ESG Lab Review

RingCentral Mobile Voice Quality Assurance

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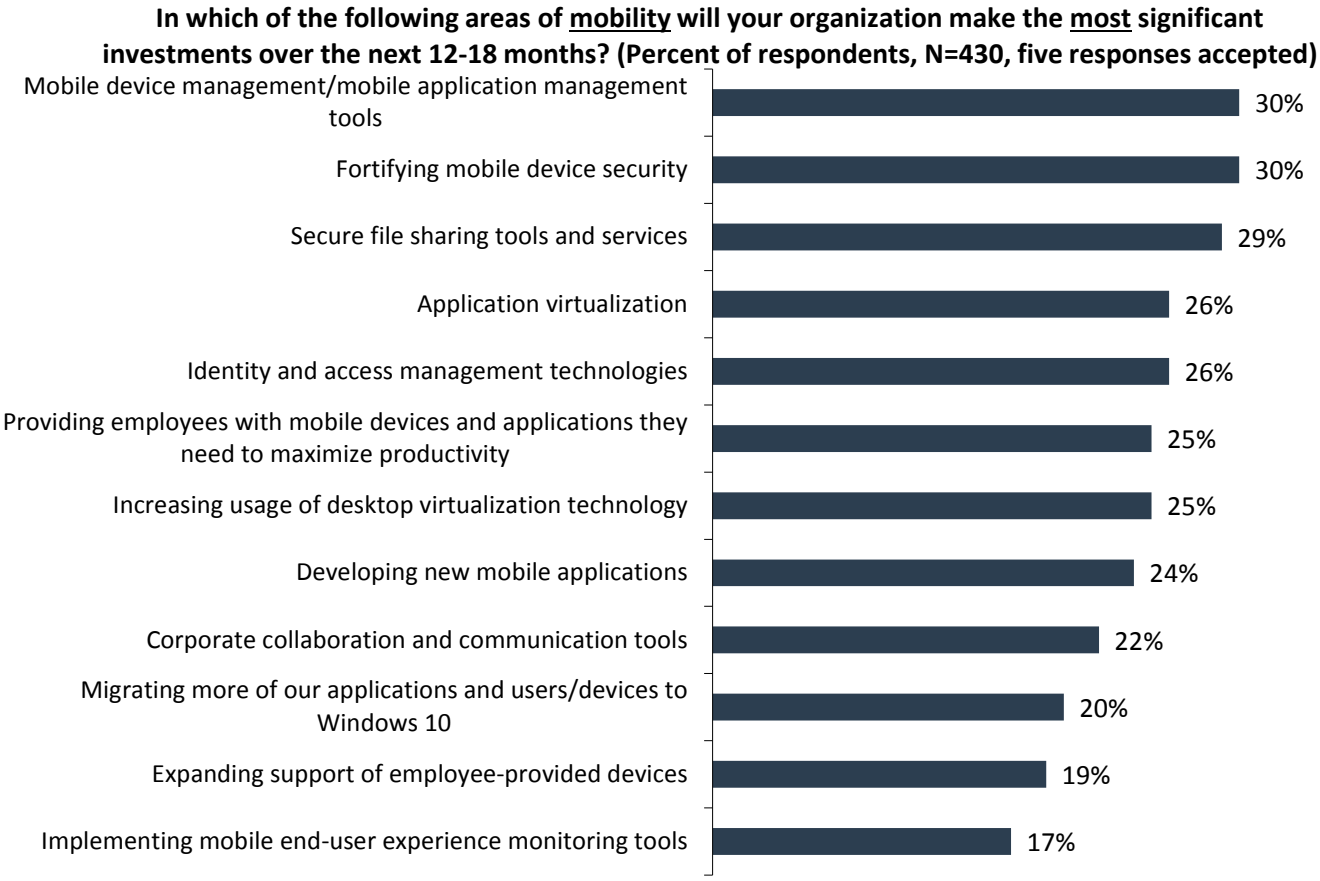
Abstract

This ESG Lab Review documents hands-on testing of RingCentral Office to verify its ability to assure high quality of service (QoS) for business communications. We focused on two key aspects: 1) how the RingCentral unified communications-as-a-service (UCaaS) platform can help enterprises to enable carrier-class voice quality calls over mobile devices; and 2) the RingCentral QoS management tool that allows organizations to continuously monitor voice communications via its QoS Reports.

