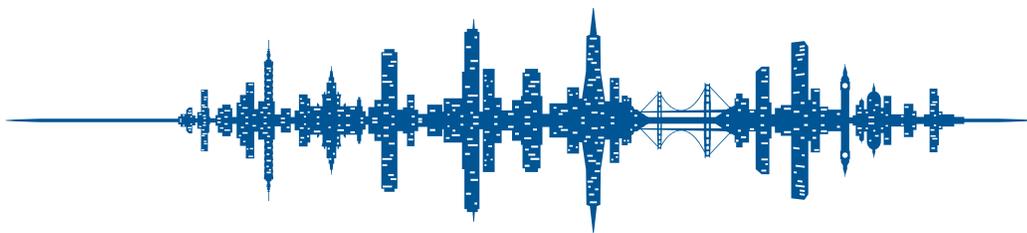


plantronics®



Smarter Working UC Toolkit
Wireless Voice in the
Office Environment

The workplace is changing, and the way people communicate is evolving along with it. Combined with email, instant messaging, audio and video conferencing, and the use of voice over IP (VoIP), landlines and mobile phones, users are more connected than ever before. New technology is enabling employees to work from a variety of locations. People are working from the office, at home, in airports, cafes, and anywhere else work takes them. While corded headsets work in many environments, the freedom to move while continuing conversations is fast becoming a necessity.

Wireless audio devices connected to landline desk phones, soft phones, or mobile phones give workers unprecedented mobility and let them to do their jobs in new and more efficient ways. Employees can move throughout the building or take work on the road and remain connected to vital communication systems, improving productivity and collaboration. Whether you are deploying audio devices as part of a Unified Communications (UC) strategy, or into a contact center or other phone-intensive environment, putting the right audio solution to work in the right situation is key to optimizing employee satisfaction and UC adoption.

Plantronics — The Leader in Wireless Audio Device Technology

With proven experience and a vast portfolio of personal, enterprise, and UC-optimized audio devices, Plantronics can help you integrate wireless devices into your organization. Our comprehensive portfolio of audio devices is suited to a broad range of work styles and applications — from wireless Digital Enhanced Cordless Telecommunications (DECT™) headsets that help bridge the gap between existing traditional telephony and PC communications, to Bluetooth® headsets that provide a bridge for mobile and PC communications.

Overview of Wireless Technology

Wireless technology surrounds us — in the workplace, at home, and many places in between. Mobile phones, WiFi networks, wireless computer accessories, and cordless phones all use radio transmissions for wireless communication. Even devices not used for communication, such as microwave ovens and lighting systems, emit radio frequency energy that can impact wireless devices. In this crowded radio environment, two technologies have emerged as the standards for wireless voice communication in UC and enterprise applications.

- **Digital Enhanced Cordless Telecommunications.** Digital Enhanced Cordless Telecommunications (DECT) headsets provide the enterprise standard in voice communication. A dedicated frequency allocation, strict behavior protocols, and the ability to actively avoid interference from other wireless devices, enable DECT headsets to provide clear voice communications (corded quality audio) over distances up to 350 ft.
- **Bluetooth.** Initially designed as a replacement for cables in computer applications, Bluetooth is an open wireless technology standard that has been adapted for voice communications. While Bluetooth headsets are commonly used to connect with mobile phones, they can also connect to computers through a Plantronics USB Bluetooth module and to Bluetooth enabled desk phones. While the most common Bluetooth implementations allow communication up to 30 feet, the Bluetooth standard also supports classes of operation that can communicate up to 330 feet.

General Concepts for Wireless Headset Success

Several factors can influence wireless headset technology selection, deployment, and performance.

