (including messages of a limited size, such as texts), a file distribution service (which can be used for file

transfers or to support specialized data applications), a data streaming capability, and others.

- o MCVideo capability could bring with it a new ecosystem for devices and software that provides video streaming, video conferencing, and video group calls. Much like text messaging is built into every smartphone today, it is possible that MCVideo may be built into devices in the coming years.
    - *Will the carrier provide MCVideo and MCData services? If so, when?*
    - *How will these services work? Will the carrier provide applications that operate on standard smartphones to leverage these capabilities and the core services to allow multi-user applications?*
    - *What will these applications do? Can you test these features to see if they are of interest to you?*
    - *Will the carrier's MC services be interoperable with users on other networks? For example, will you be able to share video with agencies using another broadband service provider?*
    - *What will they charge for these services? For the software?*
    - *Will these applications use a very high priority? Will these services be prioritized higher than standard public safety applications with priority on the network?*

- Interoperability: The interoperability of applications is a key consideration when choosing a carrier and the application to be used by a public safety agency. If you have a need to communicate directly with neighboring agencies via PTT, video, or short data service, consider coordinating with those agencies to understand their plans. Because your decision to go with a carrier-based application could isolate you, consider a regional approach to decision making regarding implementation of common applications.

- Identity, credential, and access management (ICAM): In addition to applications developed around mission-critical protocols, a carrier may offer public safety applications such as ICAM. This platform may control access to public safety applications and make other agencies' users discoverable on the platform. They may also interface with existing systems to allow agencies to leverage single-sign-on (SSO) for both carrier and agency applications.
    - o Consult with your IT department to learn more about the potential benefits of implementing ICAM features. If interested, engage the carrier in a discussion to understand and evaluate the ICAM services that are available to meet your operational needs.
        - *Does the carrier offer ICAM software? Perhaps the carrier will bundle the solution at no additional charge?*

- Mobile Device Management (MDM): These platforms make it easier to push software, configurations, and updates to mobile devices. It enables agencies to create application standards that can minimize downtime, improve security of the mobile operations, and dramatically reduce the labor associated with device management. While these applications are available directly from the developers and do not require carrier involvement, there may be some benefit to leveraging the service available from the carrier.
    - o Consult with your IT departments to learn more about the potential benefits of implementing an MDM solution. If interested, engage the carrier in a discussion to understand and evaluate the MDM services that are available to meet your operational needs.
        - *Does the carrier offer MDM software? Perhaps the carrier will bundle the solution at no additional charge?*

4 Network Considerations

When you were evaluating the carrier's coverage, you were considering the level of service they can provide when the network is functioning as designed. Unfortunately, those conditions do not always exist. The true test of a carrier's capabilities comes when things are falling apart and the need for reliable public safety voice/data capabilities is the greatest.

If the carrier's network cannot provide the voice/data capabilities that you need, when you need them, and where you need them, emergency responders' ability to safely and effective perform their duties can be significantly compromised.

To accommodate your needs, the carrier's network must have sufficient capacity and the ability to prioritize your access to potentially limited voice/data resources. Most of the wireless service providers have a substantial amount of radio spectrum and can deliver very high speeds. But that capacity is shared with other users. Your signal quality, which we addressed in the coverage section, also plays a role in your capacity at any particular location. The two biggest differentiators on whether or not you will have the data speeds you need are the technology (3G, 4G, or 5G) and public safety priority features.

4.1 Technology

The technology used by the carrier can play a major role in the user experience. If one of the carriers you are considering serves parts of your area with 3G, it could be a significant issue. 3G technologies have much lower data speeds than 4G. Further, they have other issues like data transit delay (they have very long round-trip durations that impact time-sensitive apps like voice communications), and they don't support robust quality of service and priority (see the next section).

