



Cloud Work Quality of Service Analytics Video & Phone User Guide

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Quality of Service Analytics

The Quality of Service analytics provides near real time information on the global health of the Cloud Work Phone and Cloud Work Video and allows for proactive monitoring and reactive troubleshooting of potential issues.

You can use QoS for the following purposes:

- Proactive Monitoring
 - Identify potential issues based on patterns of degradation in quality
 - Correct quality issues before they become disruptive to the organization
- Reactive Investigation
 - Handle individual user escalations
 - Find problematic meetings and calls and identify their root cause

Access & Recommended Users

Quality of Service Analytics provides data on both Cloud Work Phone and Video service.

Cloud Work Phone QoS is available to all Cloud Work Office customers and Cloud Work Video QoS is available to all Cloud Work Video customers. It is a powerful tool for IT Administrators who are responsible for managing and maintaining optimal infrastructure and ensuring that the employees in their company can use the communication tools with minimum interruption.

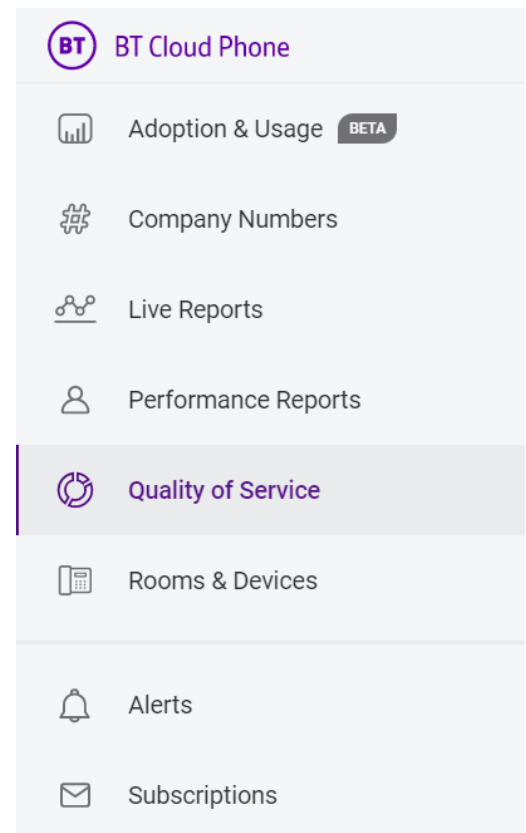
By default, all super admins will have access to this analytics and any admins can be granted access on Cloud Work's agent portal.

Once access is granted, admins can access QoS by going to:

- <https://analytics.btcloudphone.bt.com/qos/calls>

OR

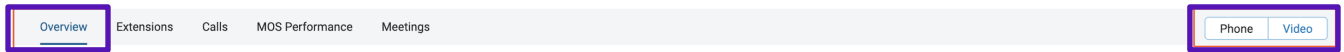
- Accessing "Analytics" tab from within Cloud Work's online agent portal
- Clicking Quality of Service on the left navigation bar
- Clicking on More -> Admin Tools -> Analytics on your mobile Cloud Work application



Product Structure

Quality of Service analytics for Cloud Work Video can be found on the following pages:

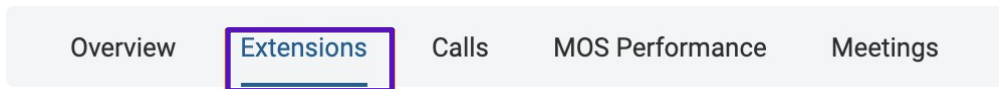
Overview



- Landing page for Quality of Service, Overview tab features broader quality patterns that helps Admins proactively monitor and spot anomalies. Overview page contains both Phone and Video data. To access the Video QoS overview, click on the “Video” switcher on the top right corner. To access Phone QoS overview, click on the “Phone” switcher.

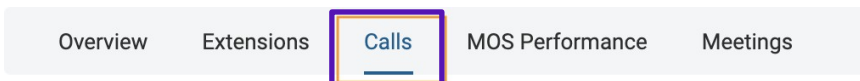
Extensions

- Extensions page contains both Phone and Video data for a specific user/extension. To access Video Extensions, click on the “Video” switcher on the top right corner. To access Phone Extensions, click on the “Phone” switcher.



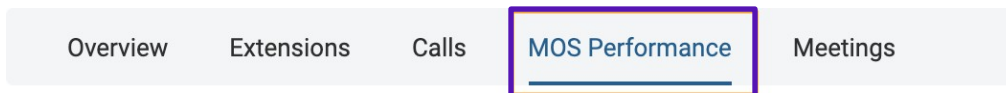
Calls

- The Calls page features a list of all Calls on the account each containing comprehensive troubleshooting data on each leg of the calls.



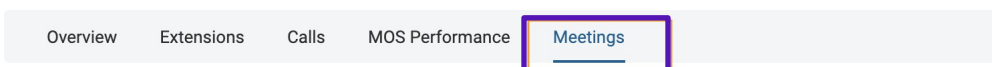
MOS Performance

- Provides Trend of monthly MOS performance compared against SLA



Meetings

- The Meetings page features a list of all video meetings on the account each containing comprehensive troubleshooting data on every session within that meeting.



Quality Scoring and Data Gathering

Phone

Quality of Service data is collected at multiple points during a call and combined to quality score.

Every active call has several connections between participants of the call and the Cloud Work Cloud backend. The connection between each participant (Cloud Work user) and the Cloud Work backend is referred to as a “call leg.”

Each leg has two data streams: 1) from the initiator endpoint to the Cloud Work Session Border Controller (SBC) and 2) from the Cloud Work SBC to the recipient endpoint.

- For the up-stream leg, the quality is measured by a Cloud Work SBC.
- For the down-stream leg, the quality is measured by the endpoint device.

The transport between the Cloud Work endpoint and the Cloud Work SBC is provided by the client’s ISP (Internet Service Provider) and relies heavily on the ISP network quality.

Cloud Work supports and provisions multiple endpoint types: hard phones (Polycom and Cisco devices), desktop (soft client), mobile (application for Android and iPhone), Cloud Work App (web based client). At the end of the call, Cloud Work endpoints send their statistics via an RTCP-XR protocol to the Cloud Work Global Data Collector (GDC) for call score evaluation.

Video

Meetings data for QoS is gathered from Cloud Work Video media servers and the client endpoints from where the meeting sessions are initiated.

In order to understand the video QoS, it is important to know the key terminologies:

Meeting - A video conference with two or more users participating in

Host - User who scheduled the meeting. He/she may or may not actually be part of the meeting

Participant - User who dialed in to the meeting scheduled by the Host user

Session - Connection established with Cloud Work Video service. Each time a user dials into a meeting with a device, a new session is established. A user can have more than one session in a meeting if they dial in using more than one device. Also, each time a session disconnects and reconnects, a new session is established.

Streams - Media channels within a session. Each session can have audio, video and/or screen share streams. Some sessions may have only one of these streams or two of these streams.

Sent Streams - The media data flowing from a user to all other participants

Received Streams - The media data that a user is receiving from all other participants

Quality Of Service Analytics enables IT admins to monitor and troubleshoot meeting quality at the lowest level of granularity which is stream level.