Challenges

In recent ESG research, 25% of organizations indicated that one of the top mobility areas in which they planned to make significant investments in 2018 was to provide their employees with mobile devices and applications to maximize workforce productivity (see Figure 1). Also, 22% of organizations plan to invest more in corporate collaboration and communications tools.[1] Of mobile applications and communication tools available to organizations, voice calls remain a critical method of business communications.

Figure 1. 2018 Mobility Spending Priorities



Source: Enterprise Strategy Group, 2018

[1] Source: ESG Master Survey Results, *2018 IT Spending Intentions Survey*, December 2017.

However, today's voice communications are predominantly conducted over mobile devices. Employees are no longer tied to traditional offices and are less dependent on traditional landlines. They are also expected to be available outside of working hours. Organizations rely more on mobile devices to maintain employee contact.

More organizations are moving away from the public switched telephone network (PSTN) for making voice calls, leveraging IP-based unified communications platforms to foster employee collaboration and reduce costs. As these platforms leverage Voice over Internet Protocol (VoIP), employees are making more VoIP calls via their mobile devices, specifically through WiFi or cellular networks, which cannot duplicate the carrier-class network conditions provided by the PSTN.

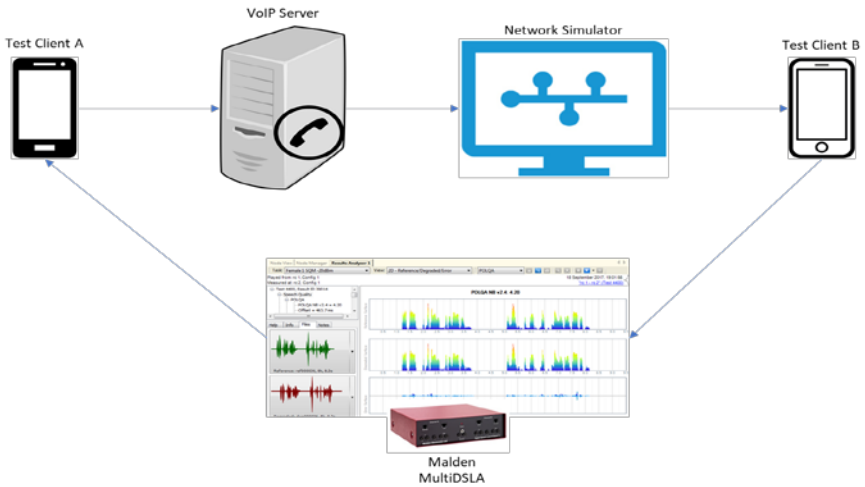
As mobile VoIP becomes more prevalent, organizations must ensure that their voice communications exhibit the carrier-class quality that the PSTN has provided for many years. Call quality remains a high priority to ensure that employees remain productive outside of the office. Low quality calls discourage communication, thus affecting how well employees collaborate outside of the traditional office. Maintaining high call quality becomes imperative as more calls are being transmitted via networks and protocols not built for carrier-class voice quality. In other words, inconsistent network conditions presented by wireless and VoIP technologies are becoming more prevalent in business voice communications.

RingCentral offers a cloud communications platform that enables business communications via the public Internet, with a foundation of VoIP. The platform enables voice calls, video meetings, and conferencing, messaging (SMS/MMS), and Internet faxing. RingCentral has designed its platform to address the factors that can affect voice quality: network congestion, packet loss, and jitter (delay between arrival of packets). VoIP calls made or received by mobile devices will always encounter one or a combination of these factors and need to be managed constantly to maintain high voice quality. This report examines the results of ESG's testing of the RingCentral platform and how it mitigates the effects of these factors.

ESG Lab Testing

ESG Lab employed the test bed environment illustrated in Figure 2. We used two pairs of smartphones—iOS and Android-based—for testing voice connections under both normal and adverse conditions. We defined adverse conditions to be those factors that can affect voice quality: network congestion, packet loss, and jitter; normal conditions were defined as simply the absence of those factors. Both mobile clients were connected via a VoIP Server and a network simulator, representing the "cloud" in which the calls are completed. It is assumed that the clients connect to the cloud via WiFi connections. While the VoIP server initiated calls, the network simulator injected the network connection with impairments that simulated adverse conditions. A MultiDLSA device was connected to both clients to measure voice quality.