- **User density.** When multiple wireless headsets operate near each other, they share the radio spectrum. It is important to understand how many wireless headsets can be used near each other without experiencing interference, and how you can maximize the number of wireless headsets that can be deployed. The key factor — *user density* — defines the number of users who can talk on wireless links simultaneously, and depends on the wireless headset technology in use. As a result, it is important to understand the capabilities of DECT and Bluetooth headsets and appreciate how they affect support for multiple users in close proximity.
- **Roaming needs.** The ability to move from place to place and continue conversations is key in many corporate environments. Where users need to roam, and whether or not they are likely to roam into areas containing other wireless headsets, are important factors to consider when planning and deploying wireless headsets.
- **Coexistence with other wireless technologies.** In a busy office, wireless headsets may need to contend with other transmitting devices. While different systems coexist best when each has its own frequency band, this isn't always possible. For example, Bluetooth and WiFi share the same radio spectrum. As a result, it is important to understand how many and what kind of wireless devices are in use, and how interaction between them affects operation.
- **The building and environment.** No two offices are alike. Some utilize an open plan, while others are divided by meeting rooms and walls. Building layout and materials affect how far wireless headset signals will reach, which influences roaming range and density. Concrete and metal construction blocks wireless signals, reducing the potential for interference while limiting roaming range. On the other hand, large windows or a central atrium allow signals to travel farther, allowing greater range while potentially increasing density issues. Understanding how building design affects wireless performance is key to maximizing wireless headset deployment density and audio quality.
- **Security needs.** Older wireless systems using analog modulation are subject to eavesdropping by receivers tuned to the right frequency. While this low security may be fine for relaying orders to a cook, it is inadequate for many business conversations. DECT and Bluetooth incorporate security technologies to block eavesdropping. Digital keys limit access to authorized devices, and sophisticated encryption algorithms encode speech. Additionally, DECT and Bluetooth systems do something else: they change the frequency and/or timing of transmissions, making interception more difficult.

Table 1 summarizes the key characteristics of DECT and Bluetooth wireless headsets.

Table 1. Overview of DECT and Bluetooth technology

FEATURE	DECT	BLUETOOTH
Radio Frequency	1.9 GHz	2.4 GHz
Voice Quality	Desk phone quality	Mobile phone quality
Use with WiFi	Excellent	Limited
Use with Mobile Phones	No	Yes
Range	Up to 350 feet	Up to 30 feet (Class 2) Up to 330 feet (Class 1)
User Density	Up to 1 per cubicle	8 active users per 3000 sq. ft.
Talk Time	Excellent	Excellent
Security	Excellent	Excellent

An In-Depth Look at Wireless Headset Technology

IT architects and other technical staff tasked with creating a wireless headset deployment strategy may need to understand the technology to a greater depth. The following sections provide more technical information on the important characteristics of DECT and Bluetooth technology.

DECT ARCHITECTURE AND CHARACTERISTICS

Digital Enhanced Cordless Telecommunications or DECT was created by the European Technology Standards Institute (ETSI) as a voice optimized communication system operating in the 1,880 to 1,900 MHz radio band. Similar to Time Division Multiple Access (TDMA) cellular phone systems, DECT uses a FDMA/TDMA/TDD transmission system. Data is synthesized and encrypted before Gaussian Frequency-shift Keying (GFSK) modulation takes place. The transmitter operates at a low duty cycle in non-constant-envelope mode. DECT is limited to two-way voice isochronous communications. This results in a cooperative environment of like-designed devices that mitigates contention for frequency channels when higher numbers of devices are deployed in a given area.

After the successful adoption of DECT technology in Europe, a North American Personal Communication Services (UPCS) standard was approved for operation on the 1920 to 1930 MHz band. North American DECT, named DECT 6.0, adapted European DECT technology to be compliant with UPCS regulations.

DECT 6.0 segments the UPCS 1.9 GHz band into five 1.728 MHz carriers. Each carrier is then time-divided into 10 ms frames with each frame containing 24 timeslots (Figure 1). In Plantronics headset applications, DECT 6.0 provides 30 bidirectional communication channels. Protocol requirements force cooperation between headsets in the band. When a wireless headset or other transmitting device selects a channel for use, it must *listen* first and determine that no other nearby transmitters will be affected before it attempts to *talk* (transmit).

A DECT headset system consists of a headset and a base. The two components operate together once they are paired through a subscription process in which they exchange unique authorization and encryption codes. Other DECT devices are not able to communicate with or decode transmissions from headsets that do not have the unique subscription codes.

DECT Channels	10 ms Frame																							
	Downlink												Uplink											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1921.536 MHz																								
1923.264 MHz																								
1924.992 MHz																								
1926.720 MHz																								
1928.448 MHz																								

Figure 1. The DECT 6.0 standard divides the 1.9 GHz allocation into five frequency bands, with 24 timeslots in each band.

ADDITIONAL CAPACITY AT 900 MHZ

Prior to the authorization of DECT 6.0, Plantronics adapted the European standard to operate on the 900 MHz Instrument, Scientific, and Medical (ISM) band. Today, the 900 MHz band generally is underused in medium or large offices, giving DECT 900 headsets that operate at that frequency an advantage.