Two types of quality scoring is available for Video Meetings QoS:

1. Stream level quality

- a. Audio Quality: Uses the industry standard audio MOS score.
- b. Video Quality: Quality assessment based on Cloud Work’s proprietary algorithm using requested, available and actual FPS and resolution. Note, there is no industry standard formula available for Video & Screen share quality scoring.
- c. Screen Share Quality: Similar to Video, SS quality assessment is done based on Cloud Work’s proprietary algorithm using requested, available and actual FPS and resolution. Note, there is no industry standard formula available for Video & Screen share quality scoring.

2. Media Signal level quality

On each session, the media signals such as packet loss, jitter, delay etc. are also measured against their expected normal range and highlighted when they reach problematic regions. Refer to the Meetings page for more details.

Mean Opinion Score

Mean Opinion Score (MOS) is a measure of Quality of Experience and it is used to closely estimate the human user’s opinion of call quality. Cloud Work MOS is an aggregate of bandwidth, jitter, packet loss, latency and codecs scores.

Cloud Work’s ability to collect the QoS data elements on the multiple data streams for each

*Absolute Category Rating by Human Subjects
Note that digital lines have a maximum rating of 4.5*

Rating	Label
5	Excellent
4	Good
3	Fair
2	Poor
1	Bad

RingCentral Category Rating Correlation of Algorithmic Estimates

Rating	Label
>= 3.50	Good
3.00 - 3.49	Moderate
<3.00	Poor

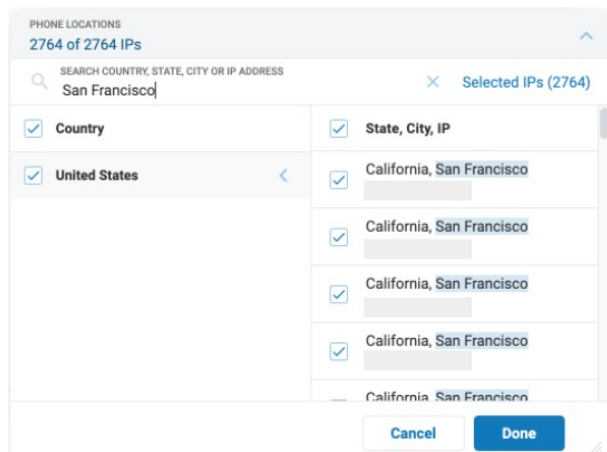
Note: RingCentral may adjust the rating categories based on an actual customer experience. We may boost MOS scores for certain codecs, for example OPUS.

call leg permits correlation between human and algorithmic MOS scores.

Note: MOS scores are used to measure the quality of both Phone calls and audio streams quality in Video Meetings in QoS.

GeoIP Location

Cloud Work uses industry leading IP intelligence services by MaxMind® to associate customers' IP addresses with Geo Addresses. VPN IP addresses cannot be associated with the Geo Addresses and are displayed only as IP addresses that are identified by the internal network or system administrators. See Figure 2. Note: Submit a GeoIP data correction request at the following address: <https://support.maxmind.com/geoip-data-correction-request/>



Note: Same method is used to surface Geolocation for both Video QoS and Phone QoS.

Overview Page

The overviews page enables you to monitor the health of your company's Cloud Work Phone and Video system. Widgets display near real-time information about multiple underlying causes that can contribute to a change in quality. Robust filtering options are available to focus your monitoring and investigations. Figure 3 shows the landing page of QoS Analytics.

A switcher at the top of the overview page allows you to switch between Video & Phone overview.

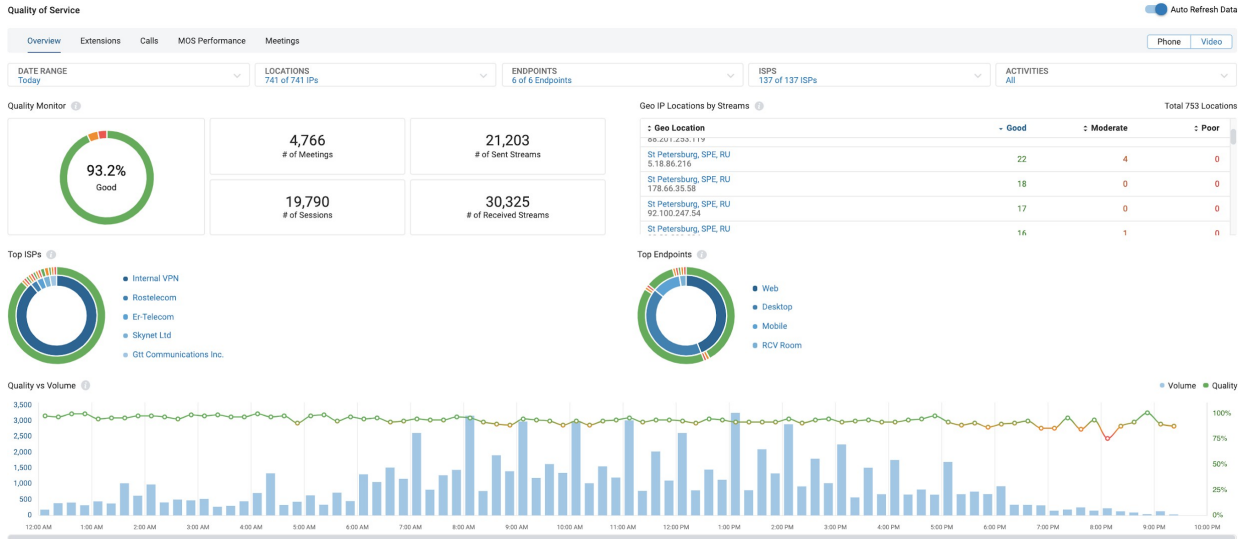


Figure 3 Landing Page of QoS

Filtering on the Overview Page

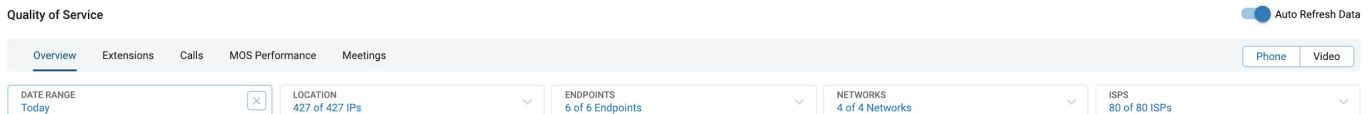


Figure 4 Filters on Overview Page

The first way to apply a filter is to navigate to the filter of interest on the top of the page. Then select the data points you wish to focus on (e.g. for the Network filter, select WIFI). When you select a filter and click ‘Done’, your selection is added under its respective filter type at the top of the page and the information on the page is updated in line with the selected filters. Clicking on the ‘X’ in the corner of the filter drop down menu box removes the selected filters of that specific category and updates the page accordingly.

The following filters are included on the top of the page:

- **Date Range** — Selects call data for user defined time range. The default value is Today.
- **Location Filter** — Filters based on the GeoIP location rendered by MaxMind; for example, particular sites in the United States. See GeoIP section on page 4 for more information.
- **Site Filter** - For premium and ultimate accounts, site filter is available for users to filter call legs or video streams by sites set up in customer portal.

- **Endpoint Filter**—Filters call data based on the type of endpoint connected in theCloud Work network, for example, hard phone or mobile.
- **Network Filter**—Filters call data based on the network connection type of the call leg to Cloud Work cloud backend. For example, only include call data from call legs that use WIFI or ethernet.
- **ISP Filter**—Filter calls by the ISPs used in the enterprise network.
- **Activity Filter** - This filter is only available on the Video overview page. It filters the streams during a meeting session, such as audio, video and screen share.
- **Call Results Filter** - This filter is only available on the Phone overview page. It filters call legs based on call results: voicemail, fax, connected, missed.