Figure 2. Test Bed Environment



Source: Enterprise Strategy Group, 2018

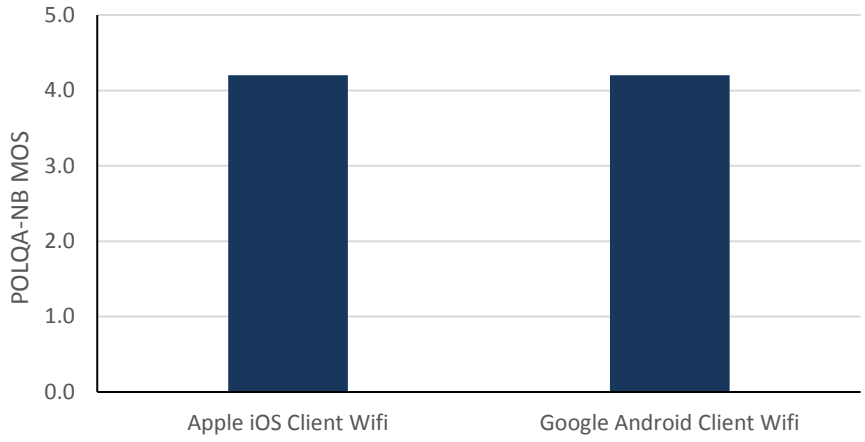
The MultiDLSA device measures voice quality by calculating a Mean Opinion Score (MOS), a common measurement of audio quality. Scores can range between one (Bad) and five (Excellent). Five is generally accepted as being equivalent to speaking conversationally face-to-face. Intermediate ratings are two (Poor), three (Fair), and four (Good). The device uses software that follows a global standard for measuring voice quality of fixed, mobile, and IP-based networks called the Perceptual Objective Listening Quality Analysis (POLQA) standard. All results are expressed in POLQA-NB (Narrowband) MOS.

We tested voice connections under three scenarios: Mobile VoIP-to-VoIP call, Mobile PSTN-to VoIP call (call originating from the PSTN), and Mobile VoIP-to-PSTN (call originating from the RingCentral platform). We ran each scenario under normal and adverse conditions. MOS scores were recorded and compared against the defined MOS scale.

Mobile VoIP-to-VoIP

ESG Lab began by obtaining MOS for voice connections between two iOS clients and two Android clients, without simulating adverse network conditions. We injected network impairments, then proceeded to record the MOS. Figure 3 shows the results.

Figure 3. POLQA Score for Voice Connections between Pairs of iOS and Android Clients