Because they are independent systems that operate at different frequencies, 1.9 GHz and 900 MHz DECT platforms can be deployed together to increase the total number of communication channels available. Consider that the 1.9 GHz DECT system provides 30 channels, and the 900 MHz system provides 54 channels. When used in combination, the two technologies deliver 84 channels. Adding 900 MHz devices to existing 1.9 GHz deployments that have reached their capacity limit can help alleviate headset density challenges.

COEXISTENCE WITH OTHER WIRELESS TECHNOLOGIES

Because they use a dedicated radio band, DECT 6.0 wireless headsets do not interfere with, or receive interference from, WiFi networks, wireless security systems, mobile phones, or other wireless equipment operating in adjacent frequency ranges (Figure 2).

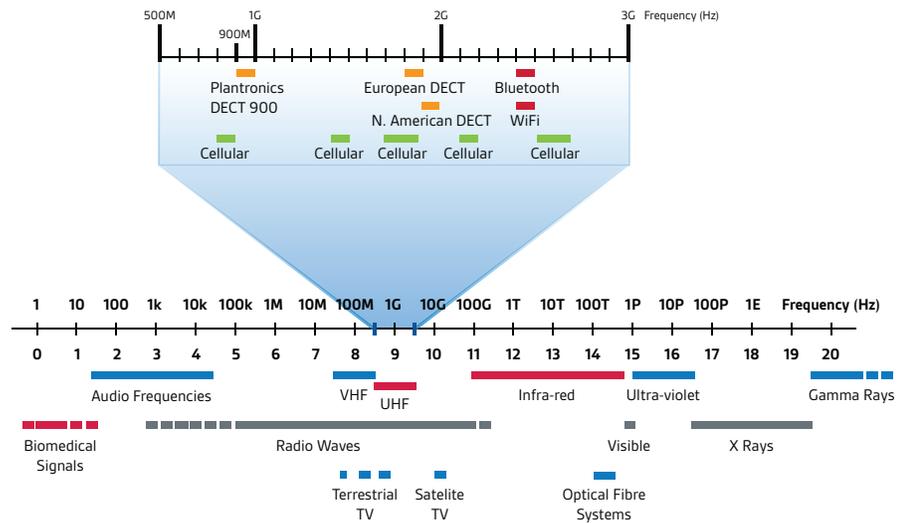


Figure 2. Radio spectrum allocations.

- Medical environments.** The use of wireless headsets is sometimes raised as a concern in medical environments. While the low transmit power level used permits DECT headset operation in virtually all environments, they should not be used within a few feet of EKG, EEG, pulse oximetry, or similarly sensitive equipment typically found in certain areas of hospitals or medical offices. The general rule is that Plantronics wireless headsets can be used wherever mobile phones can be used, and present less of an electromagnetic interference risk than a mobile phone due to the lower transmit signal level.
- GSM mobile phone proximity.** The Global System for Mobile Communications (GSM) is a common mobile technology operating on frequencies close to those used by wireless headsets. Plantronics wireless headsets, are designed to block interference from GSM. Nevertheless, phone designs vary. Interference can still occur under certain conditions. When interference does occur, it usually is limited to when the mobile phone is only a few inches from the headset or base. Simply repositioning the mobile phone or the DECT headset to increase separation usually eliminates the interference.
- In-building cellular repeaters.** Some cellular repeaters, also called cellular boosters, transmit on frequencies very close to those used by DECT headsets. Because the transmit power of the repeater is many times stronger than headset signals, they can cause interference even though they are not operating on the same frequencies. In most cases, problems can be avoided by locating the repeater antennas so that they are not in close proximity to the wireless headsets.

INTERFERENCE AVOIDANCE AMONG DECT HEADSETS

DECT headset systems avoid interference by selecting the best available channel at the start of a call, and changing channels automatically when encountering interference. Interference occurs when two headsets in close proximity operate on the same channel. This can occur when a roaming user moves closer to another user on the same channel, or in dense

installations with workers seated close together and all channels in use. Interference manifests as pops, clicks, or blanks noticeable to headset users.

Each headset and base continuously monitors the channels and maintains a map of channel versus signal strength. When interference is encountered, the headset consults the channel map and changes to the best available channel. This *aperiodic adaptive frequency hopping* lets the system respond to changing conditions and eliminate interference before it impacts audio quality. The result is a clear frequency optimized for voice communication.

