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Improved call quality indicator

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ABSTRACT

The number of signal bars displayed during a wireless telephone call does not necessarily correlate with user experience. The number of signal bars displayed is based on available signal strength for the user's cellular device. However, it fails to account for other network parameters that govern call quality. For example, one participant device of a wireless phone call may have excellent signal strength but poor call quality because the other end has poor signal strength.

Techniques of this disclosure describe an improved call quality indicator that is based on signal conditions on both sides of a call, as well as QoS-related network parameters such as packet delay, packet loss, jitter, call-drop status, etc. By incorporating remote side call quality, the resulting call quality metric is a more accurate reflection of user experience.

KEYWORDS

- call quality indicator
- signal strength
- VoLTE
- VoIP
- packet loss
- packet jitter

BACKGROUND

Cellular telephones include signal bars that are displayed on the device. The number of signal bars displayed, e.g., during a wireless telephone call, is based on strength of the pilot signal of the serving base station as received by the user's cellular phone. In the early days of

cellular telephony, the number of signal bars served as a reasonable proxy for call quality since there were relatively few cellular phones, and the rest of the network was generally much more reliable than the wireless link. For example, if a cellular phone user called a landline phone and the call failed, there was a high likelihood that the failure was due to the last mile wireless link, likely the weakest link in the chain of nodes that the call passed through.

As cellular technology has developed over the years, reliability of the physical layer has become comparable to that of other parts of the network. Simultaneously, an increasing number of voice calls are now packet-switched using voice over internet protocol (VoIP), e.g., under the IMS framework. The physical layer has improved. Calls are no longer necessarily routed out of carrier-operated base stations. For example, a call can be made by a cellular phone over Wi-Fi. With these developments, a call-quality indicator that is based solely on detected wireless signal strength has lost meaning. In today's networks, several parameters within the core and the periphery of a network govern call quality. For example, such parameters include signal strength, wireless bandwidth availability, packet delay, packet loss, jitter, call-drop status, etc., with each parameter effective at both ends of a cellular phone call.

Call participants can be frustrated when their cellular device indicates a high quality network, e.g., five bars, the word "HD," etc. and yet, the call is dropped by the network or offers low voice quality. Such occurrences occur due to bad conditions at the other end of the call.

DESCRIPTION

Voice over LTE (VoLTE) calls inherently provide real-time control protocol statistics, including packet delay, loss, and jitter information for quality of service (QoS) at both ends of a phone call. Techniques of this disclosure use the real-time QoS-related information, physical

layer status, e.g., signal strength, bandwidth availability, at both ends of a phone call, call-drop (time-out) status, etc. to compute and display an improved call-quality indicator to the user.

Cognizant of situations wherein a call participant can hear the other call participant clearly but not vice-versa (e.g., an example case being that the relevant participant is on mute), the techniques can provide indicators of call quality to the participants. For example, the indicators can indicate a respective call quality for each participant in the call. The techniques generalize to calls with multiple participants, e.g., conference calls, where the call quality as perceived by each participant can be displayed to other participants.

In some implementations, raw call-quality statistics such as packet loss, jitter, delay, signal strength, available bandwidth, etc. are sent across by the device of one call participant to devices of the other participant(s). For example, such statistics can be determined based on received real-time transport protocol (RTP) and real-time control protocol (RTCP) packets exchanged between the participant devices. These statistics enable each participant device to locally compute and display perceived call quality of each of the other participant devices. In some implementations, an aggregate call quality indicator based on raw call-quality statistics is computed locally by each participant device to a call and sent over to the other participant devices.

A graphical user interface (GUI) that illustrates the call quality as computed by using the techniques of this disclosure can include different formats. For example, the GUI can be based on color (e.g., green indicates good quality, red indicates poor quality), words (e.g., "Excellent," "Average," "Poor," etc.), signal bars, call quality dials, etc. The GUI can include separate indicators for network conditions at local user device and for network conditions as

determined for remote user device(s). The GUI provides the user to determine the source of poor audio quality as local or remote.

CONCLUSION

Techniques of this disclosure provide an improved indication of call quality by taking into account local wireless signal strength as well as other QoS-related network parameters. The call quality experienced by each participant in a call is reflected at other participant devices. By incorporating remote side call quality, the resulting call quality metric is a more accurate reflection of user experience. Such knowledge of the call quality or status can enable participants to pinpoint the source of a call quality problem and can therefore reduce frustration amongst participants. Unnecessary traffic, e.g., repeated call attempts, is avoided.