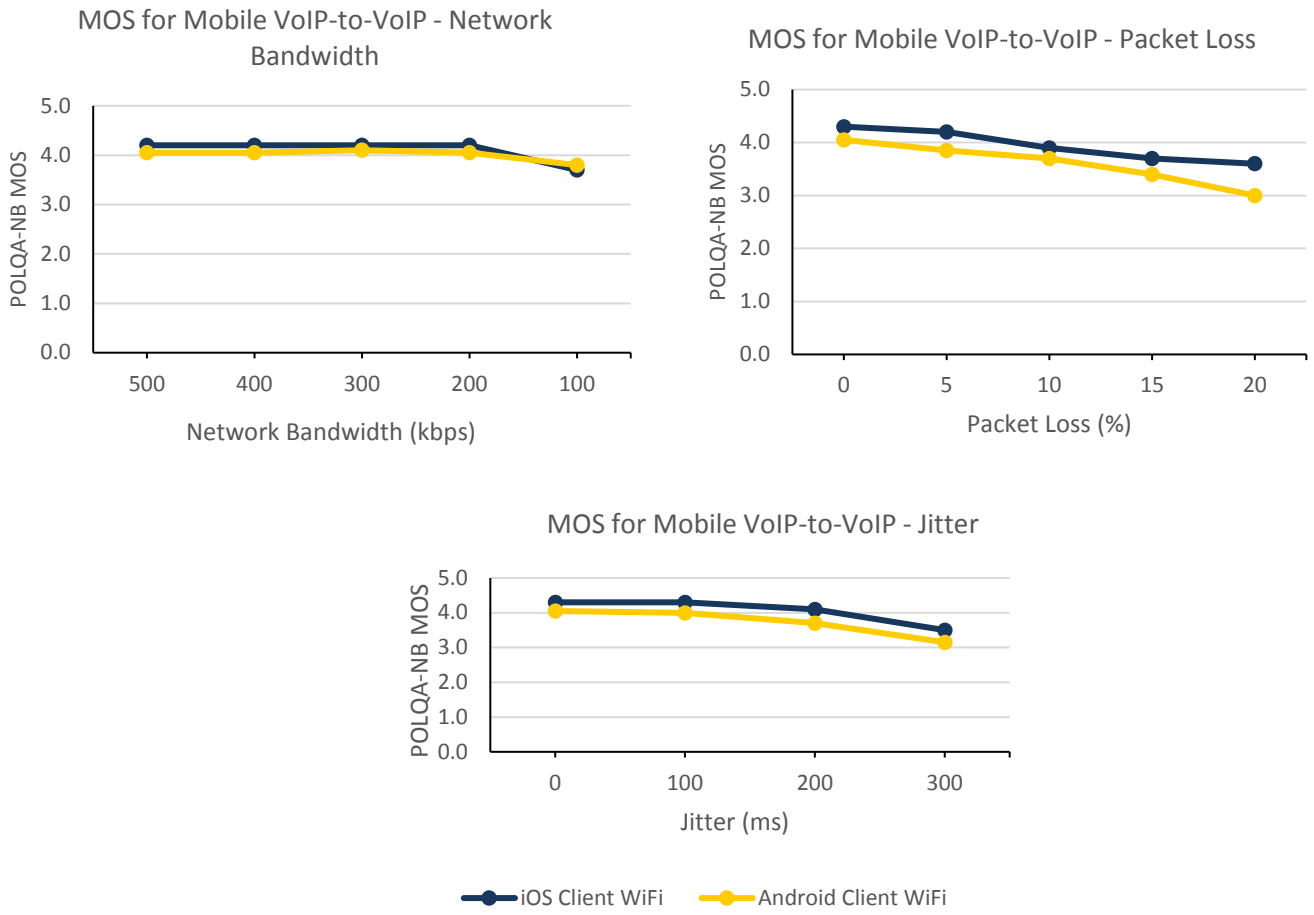
Source: Enterprise Strategy Group, 2018

The results indicated a Good rating, as the connections between pairs of iOS and Android mobile clients rated 4.2 on the MOS scale.

ESG Lab then simulated adverse conditions to see how voice quality was impacted. Figure 4 shows the results of simulating network congestion (limiting available network bandwidth), packet loss, and jitter. We first simulated network congestion by decreasing the amount of available network bandwidth (in Kbps) for the voice connection. For both iOS and Android clients, we observed that the MOS decreased as the bandwidth decreased from 500 Kbps to 100 Kbps. However, the MOS scores in both cases remained at or above 4.0 until bandwidth decreased to 100 Kbps. Even at that level, the MOS did not drop significantly below 4.0 (Good) quality.

We then simulated packet loss, increasing the percentage up to 20% at 5% intervals. As the packet loss percentage increased, the MOS decreased for both iOS and Android clients. We observed that the MOS scores significantly decreased at 20% packet loss, as they both were in the 3.0-4.0 range. We also observed the MOS for both clients as we injected jitter conditions into the simulated connections. Again, as the amount of time between packet arrivals increased, the MOS decreased. As in the packet loss case, the MOS did not fall below 3.0 at the maximum value tested.

Figure 4. MOS for Mobile VoIP-to-VoIP Connections Under Simulated Adverse Conditions



