A SPECTRALINK WHITE PAPER

spectralink

# The Challenges of Ensuring Excellent Voice Quality in a Wi-Fi Workplace

## Introduction

In the last few years, smartphones have come to be the device of choice for many of us, both in our personal and business lives.

Today, nearly every smartphone has the ability to connect to both mobile and Wi-Fi networks. Devices are now designed to optimize connections, with automated features deployed to connect to what's best in a given environment. Generally, voice traffic is carried on the mobile network and if a Wi-Fi network is available, data traffic is carried over Wi-Fi.

However, in the world of enterprise wireless communications, voice and data aren't created equal. In many work environments, smartphones can't or don't connect to the cellular network and are strictly limited to Wi-Fi connectivity. This is in part due to the expense of cellular subscription plans, poor cellular coverage, or the wish to use existing Wi-Fi infrastructure. When used in these situations, smartphones are dependent on the Wi-Fi network not only for data, but also for voice.

Voice over Wireless LAN (VoWLAN), is the term used to describe voice traffic carried over a Wi-Fi network. When designed and implemented correctly, a VoWLAN solution can deliver high voice quality to mobile users who are solely dependent on a Wi-Fi network for connectivity. The latest and greatest smartphones can be alluring for many who seek voice quality over VoWLAN. But service on these types of devices can often fall well short of the mark. Rather, these users need a mobile communications device that is purpose-built and optimized to deliver excellent VoWLAN.

For a nurse traversing a hospital unit, a retail associate working the sales floor or a manufacturing employee on

a production line, voice quality is critical and may be life threatening in a hospital environment. These users require a purpose-built mobile communications device built on a system that ensures superior voice quality over in-building enterprise Wi-Fi networks like VoWLAN.

This white paper looks at the voice quality imperative. It addresses the need and explores how Spectralink Voice Quality Optimization (VQO) ensures superior levels of performance and consistency required in every voice-critical use case.

## Why Voice is Unique

When information is delivered over a Wi-Fi network, sometimes data can get delayed or lost in transmission. When this happens, these packets are corrected or resent. This process normally takes just a few milliseconds and has no discernible impact on normal applications such as web browsing or transferring files. VoWLAN carries voice traffic as data over the Wi-Fi network making voice traffic vulnerable to the same issues as any other data transmission. When data loss, delays or corruption happen to a VoWLAN call, the effect can be much more dramatic, resulting in poor clarity as well as popping and crackling sounds, or even causing the call to drop entirely.

In order to avoid this problem, the entire VoWLAN ecosystem needs to be implemented and configured in such a way that calls are of the highest quality. Achieving this means that voice transmissions take priority over any other network traffic, handovers between access points need to be seamless and that any individual point in the system does not get overloaded.

This specific configuration requires a combination of specialized hardware and software built into the handsets and network access points.

Most smartphones do support Wi-Fi functionality but this support is optimized for data, not voice, and is typically missing key features such as Quality of Service (QoS) support for prioritizing voice packets.

## Voice Prioritization

The human ear is extremely sensitive to distortion of sounds, and voice quality has always been one of the top priorities when selecting a device for use by mobile knowledge professionals. Voice applications have a very low tolerance for network errors and delays and gaps of only a few hundred milliseconds can severely deteriorate voice quality.

Smartphones are primarily designed for mobile voice calls and data. Data traffic is often delivered in bursts and is quite sporadic. This is acceptable because data applications can tolerate network congestion with reduced throughput and slower

response times. When talking to a friend or colleague on a typical mobile phone it's generally considered acceptable if you have to occasionally ask them to repeat themselves or even if the call drops.

For on-site professionals, the expectation is for a reliable, clear call – every time. The risk of inaccurate patient information or losing a sale is too great. As such, businesses often look to VoWLAN, rather than mobile networks to ensure call quality for their mobile knowledge workers.

Most smartphones do support Wi-Fi functionality but is typically missing key features such as Quality of Service (QoS) support for prioritizing voice packets. As such, one of the greatest challenges for smartphones in an in-building work environment is delivering acceptable voice quality when using an organization's in-building Wi-Fi network.

Voice traffic cannot tolerate unpredictable delays, where the bandwidth requirements are much more constant and consistent. In a work environment that relies on high quality mobile calls, the mobile devices used need to incorporate specialized components to optimize all aspects of the call.

Purpose-built handsets allow users to move from hallway to patient room to meeting room, roaming from one access point to another during the transition, with no loss of packets or degradation of audio quality.

