VoWLAN Planning

Samsung VoWLAN

Samsung Telecommunications has added WiFi data and wireless voice to its product offering. The use of the wireless LAN to carry voice is commonly referred to as Voice over Wireless LAN or VoWLAN. This fully converged application integrates with the existing iDCS line of IP enabled products to deliver superior wireless voice and data. The proprietary Samsung Access Point and WIP-5000 phone can be added to any IP enabled iDCS500 or release 2 iDCS100 systems to provide wireless data or wireless voice.

What is WiFi?

WiFi is the term for the 802.11b Ethernet standard. It is similar to standard 802.11 wired networking and runs at a maximum of 11 megabits/second. It operates in the 2.4 gigahertz spectrum and shares that spectrum with microwave ovens, some satellites and 2.4 gigahertz cordless phones. 802.11b has a range of approximately 150 feet unobstructed.

Samsung Telecommunications 802.11b VoWLAN (Voice over Wireless Local Area Network) for both Voice and Data applications uses the IEEE 802.11b wireless Local Area Network standard. For voice it uses the G.711 (64k) and G.729a (8k) Codec. Samsung's 802.11b AP (Access Point) uses a proprietary Samsung WIP-5000M (Wireless Internet Protocol) phone and delivers 4 simultaneous voice conversations along with wireless data.

When designing a VoWLAN as opposed to a traditional data only wired LAN several new factors come into play. Some of these factors are the trade off between RF (radio-frequency) coverage, bandwidth capacity per user, call volume and call density. Planning for capacity, density and coverage are the key issues for VoWLANs. Many WLAN designers focus only on providing adequate RF coverage. Sufficient bandwidth and call volume requirements for the users should also be a concern. Key issues to consider when deploying a VoWLAN include determining RF coverage, Channel planning, density of users for both voice and data and accounting for RF signal-loss factors.

The distance at which a particular throughput can be achieved with 802.11b has a data rate of 11 Mbps inside a radius of 100 feet when indoors. Because of several factors, actual throughput on a wireless system is much lower than the technology's specified data rate. For instance, with even a one-way transmission on a 54-Mbps system, the best possible throughput is approximately 30 Mbps. For an 802.11b network, the best possible throughput is 4 Mbps to 6 Mbps.

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The number of users and their applications are major drivers of bandwidth requirements. The network architect must account for the number of users within the AP's cell diameter. In a large office or where user density is high, you should design smaller cells to achieve a higher data rate, since walls and other objects will not naturally create the cells by attenuating or blocking the RF signal.

Determining how much bandwidth each user will need is critical, as your calculations will define the user experience, as well as the number of APs required. A good rule of thumb for an 802.11b network is to allow for 500 Kbps each way, which delivers a user experience similar to a DSL connection. With the 16k packet header, full duplex signal, and a 60% silence compression the average call should use around 32k for the G.729a codec and 140k for the G.711 codec. This number can vary depending on frame count, the frequency of engaging full duplex mode and the amount of silence per conversation. We provide these average bandwidth usage scenarios for the purpose of proper bandwidth planning.

A major difference between designing for wired and wireless LANs is the impact of objects on RF signals. Walls, doors, windows, stair wells and other fixed objects in the building will absorb RF signals, causing signal loss. The building construction also has an impact: Concrete absorbs more signal than wood. When allocating channels to the cells, be sure that adjacent cells use non-overlapping channels. 802.11b provides three non-overlapping channels. Be sure to consider the vertical cell overlap between floors if you are designing for a multistory building.

Samsungs AP has 5 different power settings to control area of coverage per AP. With smaller cells, you will need to re-use frequencies more often so proper the channels planning is critical. The Samsung AP uses CSMA/CA (Carrier Sense Multiple Access / Collision Avoidance) which allows two AP's on the same channel to overlap without disrupting the signal. This sort of configuration can be used to increase call density and Data throughput in a given area but does decrees the bandwidth for data users on the same AP. Since there are two AP's in the same coverage area this may still result in higher data rates for the end user because the number of data connection on a single AP will now be divided between 2 AP's. We do not recommend more than 2 AP overlapping the same channel. More than 2 AP's will greatly degrade the quality of voice conversation and dramatically reduce the data throughput. With this sort of configuration you can have six AP's (2 per non overlapping channel) in the same coverage area without disruption the voice quality.

By doing a proper site survey it will help to ensure the wireless network is going to perform to the customers expectations. It will reduce the number of reconfigures and tech revisits. This will also help to plan for future growth and help in the trouble shooting process.

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The Planning Process

- Define the size of the area where high-speed coverage is desired by calculating its width and length. An office building can be divided into multiple areas for planning.

- Use a floor plan or blue print to mark the locations of AP's and density of users. Mark the desk of each WIP-5000 user and critical coverage areas for each wireless voice user.

- Check for background noise and interference from other 2.4 GHz devices.

- Take signal readings for each AP to verify radius and strength of signal.

- The power should be adjusted to increase or decrees the coverage area to account for call density and data requirements.

- Plan for a hotspot area, such as a conference room, separately from the rest of the enterprise, as it will have different access and quality-of-service requirements. Calculate the expected total bandwidth needed to serve the area by multiplying the average bandwidth needed per user by the number of users in that coverage area.

- By designing smaller cells with higher throughput, you can increase the quality of voice calls in a given area as well as provide higher quality data connections.

- The non overlapping channels are 1, 6, and 11. Samsung's WAP can support up to two AP's in the same coverage area on the same channel. We only suggest reusing the same channels for particularly dense call areas since this will lower the throughput rate for data users.

- Test each AP for date throughput and voice quality at incremental distances. Verify coverage and quality in critical application areas.