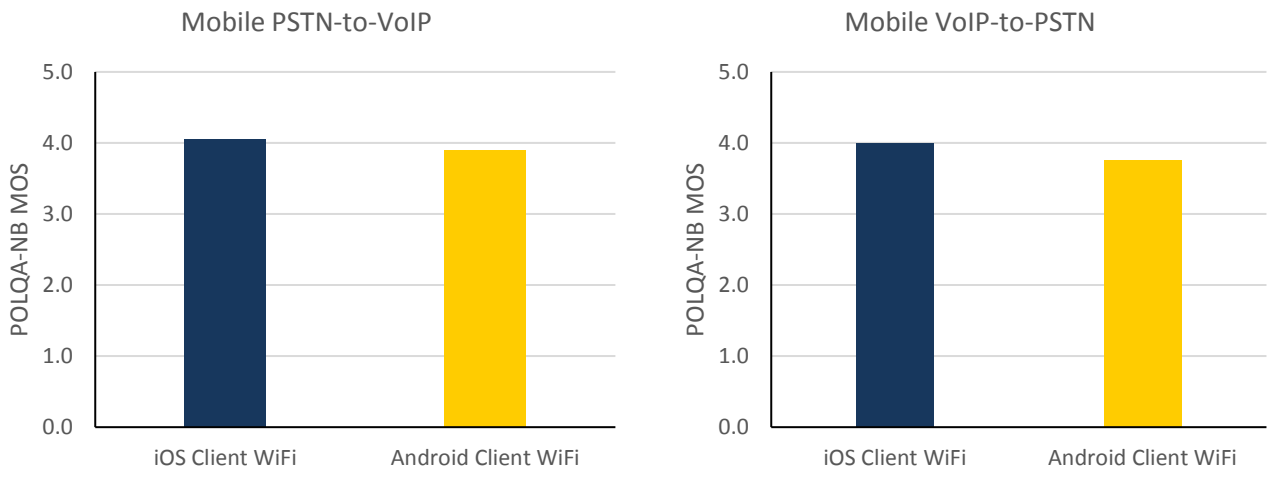
Source: Enterprise Strategy Group, 2018

These results indicate that the RingCentral platform delivers business value to organizations by maintaining high-quality mobile VoIP-to-VoIP calls.

Mobile PSTN-to-VoIP and Mobile VoIP-to-PSTN

ESG Lab proceeded to conduct the same tests for the Mobile PSTN-to-VoIP and Mobile VoIP-to-PSTN cases. In both cases, we simulated a call originating or terminating from a traditional landline phone. The call then traversed to the VoIP network. We ran the same tests under both normal and adverse conditions. Figure 5 shows the POLQA scores for both iOS and Android clients in both use cases.

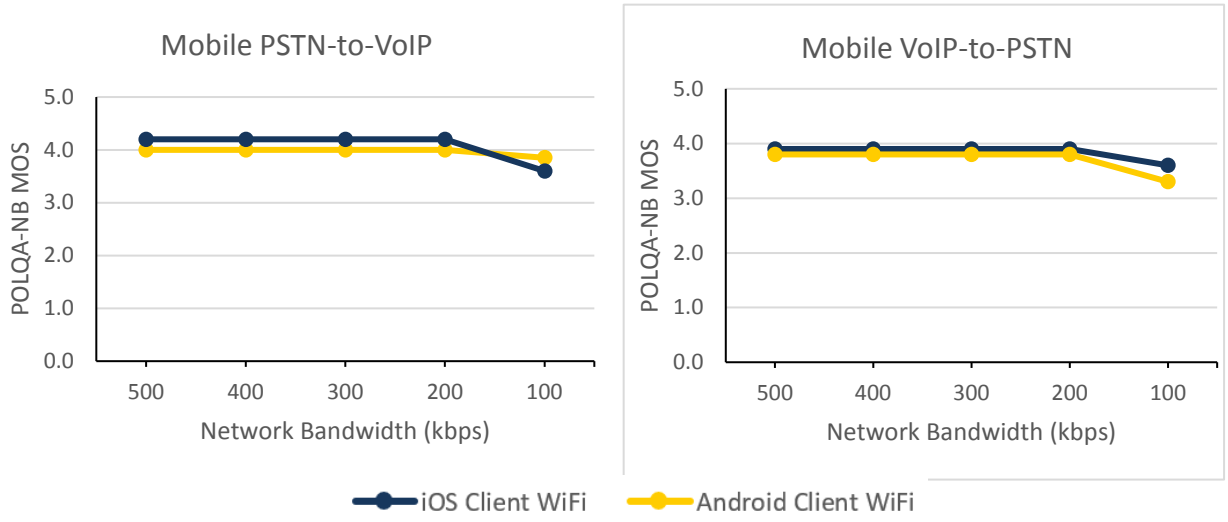
Figure 5. POLQA Scores for Mobile PSTN-to-VoIP and Mobile VoIP-to-PSTN Connections (iOS and Android)



Source: Enterprise Strategy Group, 2018

ESG Lab then proceeded to test under adverse connections. We injected the same conditions and measured the MOS at the same intervals as in the Mobile VoIP-to-VoIP case. Figure 6, Figure 7, and Figure 8 depict the observed MOS for both use cases as we simulated network congestion, packet loss, and jitter.