When switching between video and phone tabs, the value in the Date Range filter stays consistent, values in other filters will reset.

Interactive widgets let you view QoS data for a category of calls and add filters to the Overview page. Using your mouse to hover over any segment of the double donut displays detailed information. Clicking on the inner ring adds a filter for that selection to the top of the Overview page, while clicking on the outer ring navigates to the Calls page for a deeper analysis into the specific calls represented by the widget.

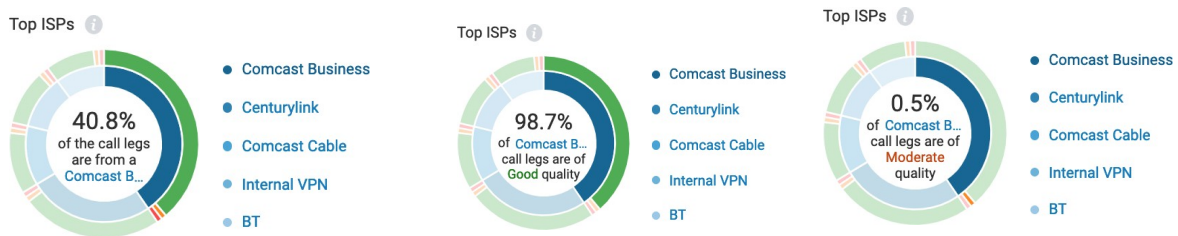


Figure 5 Hovering to See Mobile Call Quality Information

When you hover your mouse over the inner ring (for example, the leftmost widget in Figure 5) you see a percentage of call legs from Comcast Business. If you click on this inner ring, you will set the filter of ISPs to only include Comcast Business call/meetings data. The middle and rightmost widgets show what happens if you hover your mouse over the outer ring. They display the percentage of calls/Meetings with media streams from Comcast Business that have good, moderate, or poor quality.

If you are on the Phone tab, by clicking on the outer ring you will navigate to the Calls page showing data for only Comcast Business calls in the Phone Overview page.

Currently the Video Overview page does not provide the ability to drill down to the Meeting record page.

Overview Page - Video

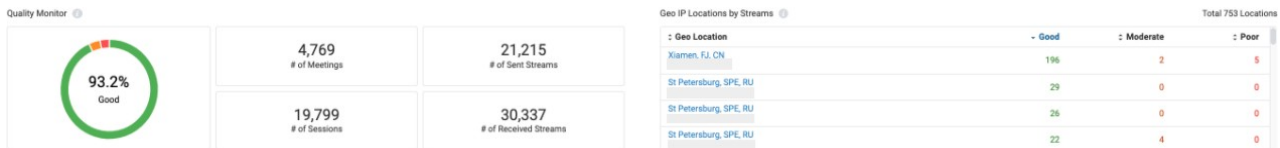
Overview page is the landing page of Quality of Service Analytics. By default the page is set to overview of Cloud Work Video. To access Phone data, click on the “Phone” tab on the top right corner.

By default when you land on the overview page, you see data for “Today”, which allows you to monitor quality in near real-time throughout the day. However, you can also view data for a specific date range you prefer by selecting the “Date Range” filter.

Quality Monitor

At the very top of the overview page, “Quality Monitor” widget helps you monitor the overall health of Cloud Work Video Meetings across your account. On the right hand side, you can see the usage of meetings across your account updated near real time:

- Total number of Cloud Work Video meetings across your account
- Total number of sessions within those meetings
- Total number of sent & received streams within those sessions.



The pie chart on the left side shows you the quality of streams as a percentage of total number of streams. You can see the percentage of streams that were good, moderate and of poor quality by hovering on the pie chart.

This helps you keep track of the overall quality of the Cloud Work Video across your organization.

Ex: For the account shown above, there were a total of 4,769 meetings with 19,799 separate sessions/connections in them. Of those sessions, there were a total of 52,552 streams and 93.2% of those streams were of good quality.

Geo IP Locations by Streams

Top Locations by Streams ⓘ

Location	Good	Moderate	Poor
San Jose, CA, US	4,145	50	33
Singapore, SG	1,148	25	4
Denver, CO, US	534	5	6
Santa Clara, CA, US	517	11	13

Widget above can help you see the top geo locations of your company by the volume of meetings held and the stream quality in each of the locations. You can sort the locations by the number of “Good”, “Moderate” or “Poor” streams or by the name of the location itself. It is also possible to click on one of the locations and filter out the entire overview page to display analytics for that particular location, helping you to monitor quality patterns for that specific location.

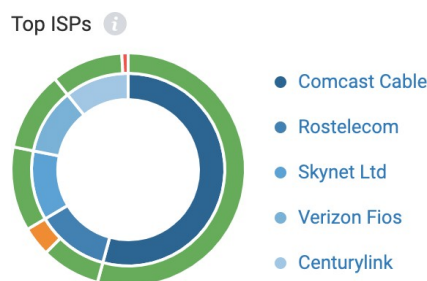
Ex: You have recently made network infrastructure changes to your Chicago Office and you are interested in monitoring the quality in that office location. Clicking on Chicago will update the overview page to reflect data only for Chicago location.

You can also achieve the same result by selecting “Chicago” from “Locations” Filters at the top of the page.

For Connect and Collaborate accounts, you also have the option to view stream quality by Sites as the first tab.

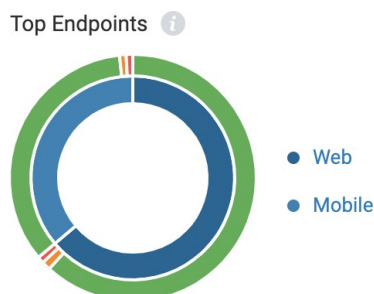
Top ISPs

Top ISPs widget helps you monitor how well your Internet service provider is able to support your bandwidth requirements. From this chart you can see the total volume of video meetings on each of your ISPs in the inner ring and the quality of streams on the outer ring.



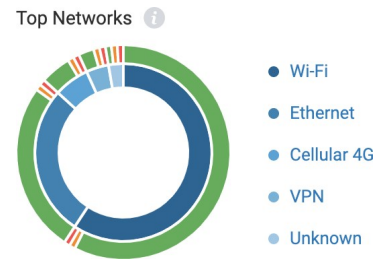
Top Endpoints

Top Endpoints widget helps you monitor quality on the client applications used for video meetings. If you notice a particular endpoint particularly being problematic, you can focus on providing necessary infrastructure support for that or guide your employees towards a more suitable client as per your company’s needs.



Top Networks

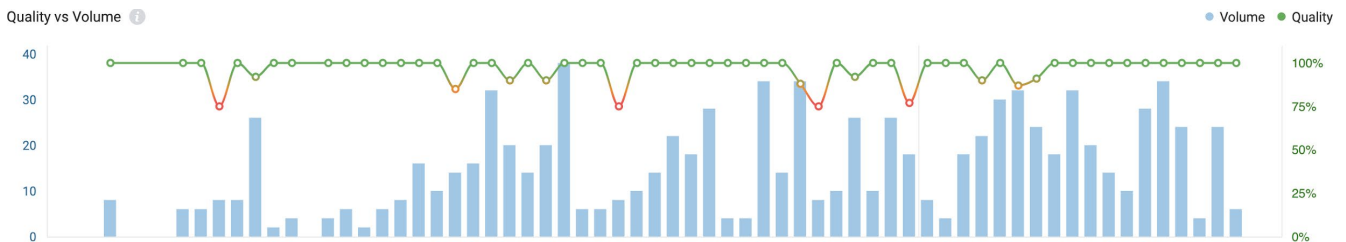
Top Networks widget helps you monitor quality on the network types used for the video meeting. This is especially useful for cases where a certain network type is causing meeting quality issues.