ROAMING RANGE

The ability to move around is an important factor for deciding to go wireless. The distance you can travel is commonly called the *roaming range*. In a simple system with a small number of users, roaming range primarily is a function of the strength of the radio transmitter and the effects of objects that block the transmitted signal.

The maximum range in an outdoor line of sight environment is easy to predict since signal transmission path loss is well defined. For this reason, manufacturers commonly use the unobstructed outdoor range — typically up to 350 feet — as the stated maximum roaming range for a DECT wireless headset system. While evaluating wireless headsets in an open, outdoor environment with no obstacles is easy to calculate and results in a large range value, it isn't how most people use the technology.

Using DECT wireless headsets within buildings changes the way radio signals propagate and affects the usable range of wireless headsets. Signal strength can no longer be modeled according to a neat mathematical equation. Many objects in typical office environments can reduce the range of radio signals. Walls, furniture, and people attenuate the radio signal and reduce the roaming range of a wireless headset.

DENSITY

Density is the term used to describe the number of active users operating in an area in which headsets share the radio spectrum. When considering wireless headset density, the most important factors are the number of simultaneous active headsets and the size of the area. An active headset may be a person on a telephone call, a person listening to music or a webinar on their computer, or a contact center agent with a headset connected to an automatic call distributor (ACD) and operating in constant-on mode.

Every DECT user occupies a portion of the DECT frequency spectrum, with active calls consuming more than idle devices. In comparison to Bluetooth, DECT technology allows for the deployment of many more wireless systems within a single site. Nevertheless, several inter-related factors eventually limit how many units can be deployed.

- **Concurrent users.** As long as the total number of simultaneous users is lower than the total number of channels available, DECT headsets operate without restriction. When there are more active users than channels, range is reduced.
- **Room size.** The size of the room, combined with the number of active users, affects the distance between users during channel sharing.

- **Channel sharing.** When there are more active headsets than there are channels, the headsets share channels. Channel sharing works by exploiting the distance between sharing users. This is where the relationship between density and roaming comes into play. The greater the distance between the sharing users, the greater the roaming range. As the number of active users increases in an installation, the effective roaming range decreases.
- **Density versus roaming range.** DECT 6.0 is a 30 channel system. When the number of active headsets is equal to or less than the number of channels, roaming range is strictly a function of the radio signal strength and the environment. As the number of simultaneous DECT conversations in an area increases beyond the channel count, density begins to affect roaming range. When more users are active in an area the channels must be shared, reducing headset roaming range (Figure 3). In a large room with many users and high phone usage rates, roaming range may be reduced significantly. Typically, as long as the cubicle walls are high enough to block the line of sight between headsets, users should experience satisfactory operation within their cubicle — but may experience limited roaming range.

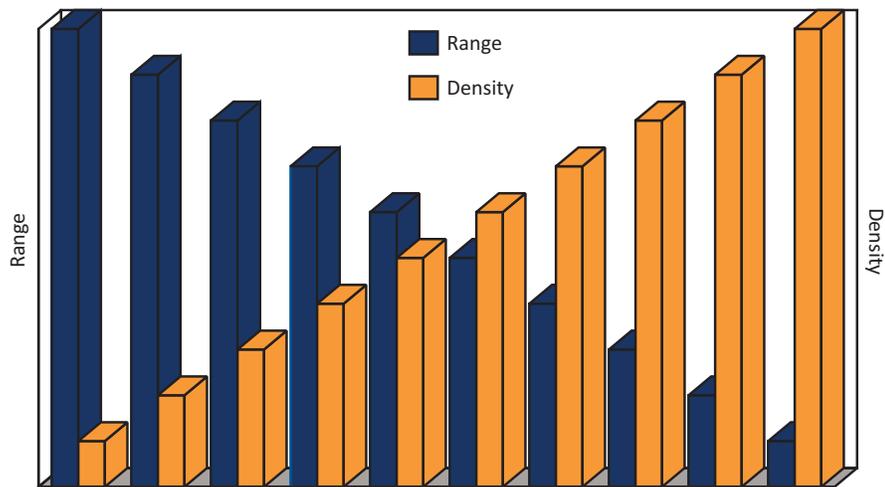


Figure 3. As the number of DECT headsets in an area increases, roaming range decreases.