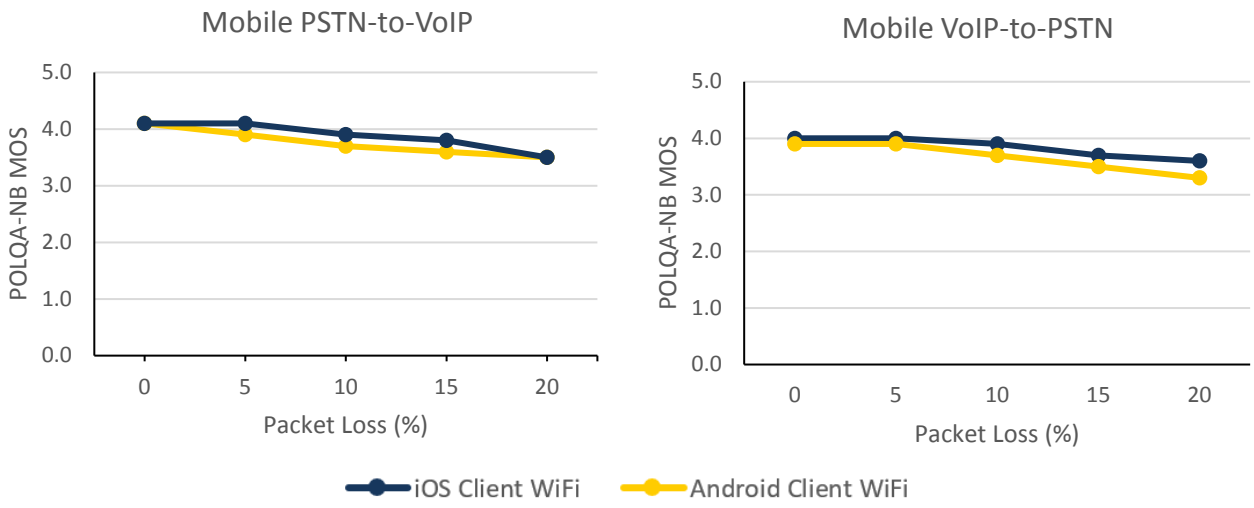
Figure 6. MOS for Mobile PSTN-to-VoIP and Mobile VoIP-to-PSTN Connections – Network Congestion



Source: Enterprise Strategy Group, 2018

After simulating network congestion, decreasing the bandwidth from 500 Kbps to 100 Kbps, ESG Lab noted that the MOS scores in both cases remained consistent until the bandwidth decreased to 100 Kbps. Again, the Mobile PSTN-to-VoIP case sustained slightly higher MOS compared to the opposite arrangement. Even in the worst case, the MOS remained somewhat between Fair and Good.

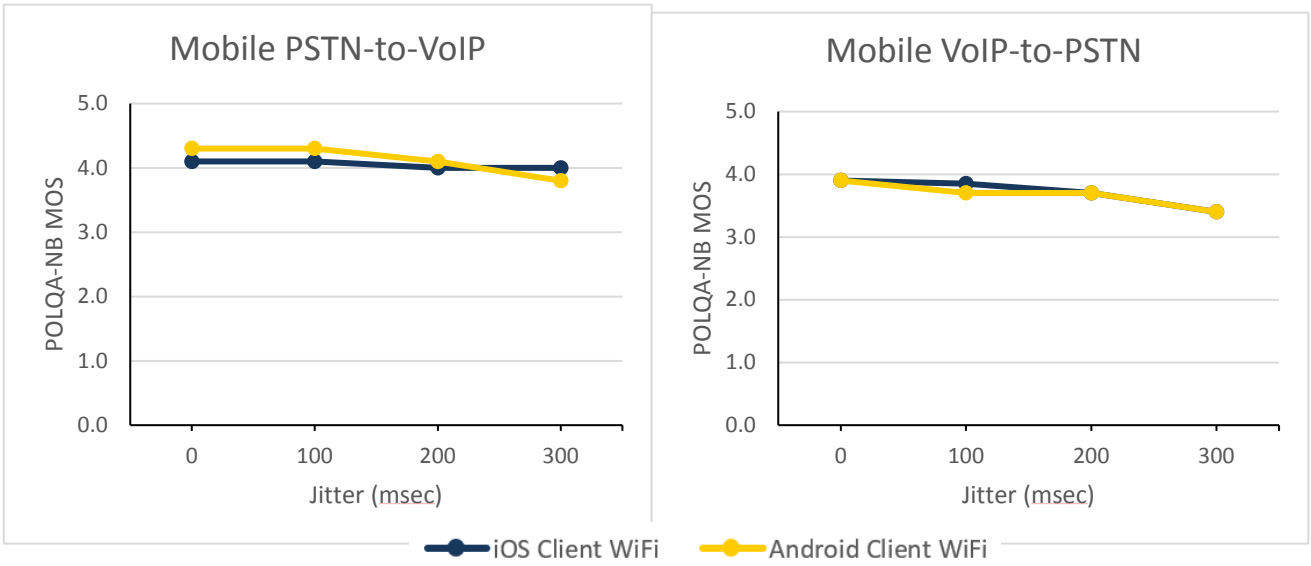
Figure 7. MOS for Mobile PSTN-to-VoIP and Mobile VoIP-to-PSTN Connections – Packet Loss



Source: Enterprise Strategy Group, 2018

ESG Lab then simulated packet loss as in the Mobile VoIP-to-VoIP case, increasing the percentage to 20%. After measuring the MOS at set intervals, we observed that the voice quality decreased as the packet loss reached 20%. The MOS decreased steadily, as is expected as dropped packets increase, thus contributing to possible gaps in the connection.