Quality Vs Volume

Quality Vs Volume widget helps you monitor the volume of video meetings throughout the day and how the volume is affecting the quality of these meetings. This helps in two ways:

- Prioritize support based on the volume.
Ex: If you see a poor quality over two video meetings, that may be an anomaly that does not require your attention
- Assess if your infrastructure can efficiently support the volume you have
Ex: You consistently see a certain time of the day has peak volume and quality suffers which may mean your infrastructure is not set up to support the volume



Overview Page - Phone

You can use several widgets to help you understand the status of your phone system. There is a quality monitoring widget, a quality by location widget, quality by endpoints widget, quality by ISP, or quality by volume widget.

Quality Monitoring

The quality monitoring widget is an indicator of the overall call quality of an enterprise. Additionally, it includes a breakdown of calls showing the number of all inbound, outbound, and internal calls. See Figure 7.

Call Volume stats, as shown on the right of Figure 7, can help detect unusual activities that may highlight future capacity problems.

The overall quality of a call is determined by the minimum quality of all call legs. For a call to be considered “Good” all legs of the call must be of “good quality.”

Quality Monitor ?

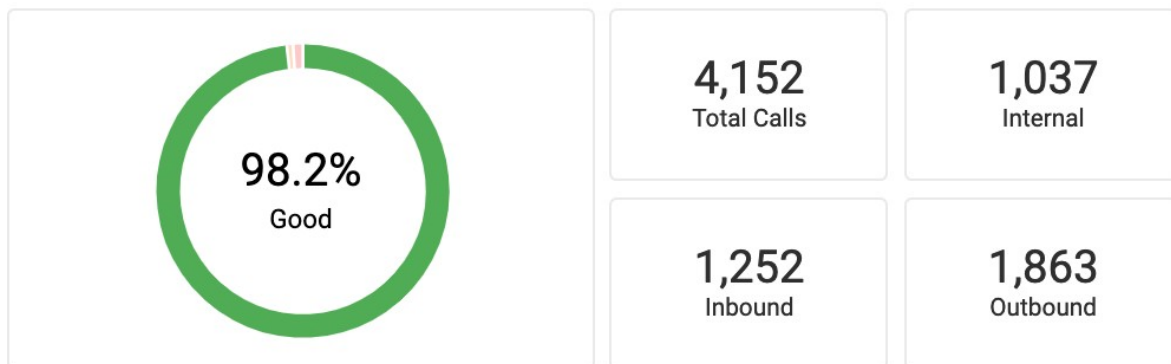


Figure 7

Quality by Location

The GeoIP section of the Overview page compares quality call distribution between business locations to quickly pinpoint issues. This widget provides near real time monitoring and analysis of Global GeoIP locations at the Country, Regional, or Local level. The table includes columns with the number of call legs that fall into the buckets of Good, Moderate and Poor. See Figure 8.

Geo IP Locations by Legs

Total 527 Locations

Geo Location	Good	Moderate	Poor
Denver, CO, US	445	2	3
London, ENG, GB	361	1	3
Denver, CO, US	279	0	1
Internal VPN	202	1	1

Figure 8

Clicking on a location link will filter the overview page to include call data for only that location. Clicking on a quality measurement value for a location drills down to the details of those calls on the Calls page. For example, if you click on the green “445” from the first row of Figure 8 you will navigate to the calls page and display data on only those 445 calls.

By default, the list of GeolP locations is sorted in descending order by the total call volume. Each quality column supports sorting by clicking on the column header.

For premium and ultimate accounts, you also have the option to view call quality by Sites as the first tab.

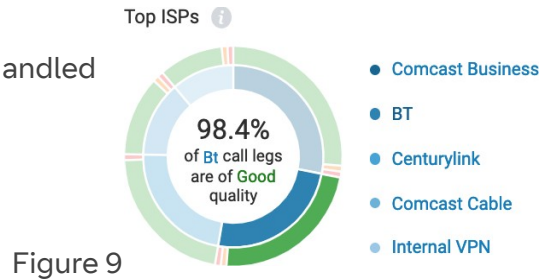
Note: Internal VPN addresses cannot be resolved to GeolP Addresses.

Quality by ISPs

The Quality by ISPs (Internet Service Provider) widget displays the call quality by ISPs. It used to relate a network issue to a certain ISP.

The inside ring represents the breakdown of call volume by ISP, while the outer ring shows what percentage of calls from the selected ISP fall into the buckets of poor, moderate, or good. See Figure 9.

Note: Quality of the ISP's is the overall quality of calls handled by that ISP based on any other filters selected.



Quality by Endpoints

The Quality by Endpoints filter allows you to see call quality data for specific call leg device types (the device users are making/receiving calls on).

The inside ring represents the breakdown of call volume by endpoint type, while the outer ring shows what percentage of calls from a selected endpoint type fall into the buckets of poor, moderate, or good. See figure 10.

Note: Quality by Endpoints is based on the quality of the call leg that belongs to the selected type of endpoint, and not on the overall call. For example, if a call made from a mobile device to a hard phone experiences a mobile service interruption, the overall call quality score is determined as poor. While the poor call quality can be attributed to the mobile endpoint, this does not mean that the call quality score attached to the hard phone user was also poor. For more information Call Scoring and Data Gathering on page 3.

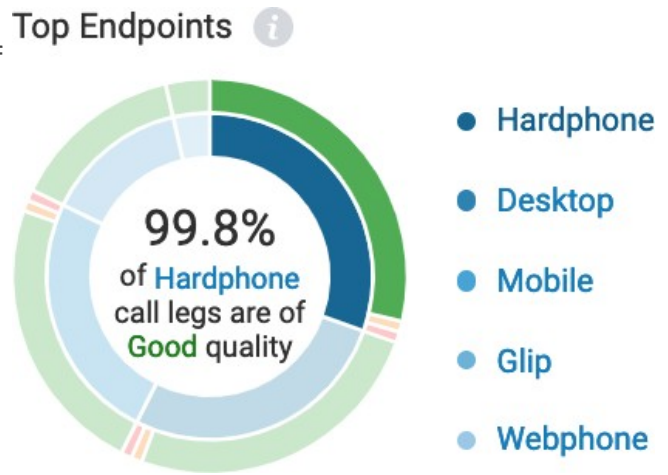


Figure 10

Quality by Network

The Quality by Network widget allows you to see call quality data on call legs grouped by network type (i.e. ethernet, wifi, 3G, 4G). For example, if Adam made a call using ethernet to Bob who is on WIFI, then Adam's call quality data would be grouped into the ethernet category and Bob's would be grouped into WIFI.

The inside ring represents the breakdown of call volume by network type, while the outer ring shows what percentage of calls from a selected network type fall into the buckets of poor, moderate, or good. See figure 11.