- **Density effects.** When the number of active users exceeds the practical density for the room, users will experience density effects in the form of dropouts, audio artifacts, and muting. As users roam away from their base, the potential for conflict over a shared channel increases. The greatest potential for problems occurs with a combination of high density and roaming.
- **Headset behavior in high density.** When a roaming user approaches another user that is sharing the same channel, they initially hear audio artifacts as the error correction mechanism works to manage the degrading signal to noise ratio. Typically users recognize that they are moving out of range and move back toward their desk. If the roaming user continues to move away from their base, the headset first attempts to jump to a different channel with a better sharing arrangement. If there is no better channel, the headset ultimately mutes its audio. The headset keeps the call active for five minutes. When the user moves back toward their base, the audio is restored. If the user remains out of range for five minutes, the call is disconnected.

- **Wideband operation.** Wideband technology provides wider frequency response than conventional telephones, resulting in rich, natural-sounding voice and multimedia transmissions. Because wideband audio requires the headset to transmit more information, it reduces the number of simultaneous calls that can be supported and depletes batteries faster. Plantronics wideband-capable DECT headsets employ Cat-iq technology to increase wideband efficiency by 25 percent, resulting in improved density performance and longer battery life. Plantronics headsets with wideband capability allow users to select standard audio when maximum battery life and density are required.
- **Variable power supports higher density.** Some headsets, such as Plantronics Savi® systems, can support higher deployment density by automatically adjusting their radio transmitting power to match communication demands. When the user is close to the base, Plantronics Savi DECT headsets reduce their transmission power to the minimum required for reliable communication, effectively leaving more room for others. Power adaptation allows units on the same radio channel to be spaced closer to one another to achieve greater density.
- **Add capacity by mixing technologies.** Using both 1.9 GHz and 900 MHz DECT systems from Plantronics helps improve headset density and audio performance by alternating system types to take advantage of the total frequency range available.

SECURITY

Protecting the confidentiality of wireless conversations is paramount. DECT incorporates digital encryption and authentication to deliver excellent security against eavesdropping. Key security provisions include the following.

- Protection against deliberate eavesdropping takes the form of user authentication and 64-bit true digital encryption of voice data according to the ETSI standard algorithm EN 300 175-7. Together these techniques render DECT secure enough for commercial applications requiring voice privacy. The casual eavesdropper listening to the radio channel hears only a buzzing sound, rather than voices, because the transmission is digitally coded and encrypted. Plantronics DECT headsets meet both Sarbanes-Oxley and Health Insurance Portability and Accountability Act (HIPAA) security requirements.
- DECT headsets jump to new channels in response to interference. Because the timing and destination of the hop is unpredictable, it adds an additional layer of security to the transmission.

BLUETOOTH ARCHITECTURE AND CHARACTERISTICS

Originally designed for data transmission, Bluetooth is an open wireless technology standard for exchanging data over short distances. Bluetooth headset support is a common feature on most mobile phones, making Bluetooth an ideal choice for workers who use a mobile device as a primary communication tool.

Bluetooth devices operate on the 2.4 GHz Instrument, Scientific and Medical (ISM) band. This radio band is shared with other technologies, including WiFi access points, cordless phones, amateur radios, garage door openers and more. Because different technologies share the same radio frequencies there is potential for conflict between devices. More specifically, Bluetooth operates on the 2,402 MHz to 2,480 MHz frequencies. This band is divided into seventy-nine 1 MHz channels. In operation, a Bluetooth headset hops among the 79 channels 1,600 times per second in a psuedo-random sequence known only to the transmitter and receiver.

Bluetooth headsets operate in a relationship with a phone, USB Bluetooth module, or other device which is referred to as the Audio Gateway (AG). Communication between a headset and an AG can occur only when the devices have been introduced to one another through a process called *pairing*. During the pairing process, the devices coordinate to create secure 128-bit codes for authentication and encryption of communication content.

ADAPTIVE FREQUENCY HOPPING

Plantronics Bluetooth headsets employ adaptive frequency hopping (AFH) to mitigate the interference effects of sharing the ISM spectrum with other users. When Bluetooth headsets encounter interference, they mark the frequency of interference and remove that frequency from the hopping sequence. This system works well with just one or two 802.11 WiFi access points in the vicinity, although short bursts of interference may occur. When more than two WiFi access points are in operation within the same area, Bluetooth headsets must operate on a significantly reduced number of channels, increasing the incidence of interference (Figure 4).