Figure 8. MOS for Mobile PSTN-to-VoIP and Mobile VoIP-to-PSTN Connections – Jitter



Source: Enterprise Strategy Group, 2018

ESG Lab then injected jitter into the voice connections, increasing the delay between packet arrival from zero to 300 milliseconds. We measured that the MOS slightly decreased again in both cases, although the Mobile PSTN-to-VoIP case was slightly higher overall than the opposite case.

Based on the testing, observing connections handed off between the PSTN and VoIP networks, we noted that the RingCentral platform continues to maintain a high level of voice quality. No test resulted in an MOS lower than 3.0. Limiting the effects of network congestion, packet loss, and jitter ensures that voice communications run smoothly and reliably, ensuring that employees exchange the right information at the right time to complete business tasks.

Why This Matters

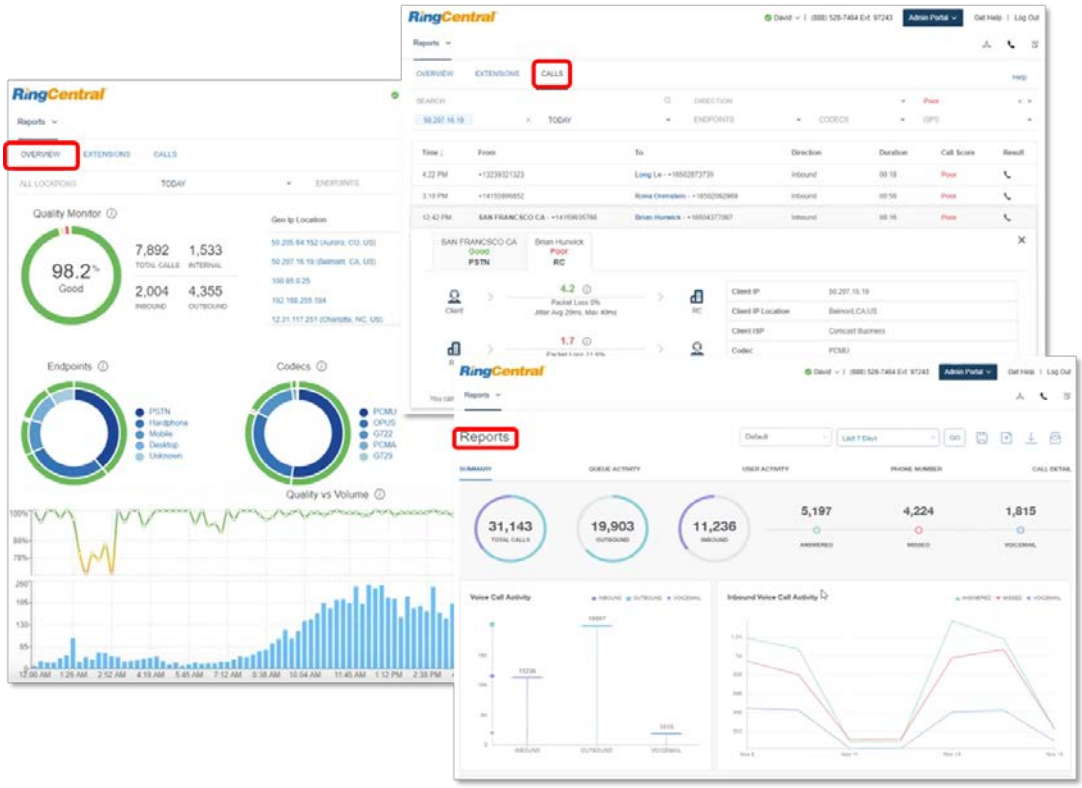
Leveraging IP-based communications becomes challenging as organizations employ mobile devices to allow for communication anytime and anywhere. While mobile devices offer more accessibility, they make it more critical for organizations to ensure that voice communications continue to be of the highest quality as dependence upon the PSTN decreases. Specifically, voice communications leveraging both mobile and IP networks introduce network conditions that PSTN-based calls never had to face. These network conditions are the new normal environment in which calls are made.