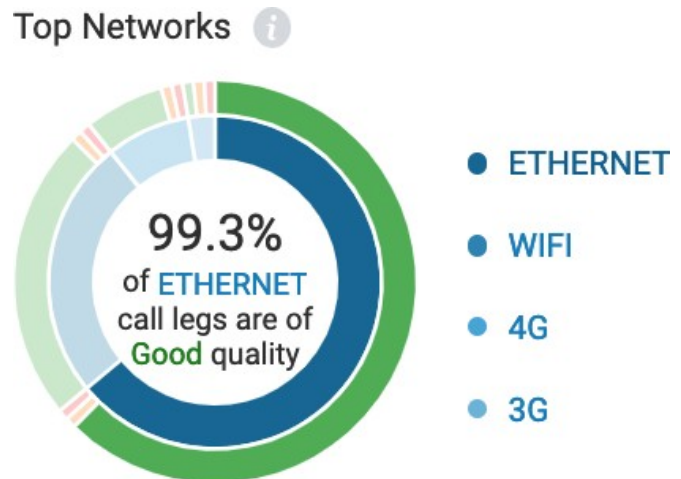


Figure 11

Quality vs Volume

The Quality versus Volume chart shows the percentage of calls with good quality vs. call volume over time. This will help you understand call volume patterns over time, call quality patterns over time, and finally help you see if call quality is affected by volume.

When overall quality drops, the graph changes colors in accordance with its severity. Placing your cursor over any point shows the quality level versus call volume at a time, while clicking on an area of the graph opens the Calls page, with records relating to the time selected. See Figure 12.

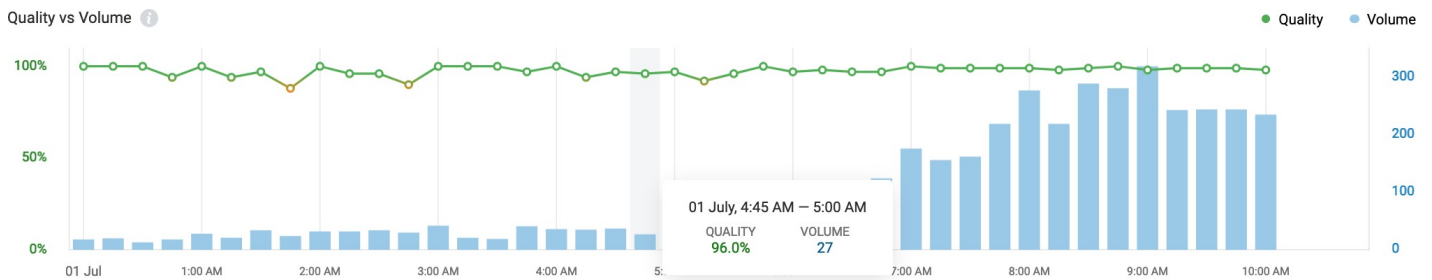
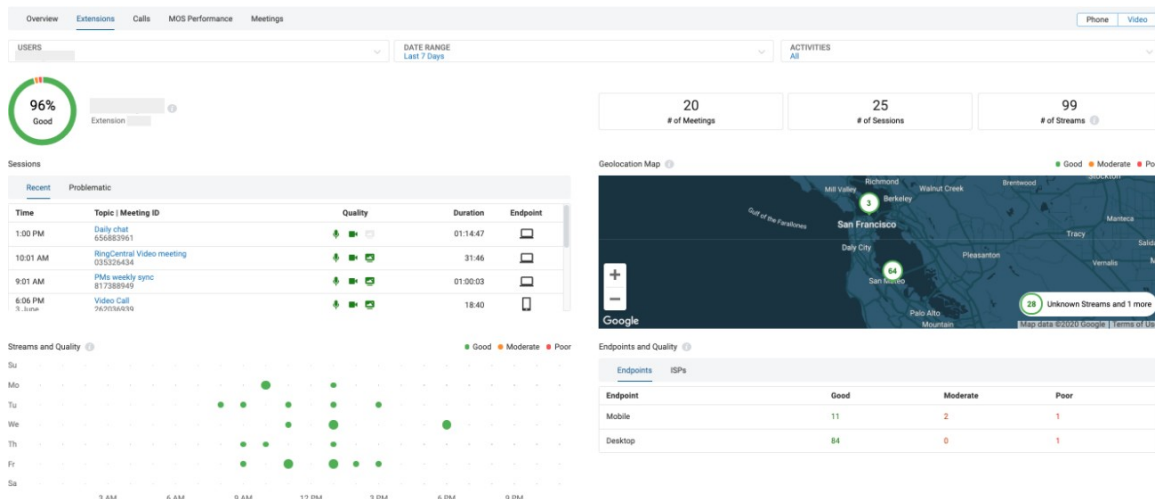


Figure 12

Note: If there are no calls for a time period (volume is 0) then the quality metric connects the quality score from before to the score after the time period. In other words, the line in the graph is shown as continuous even if there are no calls

Extensions Page

The Extensions page features QoS analysis by user name or extension. The page is accessed by selecting the Extensions page tab. It displays the aggregate data for an individual user, allowing for a much deeper analysis of the call or meeting quality by leveraging user specific graphs and trends.



Extensions Page - Video

By default the page is set to Extensions of Cloud Work Video. To access Phone data, click on the “Phone” tab on the top right corner.

You can filter the data by Users (extension), Date range (default to last 7 days) and Activities (All, Audio, Video and Screen Share).

USERS: Ruoxing Liu | DATE RANGE: Last 7 Days | ACTIVITIES: All

Summary

The summary section provides an overview of the volume and quality of meetings of the selected user.



The donut chart on the left side shows the percentage of streams with good (green), moderate (orange) and poor (red) quality. The metrics on the right show the amount of meetings, sessions and streams this user has participated in for the selected date range.

Sessions Table

The sessions table has 2 tabs, Recent shows the latest 10 sessions the user has participated in for the selected date range; Problematic shows the latest 10 sessions where user has experienced moderate or poor experience in one of the streams.

The color coding under the Quality column indicates the quality of each stream in the session. Green indicates good quality, orange indicates moderate quality and red indicates poor quality.

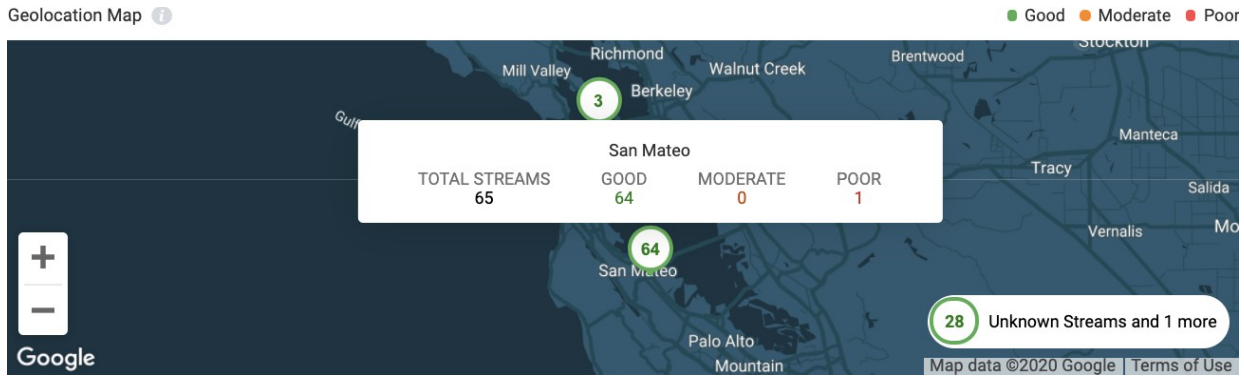
Recent		Problematic		
Time	Topic Meeting ID	Quality	Duration	Endpoint
1:00 PM	Daily chat	● ● ●	01:14:47	
10:01 AM	RingCentral Video meeting	● ● ●	31:46	
9:01 AM	PMs weekly sync	● ● ●	01:00:03	
6:06 PM	Video Call	● ● ●	18:40	

Recent		Problematic		
Time	Topic Meeting ID	Quality	Duration	Endpoint
1:08 PM 29 May	Daily chat	● ● ●	01:49	

You can click on the meeting topic and it will redirect you to the QoS Meetings page with the problematic session expanded for review.