- *Does the carrier still use 3G in or around your jurisdiction? If so, when do they intend to upgrade the area to LTE?*
  - What you may find is that while it may not be the primary technology used by the carrier, devices may revert to 3G during your testing.
- The Impact of 5G: 5G has amazing potential to substantially increase data speeds. However, the very high speeds you see advertised on TV are generally only available via what is called "small cells" that exist primarily in arenas and downtown centers operating at what's called "millimeter wave frequencies." While a carrier may have 5G enabled on all of its cell sites at lower frequencies that can serve large areas, the data speed boost only comes when you are near the cell site and signals are very strong. If 5G speeds are important to you, ask the carrier where 5G is available and where you will see these dramatic speed improvements. 5G is not expected to augment coverage, but if you are in an area with 5G service, find out if you can get access to these high speeds and maintain enhanced public safety specialized priority.

4.2 Public Safety Priority

Long-term evolution (LTE) networks have powerful capabilities to prioritize data traffic over the network. In recent years, carriers have begun introducing special features that prioritize public safety traffic over consumers. Priority in LTE is very technical. There are several different parameters that a carrier can assign to your data, but ultimately, what matters to you is whether or not you can access the carrier's network during times of extreme congestion. During a typical day, there is almost always enough capacity on the network to accommodate your needs. However, during an emergency, disaster, or special event that draws tens or hundreds of

thousands of other users, the strain on a network's capacity requires public safety priority to ensure that your voice/data communications get through.

- *Ask the carrier what their standard public safety priority offering will do for you and how you can be assured to get the network resources you need in an emergency, especially during major events involving large crowds.*
    - o "On demand" priority: Another new tool that may be useful for agencies involved in emergency response but that may not qualify for high levels of priority is "on-demand" increase in priority. FirstNet calls the feature "incident uplift". Other carriers may also support the feature. If your agency is outside of the core group of public safety disciplines that qualify for high priority (generally law enforcement, fire, EMS, PSAP, and emergency management), the on-demand increase in priority could benefit your agency's efforts to deal with situations such as a major power outage, emergency road maintenance, road hazards, or other incidents that involve non-first-responder agencies.
    - o "Spectrum priority": An important new element of priority could be preferred access to spectrum bands. For example, FirstNet's Band 14 has been allocated by law for priority use by public safety. Where it is available, and the device supports Band 14, the network may reserve a portion of the capacity for public safety, offering possible improvements to quality of service during mass events.
        - ▪ *Ask the carrier if they have unique spectrum available to public safety in your operational area and how it may benefit your agency.*
    - o Testing priority service: The best way to determine if a carrier's priority service will work for you is to test it during a special event. If the public safety priority device can achieve good data speeds consistently, then the carrier's priority schema is working.
        - ▪ NOTE: Test a regular (consumer) device at the same time to determine if the network is truly congested. If it is, and priority works, you should see substantially better data speeds and less latency (delay) from the public safety priority device.

4.3 Network Hardening

Wireless networks fail for multiple reasons — equipment can fail, and technicians can make mistakes — but the equipment the carriers use and the steps the they take are generally reliable. The primary cause for network outages is lack of sufficient backup power. Cell sites generally have batteries and plug-in ports for portable generators, but this may not be enough in a wide-scale and long-term power outage. The batteries may only last for four to eight hours, and the carrier may only have a handful of portable generators – perhaps not enough to handle all the sites in your service area. This means if there is a major flood or other blackout in your area, major portions of the network you rely on could be out.

- *How many cell sites does the carrier have serving your jurisdiction and surrounding area? What is the impact on coverage if one of these cell sites goes down?*
- *In the event of a power outage, what systems does the carrier have in place at their cell sites to supply backup power? How long will these backup systems operate before they fail?*
- *Does the carrier have permanent backup generators at their cell sites? What percentage of them? How many hours of fuel do they have and what are the plans for refueling?*
- *Does the carrier have a plan for providing portable generators to supply temporary power at cell sites? How quickly can they deploy these generators? Will it be before the batteries have depleted?*

- *Does the carrier have multiple connections from their cell sites to their switch in my area? What percentage have more than one connection all the way to the cell site?*
  - o If there is an equipment failure or a backhoe cuts a fiber line, one or more cell sites could be out for hours, days, or even weeks.

4.4 Network Operations and Security

How a wireless carrier operates, manages, and protects their network has a direct impact on the quality and reliability of the service that you receive. Consult with your IT department to assess the carrier's performance in this area.