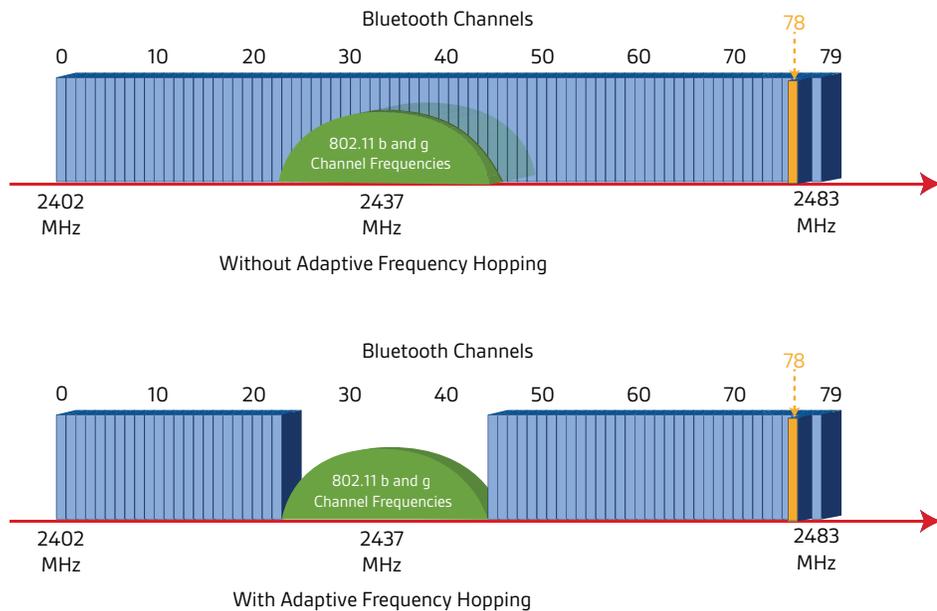


Figure 4. Adaptive frequency hopping attempts to mitigate the effects of nearby WiFi devices.

RANGE AND POWER

The Bluetooth standard defines three classes of transmit power operation (Table 2). The most common headsets utilize Bluetooth audio Class 2, which provides a good balance of performance, reasonable operating range, good battery life, and less interference with other devices. Plantronics also sells devices that can operate at Class 1, providing significantly longer range. Plantronics Class 1 headsets have the advantage of adaptive power control — they operate at Class 1 power when paired to a Class 1 AG or when Class 1 range is required. When less range is needed, or when paired to a Class 2 AG, they reduce their transmitter to Class 2 operation.

Table 2. Bluetooth power classes

CLASS	MAXIMUM POWER	APPROXIMATE RANGE
1	100 mW	100 meters
2	2.5 mW	10 meters
3	1 mW	1 meter

SECURITY

With mobile users walking freely and communicating at any time from any location, security and privacy are paramount. Bluetooth incorporates several layers of security to ensure communication privacy.

- Bluetooth devices connect to one another using 128-bit authentication measures. A combination of a Personal Identification Number (PIN) and a Bluetooth address are used to identify Bluetooth devices.
- The fast frequency hopping spread spectrum scheme used by Bluetooth devices provides another layer of security. Instead of transmitting over one frequency within the 2.4 GHz band, Bluetooth radios hop continuously in a pseudo-random sequence known only to paired devices.

CLEARER VOICE WITH eSCO AND ADPCM

Older Bluetooth devices use a Synchronous Connection Oriented (SCO) link to transfer packets. With standard SCO operation, encoded voice data is transmitted in a reserved timeslot, and packet acknowledgment and retransmission are not performed. When interference occurs, there is no mechanism to recover the lost information. More recent Bluetooth standards introduced the Extended Synchronous Connection protocol (eSCO) that lets headsets and base systems acknowledge packet receipt and retransmit lost packets to improve transmission and audio quality. The latest Plantronics Bluetooth headsets utilize eSCO technology.

The addition of adaptive differential pulse code modulation (ADPCM) over eSCO enables headset systems to digitize audio signals with greater clarity. As UC systems gain in popularity, the ability for ADPCM-capable devices to improve audio quality makes it possible for users to take advantage of features such as voice dialing.

MULTIPOINT CONNECTIONS

A multipoint-capable Bluetooth headset can be connected to two different Audio Gateways at once, enabling it to be used alternately with either base. For example, a multipoint capable Bluetooth headset can be paired simultaneously with a mobile phone and another Bluetooth UC endpoint, allowing the user to wear one headset and switch conveniently between phone systems.