Geolocation Map

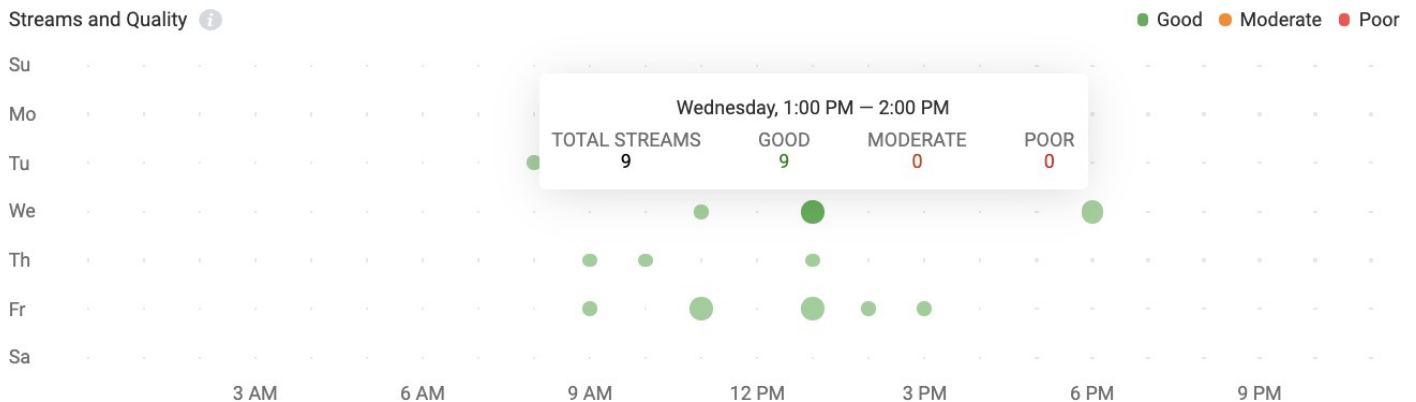
The geolocation map provides a quality breakdown of meeting sessions by location. This helps you understand if a specific location has a high volume of problematic sessions and needs to be further investigated.



The number in the bubble shows the number of good streams that occurred in the location. Upon hover, you can see the quality breakdown of all streams that occurred in the location.

Streams and Quality

Streams and Quality graph provides insights on correlation between stream quality and time of day/day of week. This helps you quickly locate a chronic quality degradation issue. A gradient color scale represents slight variations in quality. The size of the circle corresponds to the amount of streams that occurred during an hour long period for the specified day.



Upon hover, you can see the quality breakdown of streams during a specific hour.

Endpoints and ISPs

Endpoints and ISPs table displays stream quality and volume breakdown by endpoints or ISPs. This is where you can easily spot if a large amount of problematic streams are related to a specific endpoint or ISP.

Endpoints and ISPs

Endpoints		ISPs		
Endpoint	Good	Moderate	Poor	
Mobile	11	2	1	
Desktop	84	0	1	

Extensions Page – Phone

Note: Quality measurements on the Extension page - Phone are based on the selected user’s call leg (part of the call). This means if a quality downgrade was on the recipient leg of a user’s call, the downgrade will not be reflected on the selected user’s data. However, scores on the recent and problematic calls panel displays data based on the complete call experience (both legs).

You can filter the data by Users (extension) and Date range (default to last 7 days).

Calls

The Calls widget provides a snapshot of a user’s call quality for any specified time range. See figure 14.

The Recent tab displays the last 10 calls for the selected user, in order of most recent to least recent, for the selected time.

The Problematic tab displays the user's lowest quality calls in the selected time frame.

The quality displayed is based on the weakest leg of the call, considering both the selected users’ as well as their recipients’ call quality.

- Clicking on the time stamp navigates to the call details.
- Clicking on the user name switches the page focus to that extension.

Calls

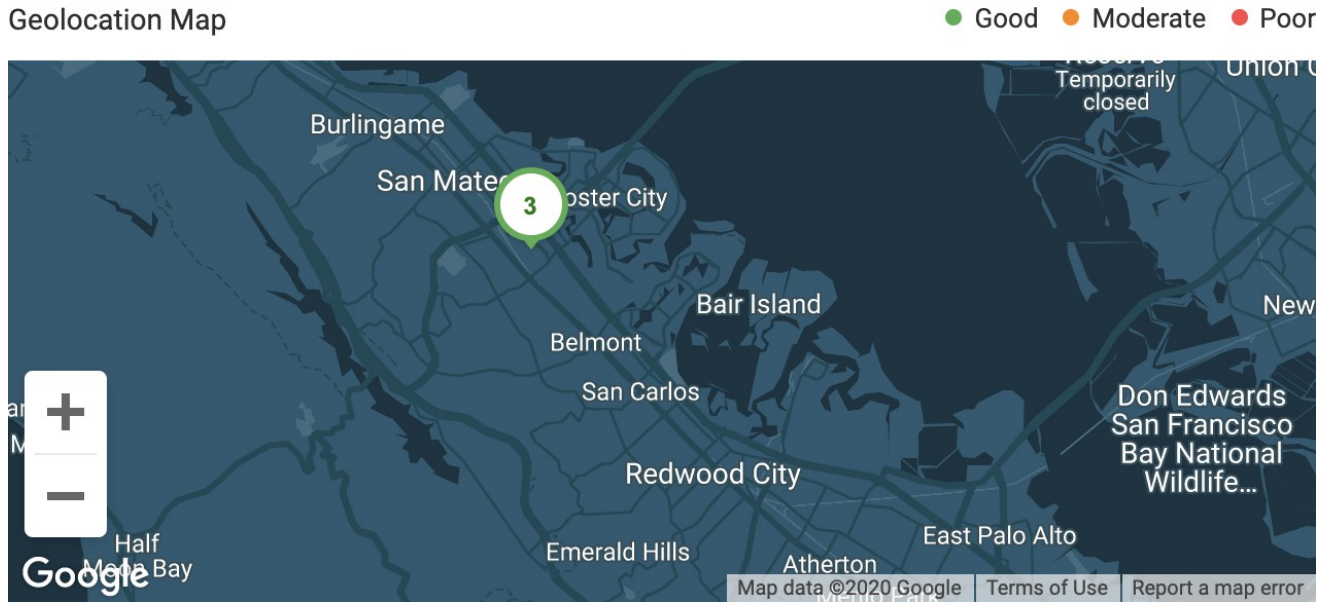
Recent		Problematic		
Time	Name	Quality	Duration	Direction
11:13 AM 24 June	Anonymous (510) 890-3375	Good	03:14	Inbound
7:09 AM 21 June	Anonymous (510) 890-3375	Good	00:23	Inbound
3:07 PM 19 June	Anonymous (510) 890-3375	Good	00:24	Inbound
7:13 AM 19 June	Anonymous (510) 890-3375	Good	00:22	Inbound
11:19 AM	Anonymous	Good	00:24	Inbound

Figure 14

Geo Location Map

The Geo Location Map shown on the EXTENSIONS page lets administrators view the call quality based on the GeoIP Locations that a user made a call.