RingCentral has designed its UCaaS platform to support high-quality voice communications under today's typical adverse conditions of network congestion, packet loss, and jitter. To test how effectively the RingCentral platform maintains high QoS, ESG Lab tested voice connections over three use cases—Mobile VoIP-to-VoIP, Mobile PSTN-to-VoIP, and Mobile VoIP-to-PSTN—in both normal and adverse conditions. We validated that most of the MOS scores were in the Good range of 4.0 and higher. Achieving the high levels of voice quality in these three cases showed that the RingCentral platform enables organizations to maintain effective levels of communication and productivity in today's distributed work environment.

QoS Reports

To validate an IT adminstrator's ability to monitor voice QoS, ESG worked with RingCentral's QoS Reports (Release 9.3). This tool provides a comprehensive view of calls made through the RingCentral platform, with summary and performance statistics. Figure 9 shows the main screens that users can access via the QoS Reports feature.

Figure 9. Screens within RingCentral QoS Reports



Source: Enterprise Strategy Group, 2018

The *Overview* Tab (left graphic) allows an IT administrator to find out the overall health of the RingCentral platform. The screen provides summary statistics of calls made and calls broken down into specific categories, such as calls handled via

service providers, and call origination and endpoints (mobile, headphone, etc.). The screen also provides a "Quality vs. Volume" bar chart that allows users to detect problem areas, and to correlate quality at any given time of the day or specified time period. This provides some insight into potential problem areas that may need attention.

On the *Calls* tab (top right graphic), the adminstrator can drill down into specific individual calls should the platform indicate potential voice quality issues. Call details include the MOS of specific connection segments (e.g., PSTN, RingCentral) to determine what is contributing to the overall voice quality, as well as the endpoint type, device used, and IP address. These call details help determine possible root causes quickly.

The *Reports* tab (lower right graphic) allows the user to summarize activity over predetermined time periods. Along with the summary statistics, the report allows for viewing queue activity, user activity, activity according to phone numbers, and call details. The user can also set up the tool to turn views into recurring reports that are generated on a regular basis. Empowering the user to customize reports helps the IT adminstrator to focus on specific areas that are of the most interest and facilitate consistent monitoring.

Why This Matters

ESG Lab reviewed the QoS Reports feature, and navigated through the summary screens that show the overall health of the voice call environment, along with views that allow for drilldown into specific environments such as phone numbers, extensions, or user groups. We verified that an IT administrator can proactively maintain high voice quality and pinpoint potential quality-impacting issues quickly.

The Bigger Truth

Today's distributed work environment makes communication and collaboration challenging. As employees are not tied to the traditional office and landlines, they rely on mobile devices and WiFi networks outside of the office to get more work done. While there are myriad mobile applications that exist to enhance productivity, the most basic application—voice calls—cannot be dismissed. Organizations have leveraged collaboration platforms that support VoIP calls while integrating other communication methods, yet they were built initially with desktop phones in mind. Now that mobile usage is prevalent, maintaining voice quality made in a mobile VoIP becomes imperative.

The RingCentral Cloud Communications Platform helps to ensure high quality and consistent voice calls that will foster employees' ability to work. The company has recognized that organizations expect their mobile VoIP communications to be as good as any call from a landline. RingCentral believes that the network conditions introduced by mobile and IP networks reflect the new normal, as fewer people leverage the PSTN.

ESG Lab tested the ability of the RingCentral platform to maintain high levels of voice quality when simulating calls between mobile devices and calls handed off between the PSTN and VoIP networks. We recorded the MOS in each case and found that the platform achieved scores around 4.0 on a scale of 1.0 to 5.0, indicating good quality; importantly, the scores remained in this range when we simulated adverse conditions related to network congestion, packet loss, and jitter. These conditions are present in mobile and IP networks, unlike the PSTN. Achieving MOS in the 4.0 range under these conditions shows that RingCentral platform can deliver high-quality voice communications consistently.

ESG Lab also verified that the QoS Reports feature allows IT administrators to monitor and proactively identify quality-impacting issues quickly. As this tool integrates statistics of all RingCentral-supported voice communications, an end-user can leverage it to assure high voice quality comprehensively. QoS Reports provides both real-time and summary views of all voice communications supported by RingCentral Cloud Communications.

For organizations that recognize the continued importance of voice communications, it is worthwhile to consider the RingCentral platform. The ability to maintain high levels of voice quality and allow users to act upon network-impacting issues more quickly can help an organization to maintain and enhance productivity and collaboration.