WIDEBAND SOLUTIONS

Wideband technology provides wider frequency response than conventional telephones, resulting in rich, natural-sounding voice and multimedia transmissions. Because wideband audio requires more data packets to deliver enhanced sound, it occupies more of the radio frequency spectrum and depletes batteries faster. Plantronics headsets with wideband capability allow users to select standard audio when maximum battery life and density are required.

USING BLUETOOTH WITH COMPUTERS

Many computers come equipped with built-in Bluetooth radios. Unfortunately, these radios vary widely in design and capability. Most do not support all the functions needed for voice communication. For this reason, Plantronics Bluetooth headsets designed for computer applications are supplied with USB Bluetooth adapters that support wireless voice communications and ensure the highest end to end experience.

Planning Considerations for Wireless Headsets

There are a number of factors to consider when planning a wireless headset deployment.

- **Match technology to user needs.** Select headset technologies based on job requirements and mobility needs. For office-centric environments where density, sound quality, and range are paramount, Plantronics recommends DECT wireless headsets. If you have users that rely on their mobile or smart phone for the majority of their communication, consider Bluetooth headsets with support for multi-device connectivity. When considering Bluetooth for enterprise applications, be sure to evaluate the range and density characteristics and ensure they meet business and user needs.
- **Understand when, and how, workers use headsets.** The percentage of time users are on the phone or otherwise using a wireless headset is a key criterion. In addition to phone conversations, understand how often users will attend webinars, participate in Web conferences, listen to music or take part in online training courses, as these activities all consume wireless capacity.

- **Identify your peak time.** Because wireless headsets must share air waves, it is important to plan for the highest demand you can expect to see to ensure you have sufficient bandwidth available for users.
- **Plan for growth.** Organizational and personnel changes occur frequently. Perform density calculations and leave headroom for new wireless headset users.
- **Know how your building design affects performance.** Walls, building cores, and concrete and metal floors block wireless signals, enabling each floor to operate independently. Wood floors allow signals to pass through, reducing the number of headsets that can be supported with sufficient performance levels. Identify the building materials in use and factor them into your wireless headset density calculations.
- **Consider nearby users.** Consider the presence of equipment in adjacent offices or buildings. Even if your organization only occupies one floor, it is important to identify the presence of technology being used by other companies in close proximity, as the wireless spectrum may end up being shared. Within your organization, use walls to separate users into smaller groups to contain wireless traffic. In dense environments, use cubicles to increase headset isolation. The higher the cubicle walls, the better the improvement.

ADDITIONAL PLANNING FOR DECT HEADSETS

While DECT provides the utmost quality for enterprise workers, several factors should be considered when estimating wireless density.

- **Limit users in an open-plan layout.** An open-plan layout (low cubicles, no cubicles, or no hard walls) with more than 30 active users in line of site may experience density effects, even at short distances from base to headset.
- **Take advantage of isolation.** Areas that are completely separate from a wireless signal perspective can operate independently. Large sites with multiple isolated areas can support many more users than completely open designs.
- **Understand headset usage requirements.** The amount of time workers use their headsets has a large effect on how many headsets will work in a given building. A typical office in which workers use their headset a few hours per day can support many more headsets than a contact center where everyone is on the phone all the time.
- **Mix technologies for maximum density.** In very dense environments, consider mixing 1.9 GHz and 900 MHz DECT headsets to take full advantage of a greater number channels. Remember that the 1.9 GHz frequency range provides 30 channels, while the 900 MHz range provides 54 channels. When used together, up to 84 channels are available for users. Because different radio frequencies are used, the two systems can coexist without impacting performance — and yield better density and range than either platform alone. Note that the use of 900 MHz headsets is suitable only in North America and select countries.

To learn more about DECT wireless headset deployment estimations, visit the Plantronics Wireless Office Voice Assessment Tool located at www.plantronics.com/uctoolkit/plan.

ADDITIONAL PLANNING FOR BLUETOOTH HEADSETS

While Bluetooth headsets are ideal for highly mobile workers, other factors can impact their effectiveness. Consider the following when evaluating where to utilize Bluetooth headsets in your deployment.