The color of the circle shows the average quality of calls: green for good, orange for moderate, red for poor and gray for unknown. See Figure 15.



Calls and Quality

Calls and Quality allows administrators to analyze usage and quality patterns, as they relate to time and weekday of calls made. This helps to quickly locate a chronic quality degradation issue. A gradient color scale represents slight variations in quality. The size of the circle corresponds to the amount of calls made during an hour-long period for the specified day. See Figure 16.

Note: Calls and Quality data is based solely on the selected user's call leg only.

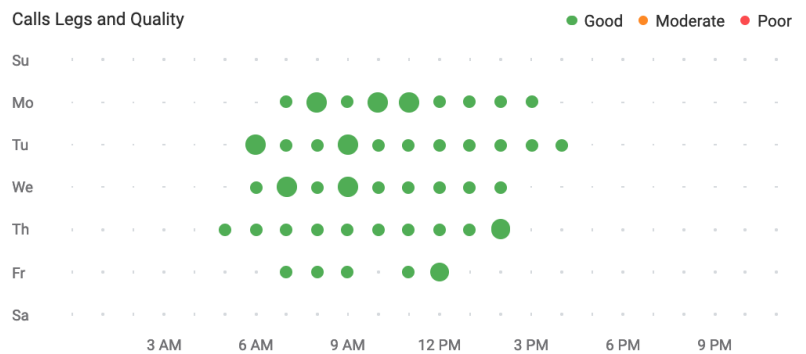


Figure 16

Endpoints and ISPs

The ENDPOINTS and ISPs panel shows the quality scores for all endpoints and Internet service providers in use by the individual during the selected time interval, broken down by average uplink and downlink scores. See Figure 17.

Endpoints ISPs		
Endpoint	Upstream	Downstream
App Desktop	4.1	4.2
App Mobile	4.2	4.3

Endpoints <u>ISPs</u>		
ISP	Upstream	Downstream
Comcast Business	4.3	4.2
Comcast Cable	4.1	4.3
Spectrum	4.2	4.3
T-Mobile Usa	4.2	4.4

Figure 17

Note: The quality scoring of calls on the ENDPOINT and ISP tab is based solely on the quality of the selected user’s call leg only.

Calls Page

The Calls page lets you view call quality data at a per call level, so that you can identify specific quality issues.

The Calls page includes a full list of call records based on your selected filters. Each record contains basic information about the call, its quality, and the record’s Call Card. See Figure 18.

Search Bar

A User, Phone Number, or Extension search identifies calls involving specific users or extensions. By entering a name, phone number, or extension you populate a call record list that is updated with all records containing the text being searched. See figure 18.

Filters

Filters at the top of the CALLS page let you specify a set of criteria to determine which call records to display on the call records list. See figure 18.

- **Date Range** - Filters call data for user defined time range. The default value is Today.
- **Location Filter** - Filters based on the GeolP location rendered by MaxMind; for example, particular sites in the United States. See GeolP section on page 4 for more information.
- **Endpoint Filter** - Filters call data based on the type of endpoint connected in the Cloud Work network, for example hard phone or mobile.
- **Network Type Filter** - Filters call data based on the network connection used by the user to Cloud Work SBC. For example, only include calls from WIFI or ethernet.
- **ISP Filter** - Filters calls by the ISPs used in the enterprise network.
- **Call Quality Filter** - Filters calls by their quality (poor, moderate, or good). If Poor is selected, all calls with at least one poor leg will be displayed. If Moderate is selected, all calls with at least one moderate leg will be displayed. If good is selected, only calls with all legs as good will be displayed.
- **Direction Filter** - Filters call records by their direction (Inbound vs. Outbound), as well as if they are within Cloud Work network or not i.e. “internal.”
- **Call Results Filter** - Filters call legs based on call results: voicemail, fax, connected, missed.
- **Site Filter** - For premium and ultimate accounts, site filter is available for users to filter call legs or video streams by sites set up in customer portal.

The screenshot shows a filter interface with the following elements:

- Search Name or Extension:** A search bar with a magnifying glass icon.
- DATE RANGE:** A dropdown menu showing "Today".
- LOCATIONS:** A dropdown menu showing "1764 of 1764 IPs".
- ENDPOINTS:** A dropdown menu showing "14 of 14 Endpoints".
- NETWORK TYPES:** A dropdown menu showing "7 of 7 Network Types".
- ISPs:** A dropdown menu showing "208 of 208 ISPs".
- CALL QUALITY:** A dropdown menu showing "All Call Qualities".
- DIRECTION:** A dropdown menu showing "All Types".
- CALL RESULTS:** A dropdown menu showing "4 of 4 Call Results".

Figure 18

Download

On the top right corner you will see a Download button. You will be able to download all information of calls into a CSV file using this download feature. Filters applied in the report will also apply to calls downloaded in the file.

Quality of Service [Download](#) [Submit Idea](#)

Overview Extensions **Calls** MOS Performance Meetings

Search Name or Extension

DATE RANGE: Today

LOCATIONS: 2697 of 2697 IPs

ENDPOINTS: 14 of 14 Endpoints

NETWORK TYPES: 6 of 6 Network Types

ISPS: 255 of 255 ISPs

CALL QUALITY: All Call Qualities

DIRECTION: All Types

CALL RESULTS: 4 of 4 Call Results

Call Records Table

After you have selected desired filters, the resulting Call Records Table will contain a row for each call that meets the filter criteria. There are 7 columns that provide information about each call. See figure 19.

Calls Total 16 Calls

	Time	From	To	Direction	Duration	Call Score	Result
📞	21:00 23 October	User Name (650) 500-5555	(213) 509-4444	Outbound	62:03	Good	📞 Connected
📞	17:40 23 October	User Name (650) 500-5555	User Name 1133	Internal	00:06	Good	📞 Missed
📞	23:33 22 October	User Name (650) 500-5555	(213) 509-4444	Outbound	26:39	Good	📞 Connected
📞	23:21 22 October	User Name (650) 500-5555	User Name 1133	Internal	05:22	Good	📞 Connected

Figure 19

Columns:

Time—Contains time when the call was completed. The time is normalized to be consistent with the Administrator's local time zone.

From—Displays call initiator (name and number/extension if available).

To—Displays recipient of call (name and number/extension if available).

Direction—Displays whether the call was outbound or inbound. If both initiator and recipient of the call are members of your organization’s network, this column will read “Internal”.

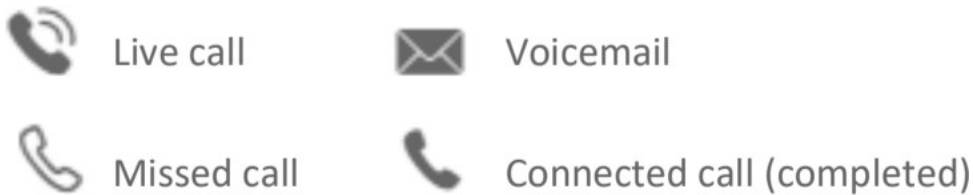
Duration—Displays length of the call. If the call is not yet complete, you will see the word “Live.”