## Seamless Roaming and Hand-offs

Making and receiving voice calls is still the primary use for in-building mobile communications devices. Interrupted or dropped phone calls can create frustration for employees and customers or patients. It is critical to maintain the equivalent voice quality, reliability and functionality as is expected from a wired telephone.

Another factor to consider when determining the coverage area is device usage. Wireless voice devices are used differently than wireless data devices. Telephone users tend to walk as they talk, while data users are usually stationary or periodically nomadic.

Purpose-built mobile devices are designed to deliver a continuous, reliable voice connection as a user moves throughout the building or campus. Users move from hallway to patient room to meeting room, roaming from one access point to another during the transition, with no loss of packets or degradation of audio quality.

Furthermore, signal strength is impacted by how and where the users hold their phones compared to other devices. This factor may result in reduced range for a Wi-Fi phone compared to a data device. Therefore the Wi-Fi network layout should account for some reduction of radio signal propagation.

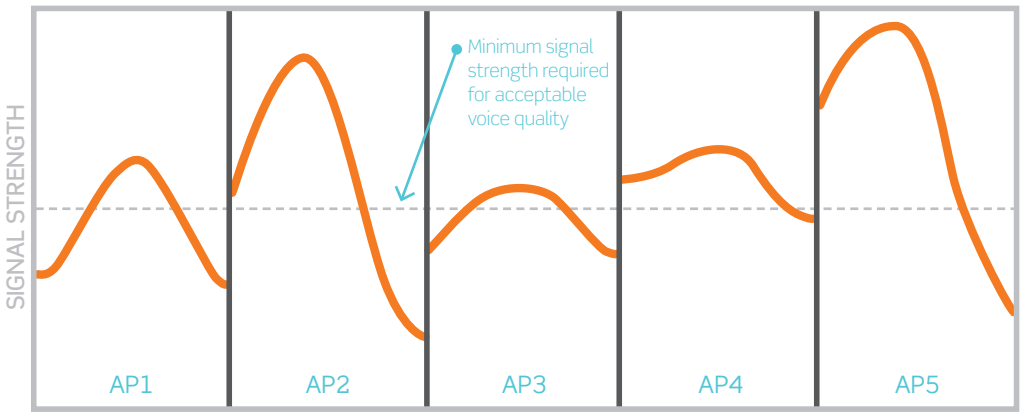


Figure 1: Typical smartphone AP hand-off in the enterprise

In this case, when a user walks between coverage zones, the call is handed off to the next closest access point when the user moves out of range from one AP to the next. Without overlapping coverage, call quality can be adversely affected.

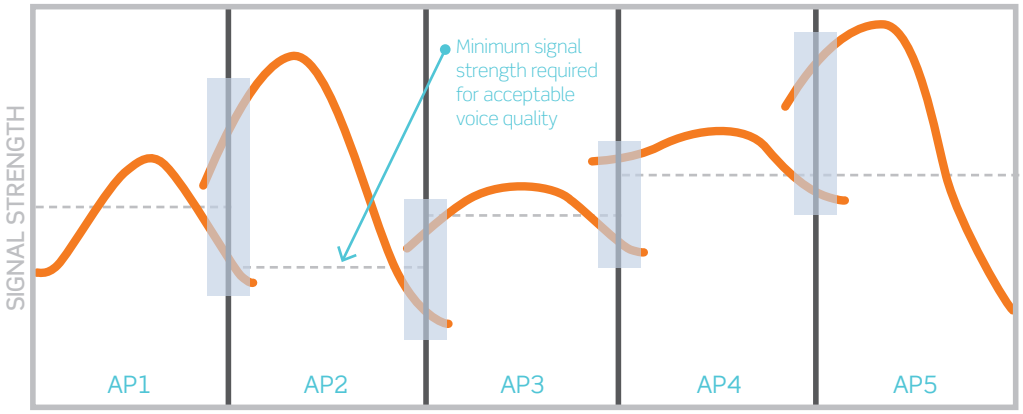


Figure 2: Voice over WLAN hand-off optimized for the enterprise

In this case, as a user walks between coverage zones, the hand-off of the call is pre-negotiated so there is no degradation of the call quality between hand-offs.

To provide seamless connectivity for VoWLAN applications, the access points (APs) must be positioned with sufficient overlapping coverage of handsets to ensure there are no gaps, or dead spots, between them.

As wireless voice users move throughout the workplace, the device will seek out other APs to roam to in order to maintain the most reliable network connection. Most consumer smartphones don't do this in a particularly intelligent way. Most will wait until the signal from the AP they are attached to is very weak, before seeking a new one to connect to. A dedicated voice-optimized device will constantly seek the strongest connection available on the network in order to ensure that the device can always be reached and that voice quality remains high. Similarly, these phones are especially designed so that the hand-off – switching from one AP to another – is always seamless, even mid-call.

