IP Office Technical Tip

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IP Telephony and Echo

The two main types of echo are acoustic and impedance although the sources of echo can be many. Echo will result when a VoIP call leaves the LAN through a poorly administered analog trunk into the PSTN.

Echo is not exclusive to VoIP solutions; echo may be heard in solutions that do not utilize IP Telephony. This will be echo generated from within the telephony network and there is little that can be done to resolve this kind of echo without first engaging the service provider to investigate this source. Under these circumstances it would be worthwhile focusing on the connectivity between the switch and the service provider and beyond.

Another major cause is from an impedance mis-match between four-wire and two wire systems. Impedance mis-match causes inefficient energy transfer. The energy imbalance must go somewhere and so it is reflected back in the form of an echo. Usually the speaker hears an echo but the listeners do not.

Echo cancellers, which have varying amounts of memory, compare the received voice with the current voice patterns. If the patterns match, the canceller cancels the echo. Echo cancellers aren't perfect, however. Under some circumstances, the echo gets past the canceller. The problem is exacerbated in VoIP systems. If the one-way trip delay between endpoints is larger than the echo canceller memory can handle, the echo canceller won't ever find a pattern to cancel.

Central office service providers sometimes deploy HDSL technology to increase the number of T1 trunks available to customers without installing extra wiring between the central office and the customer premises. A service provider uses this technology to convert an existing T1 four wire interface at the central site to two HDSL circuits and multiplexes these at the customer premises to make two T1 trunks available to the customer telephone system.

Customers that have IP telephony based systems connected to these types of T1 trunks, for example Avaya IP Office, may experience echo under certain call conditions.

The delays inherent in IP telephony along with the audio path delays introduced by the HDSL conversion may make existing echo audible to the user of the IP telephone system. Users with calls to external destinations that traditionally

introduce echo, for instance, two wire to four wire converted analog circuits may therefore experience detectable echo of their own speech.

It is therefore vital that best practice network design principles are always applied to ensure that customer data networks are suitable for IP telephony. These best practices will not remove any potential sources of echo on the network. Echo can only be resolved after identifying and minimising the original source of the echo. This is not always practical and therefore IP telephony solutions, including IP Office, may not be the best-fit solution in circumstances prone to echo.

Avaya recommends consideration of the following list of best practices when implementing VoIP. Note that these suggestions are options and may or may not fit individual business needs.

QoS/CoS: Quality of Service (QoS) for voice packets is obtained only after a Class of Service (CoS) mechanism tags voice packets as having priority over data packets. Networks with periods of congestion can still provide excellent voice quality when using a QoS/CoS policy. Switched networks are recommended to use IEEE 802.1P/Q. Routed networks should use DSCP (Differentiated Services Code Points). Even networks with plentiful bandwidth should implement CoS/QoS to protect voice communications from periods of unusual congestion such as from a computer virus or heavy downloads

Switched Network: A fully switched LAN network is a network that allows full duplex and full endpoint bandwidth for every endpoint that exists on that LAN. Although VoIP systems can work in a shared LAN, Avaya recommends the consistently high results a switched network lends to VoIP.

VLANs: Placing voice packets on a separate VLAN (subnet) from data packets is a generally accepted practice to reduce broadcast traffic (and data if on a shared LAN), from contending for the same bandwidth as voice. Note that Avaya IP telephones provide excellent broadcast storm protection.

Network Assessment: A basic network readiness assessment offer from Avaya is vital to a successful implementation of VoIP products and solutions.

This requires a pre-implementation network audit and regular network assessments to ensure that bandwidth, delay, jitter and packet loss measurements are maintained within the limits recommended by Avaya for business-quality voice.

Avaya mandates a documented network assessment for all implementations of IP Office where IP endpoints (hard-phones or soft-phones) or IP trunks are installed. Network assessment services can be sourced either from Avaya Global Services or from suitably qualified third parties that meet the Avaya minimum requirements.

For further details please visit:
https://www.avaya.com/doc/gpp/pv/all/alerts/detail_Network_Assessment_Requirements.html

As the communications market continues to embrace voice over IP, and an increasing number of customers are offered services such as HDSL delivered over T1 trunks, Avaya is committed to continuing to optimize its products to deliver the highest quality voice delivery over converging technologies. Further information on future enhancements will be available in the coming months.

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