- *Will the carrier guarantee that they will not perform elective maintenance during your busiest usage periods? If so, will they guarantee service restoration times?*
  - o While it may be unlikely that they will commit to these things in a contract, starting a dialog and understanding their policies and approach may be telling.
- *Ask the carrier how their network security is different and/or better than their competitor.*
  - o Any deficiencies in this area could impact the reliability of your service as well as your own device and network security.
- *Is the carrier willing to share information with you to inform you regarding network security monitoring, response, and resolution activities that may impact your operations?*

4.5 Other Network Capabilities

Consult with your IT department to determine if there are any other special network requirements that should be considered.

- *Does the carrier offer private access point name (APN) service with dual-path redundancy between your enterprise network and the carrier's core with encryption of all traffic between the two networks?*
- *Does the carrier offer private internet protocol (IP) addressing?*
- *Does the carrier offer static public IP version 4 (IPv4) addresses?*
- *Does the carrier offer IPv6 addresses and routing?*
- *What are the carrier's plans for providing enhanced wireless location services?*
  - o By the year 2024, the Federal Communications Commission (FCC) has aggressive targets to deliver more accurate location information for the top 50 cellular market areas. The primary intention is for improved 911 caller location accuracy, but the solutions might enable devices to use this enhanced location capability for public safety applications. Ask the carrier if they intend to "fast track" their 911 location accuracy timelines and how that may impact your operations.

5 Customer Service and Support

Evaluating the level of service and support the carrier provides is another key factor to consider.

- *Does the carrier provide 24/7/365 customer support provided by trained staff familiar with the needs of the public safety community? Are they staffed in this manner at all tiers of support (initial call through tier 3 tech support)?*
- *What are the maximum wait times and resolution timetables for service calls?*
- *When a customer opens a trouble ticket, does the customer receive updates on open tickets, a resolution log, and root cause analysis for outages affecting service?*
- *Does the carrier provide customer service and support on a local, regional, national, or international level? Where are they located?*

- *Does the carrier have a sales office in your area where BYOD users can find out more about your public safety market services? If not, are there any plans to open an office?*

5.1   Network Health/Outages

Network outages and other service degradation can happen with any wireless service provider. While it is unlikely that you can get the carrier to commit to a particular reliability level or response times when the network is down, it is important to understand the actions that the carrier is willing to undertake in regard to notification and restoration of service.

- *Does the carrier offer a web portal where you can see outages, maintenance, and other service degradations?*
- *Does the web portal provide information regarding the nature of the problem, the affected area, the estimated time to restore service, and incident resolution?*
- *Will the carrier provide automatic notifications to your agency when there are outages and other service issues affecting your jurisdiction? Will the carrier send automatic notifications when service has been fully restored?*

5.2   Emergency Deployable Assets

Wireless carriers maintain a cache of deployable assets also known as cell on light truck (CoLT) or cell on wheels (CoW) that are available to provide coverage during pre-planned events, unplanned outages, emergencies, and disasters.

- *Does the carrier maintain a fleet of deployable assets that are specifically dedicated to public safety agencies?*
- *How do I request a deployable?*
- *Once requested, how quickly will a deployable asset arrive on-site?*
- *Can we request a deployable asset for a planned event? Will you commit to deploying a vehicle for our [fill in the blank] event each year?*
- *Is there a cost associated with requesting deployable assets?*

5.3   Continued Partnership

The relationship between the carrier and the customer is a long-term partnership that goes beyond the initial service agreement. You must be confident that your wireless service provider is going to work hand-in-hand with you to achieve your mutual objectives.

- *What is the carrier's build plan for the next few years in your jurisdiction? What new sites are planned? Where are they adding 5G?*
- *Is the carrier willing to work with you to identify and address coverage gaps?*
- *What types of education and outreach activities does the carrier provide to ensure that you are aware of new features and technology? Does the carrier offer user training for specialized public safety products? How often? In what format? Where?*
- *What mechanisms does the carrier provide for you to offer feedback on service, support, and/or equipment?*