## Admission Control

In addition to the layout and configuration of the network's APs, network capacity requirements are a factor in the number of APs required. In meeting rooms and communal places where it's common for data and voice to compete for bandwidth, it is necessary to have mechanisms to prioritize voice packets over data, preserve battery life for mobile devices, and allocate appropriate AP bandwidth for the device's supported applications.

The final component is called Admission Control and allows the AP to manage its available 'air time' based on traffic requirements submitted by associated client, and rejects requests if insufficient resources are available. When Admission Control is properly implemented it avoids oversubscription of the AP, therefore preserving and protecting QoS for all associated devices.

The Admission Control facility considers the entire network and all the devices connected to it at any given moment. The intelligence comes with real-time monitoring that allocates the network resources, connecting devices to APs in such a way as to balance the load as evenly as possible.

A part of this load balancing includes predicting expected traffic flow and call patterns and reacting accordingly. When voice traffic can be accurately predicted using probabilistic usage models, this allows a network to be designed with high confidence in meeting the anticipated voice capacity requirements.

Admission Control allows the AP to manage its available 'air time' based on traffic requirements submitted by associated clients and rejects requests if insufficient resources are available.

## Third Party Voice/Video/Unified Communications (UC) Apps

The growth in Unified Communication (UC) by enterprises adds a layer of complexity to VoWLAN quality for mobile devices. Studies show benefits and productivity gains for companies deploying UC capabilities to their mobile workforces. To leverage UC capabilities, smartphones must run a UC call platform mobile app such as Microsoft Skype for Business, Cisco Spark, Avaya One-X Mobile or Broadsoft UC-One. These UC apps give smartphone users an integrated collaboration experience with presence, IM, voice and video capabilities. Note that even with the growth of UC capabilities, voice quality is still the most important reason enterprise customers select a mobile device vendor.*

*WALKER STUDY 2015

Most smartphones are not equipped for voice optimization for third-party UC voice apps that run on their devices and voice clarity suffers. To optimize voice, smartphones need additional intelligence to 1) recognize a voice packet so that voice traffic can be prioritized over data traffic and 2) detect the end of a voice call to be able to stop scanning for available access points when such scanning is no longer needed. These are critical aspects of voice quality optimization, rather easily done when a proprietary application is used but much more complex when a third-party application is active.

# Conclusion

As smartphones continue to extend their march into the workplace, it is becoming increasingly clear that they are not always the right choice for the specialized needs of inbuilding mobile employees working in vertical industries such as healthcare, retail and manufacturing.

In the case of companies that have a large percentage of in-house mobile employees and use in-building wireless, the benefits of purpose-built devices easily outweigh that of consumer smartphones, which are simply not fit for purpose.

Consumer smartphones cannot deliver on these features--there simply isn't an app for that. This impacts productivity and limits how effectively the network can be deployed or configured to optimize call quality and reliability.

The right devices will incorporate a methodology for ensuring voice quality such as Spectralink VQO – an engineered system that delivers superior voice quality over in-building, enterprise Wi-Fi networks. This system is built of technology on the inside of each and every device with specialized system architects on the outside. Using Spectralink VQO, organizations will benefit from superior and reliable voice quality for in-building Wi-Fi environments, interoperability to make complex systems fluid and crystal clear communications for every employee while on the move.

In the latest release, Spectralink VQO has been extended to optimize third-party UC voice/video apps. Spectralink VQO software has the added critical heuristics that automatically detect that a third-party application is placing a voice or video call. Key roaming algorithms are then applied to enable roaming and voice prioritization for those third-party voice/video/UC applications. This is game changing news for enterprise wireless mobile users that are leveraging vertical and UC applications to increase efficiency and performance in the workplace.

Spectralink VQO is the secret sauce in every Spectralink device. When coupled with a connection to a properly configured network, the vital role of the employee is never undermined.

## Learn more about Spectralink at: **http://spectralink.com/**

# About Spectralink

**Spectralink delivers secure, cost-effective mobile communication solutions** that empower enterprises to streamline operations, increase their revenues and deliver a positive customer experience – each and every time. Since 1990, Spectralink has deployed millions of devices worldwide across the retail, healthcare, hospitality and manufacturing sectors – providing workers with the industry's most efficient, in-building communications.

Visit spectralink.com or call +45 7560 2860 for more information.

spectralink

spectralink.com
info@spectralink.com
+1 800-775-5330 North America
+45 7560 2850 EMEA