- **Match the technology to user profiles.** Bluetooth headsets are best used by mobile phone-centric users—those who are mobile more than 60 percent of the time and use a mobile phone as their primary phone. Consider Bluetooth headsets for that segment of your population.
- **Anticipate WiFi effects.** When Bluetooth wireless headsets are used in an environment with 2.4 GHz WiFi networks, interference can degrade audio quality. Even with adaptive frequency hopping, there is greater potential for interference because the Bluetooth headsets must operate on a reduced number of channels. Problems increase when a Bluetooth headset is within range of more than one WiFi access point. To maximize Bluetooth capacity, consider moving WiFi to 802.11a which operates on 5.8 GHz.
- **Plan for density.** Many users can have access to Bluetooth headsets, as all headset users are unlikely to be on calls at the same time. When the recommended number of active headsets for a given environment is exceeded, users may experience a degradation in audio quality. Plan for the maximum usage rate to ensure audio quality. As a guide, we recommend a maximum of eight simultaneous users (active calls) in a typical 50 ft. x 65 ft. office. Each time the area doubles, the maximum number of calls that can be supported increases by a factor of 1.5. Since all users typically are not on active calls at the same time, a greater number of total users can be supported.

Best Practices for Wireless Headset Deployment

Successfully integrating wireless headsets into the enterprise requires educating users about characteristics that can affect audio quality. Key areas to consider include the following.

- **Set performance expectations.** Users may have unrealistic expectations for how far they can roam in the building. Let them know that moving outside the range of the headset, or into a congested area, can degrade audio quality.
- **Charge wireless headsets before the first use.** Users may be frustrated if a new headset is not ready for immediate use. Be sure to charge all headsets prior to deployment.
- **Train users to keep headsets charged.** Inform users of the need to charge wireless headsets daily. In high usage environments, train users to dock DECT headsets in their base station when taking breaks. Keeping headsets charged also extends battery life, reducing operating costs.

- **Use wideband wisely.** Wideband provides improved call clarity and a better user experience at the expense of battery life and density. In high-density applications, or when maximum battery life is needed, set headsets to standard frequency response to obtain the best performance.
- **Ask users to share the air space.** Wireless headsets operate on a relatively small portion of the radio spectrum. Efficient use of the spectrum is essential to achieving the best performance in your wireless installation. Some phone systems allow users to leave their headset active when there is not an active phone call. Train users to turn off their headset radio if they are not on a call, and not to roam with the headset active if they are not on a call or are not required to keep the headset active for their job.

Trust the Leader in Audio Device Technology

Audio devices are an integral part of today's dynamic workplace. For years Plantronics has been at the forefront of audio device technology, offering products that are engineered to deliver superior audio quality in even the most challenging situations. Based on industry standards and decades of engineering expertise, our DECT and Bluetooth audio devices deliver unprecedented mobility that fosters efficiency and improves productivity. When deploying audio devices into UC platforms, contact centers, or other phone-intensive environments, trust the leader in wireless headset design to help you integrate the right wireless technology right from the start.

For More Information

The Smarter Working UC Toolkit is the collective wisdom of customer experiences and lessons learned while integrating audio devices into a UC environment. It's a portfolio of best practices, recommendations, and off-the-shelf training tools designed specifically for IT organizations to leverage – ensuring accelerated end-user adoption. To access the Smarter Working UC Toolkit visit plantronics.com/uctoolkit. We'd like you to be part of our community of learning.

Additional Planning Resources

The following resources, available at plantronics.com/uctoolkit/plan, provide supplementary information to help in the planning process.

PLANNING RESOURCES

Planning FAQ	Provides responses and direction to typical questions IT organizations raise when planning UC audio device integration
Planning Guidelines for Success	Helps IT organizations prepare for the successful introduction of UC audio devices on a UC platform
Planning Checklist	Provides IT with a high-level list of items to consider when planning UC audio device integration
Planning Survey	A list of suggested questions IT organizations can use to assess user UC audio device needs and environmental conditions
Wireless Voice in the Office Environment White Paper	A technology overview for IT organizations covering the most common wireless technologies used for UC audio devices
Wireless Voice Office Assessment Tool	An online tool that provides a recommended direction for an installation of DECT 6.0 wireless UC audio devices
Global Deployment Workbook	Guides IT tasked with global, or national, deployments of UC audio devices consisting of multiple locations

For more information, contact Plantronics at 1-855-UCTOOLS (1-855-828-6657) for US and Canada, or (001) 831-458-7628 (all other countries).

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