Call Score—Displays overall call quality (poor, moderate, good). If call is not yet complete should see the following: ●●●●

Note: The quality of the overall call is taken from the weakest leg. For example, if one leg of the call has poor quality then the whole call is marked as having poor quality.

- Calls receive quality scores only after they are completed.
- Calls are marked N/A (Not Available) if information is unavailable, such as when an unanswered call goes to voicemail.

Result—Displays an icon representing the result of the call. The icon meanings are as follows:



Call Card

After a call is completed, a Call Card is generated. Each Call Card contains detailed information for both parties involved in the call.

Every row, with the exception of rows with Live Calls, will have a Call Card. If a row has a Call Card, there will be a circle with an arrow pointing down to the far left of row (See figure 20.)

▼	1:50 PM	Mobile App User (720) 789-8967
▼	11:49 AM	RICHMOND CA (510) 890-3375
▼	10:04 AM	RICHMOND CA (510) 890-3375

Figure 20

The call card can be accessed by simply clicking on the row. Included information is each party's upstream and downstream quality as well as other metadata. You can choose which party's information is displayed by selecting the tab at the top of the Call Card. Each tab contains QoS details for the upstream: from the client to the Cloud Work grid and for the downstream: from the Cloud Work grid to the client. See figure 21.

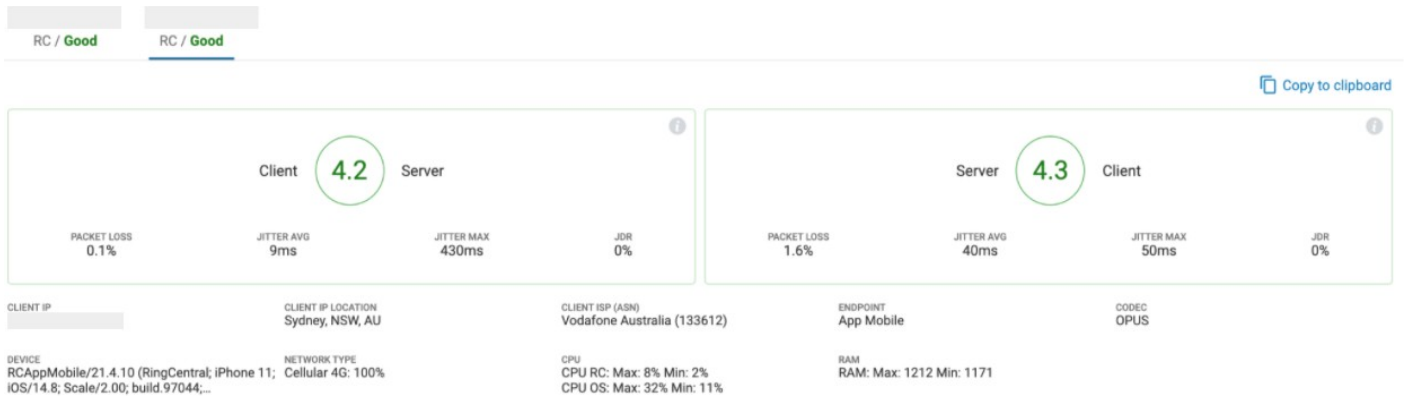


Figure 21

A call's quality score is broken down to these major factors:

Packet Loss—Occurs when one or more packets of data traveling across a network fail to reach their destination.

Jitter—Is the variation in the arrival rate of packets at a destination (endpoint or cloud media processor). The jitter buffer discard rate shows the percent of delayed packages that were discarded because of a long delay time.

Latency—The time taken for a packet to get from one endpoint to another endpoint on the network.

JDR (Jitter Buffer Discard Rate) - The percentage of delayed packages that were discarded because of long delay time.

General information on the call includes the following:

- Client IP - IP address assigned to each device connected to the network. Client IP Location - Location where the Client IP is situated.
- Client ISP - ISP used for that leg of the call.
- Codec - Coder/Decoder Module (as applied to audio data) involved in the call. Endpoint - Type of endpoint utilized by initiator of call.
- Device - Endpoint device model, for example, hard phone.
- Site - Site assigned to the extension for premium/ultimate account.

Mean Opinion Score Performance Page

The Quality of Service Mean Opinion Score (MOS) Performance dashboard provides an overview of call quality levels based on minimum and target MOS thresholds for the previous month. To access the MOS Performance, open Analytics Portal > Quality of Service > MOS Performance.

To deliver superior call quality, we expect a minimum average monthly MOS score of 3.5 or more for Cloud Work core services.

While 3.5 is the minimum acceptable for a good call, we generally aim for an average of 3.8 or above to maintain excellent quality levels. A summary of the key metrics available in the MOS dashboard is as follows:

For All Legs of the Call:

- Daily quality trend for all call legs, not only those within the Cloud Work core network.
- Upstream and downstream quality levels for GeoIP locations, endpoint types and ISPs. This information enables you to immediately identify problematic locations, ISPs, or endpoints.

For Cloud Work Core service:

- Breakdown of MOS averages based on Cloud Work targets. (This is the percentage of calls at least 3.5 or more and the percentage of calls at least 3.8 or more.)
- Average MOS scores of Cloud Work core services.

Note: The Cloud Work Network does not include the public Internet, a Customer's own private network, or the Public Switched Telephone Network (PSTN).

Previous Month Trends

The MOS Performance tool shows the previous month's trends. For example, if in the month of July, it will show the month of June's MOS performance. MOS performance for the past 6 months is available in the portal.

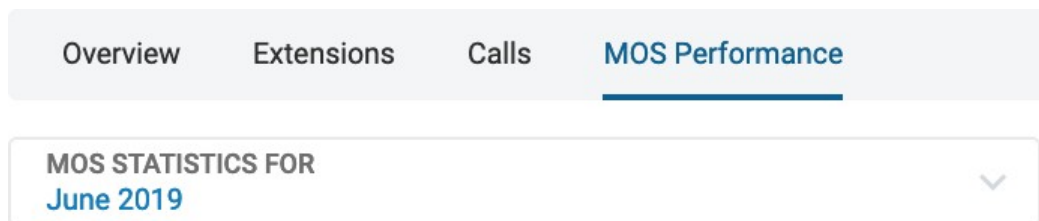


Figure 22

Performance Averages

The chart shows the actual percentage of calls with Cloud Work core MOS higher or equal to 3.5

(see the left donut) and 3.8 (see the right donut).

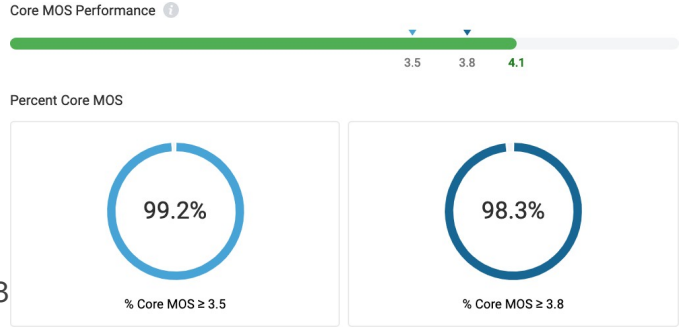


Figure 23

Summary Statistics



Figure 24

These statistics are for the entire month selected.

Daily Trend

This shows a daily trend of average scores for all call legs.

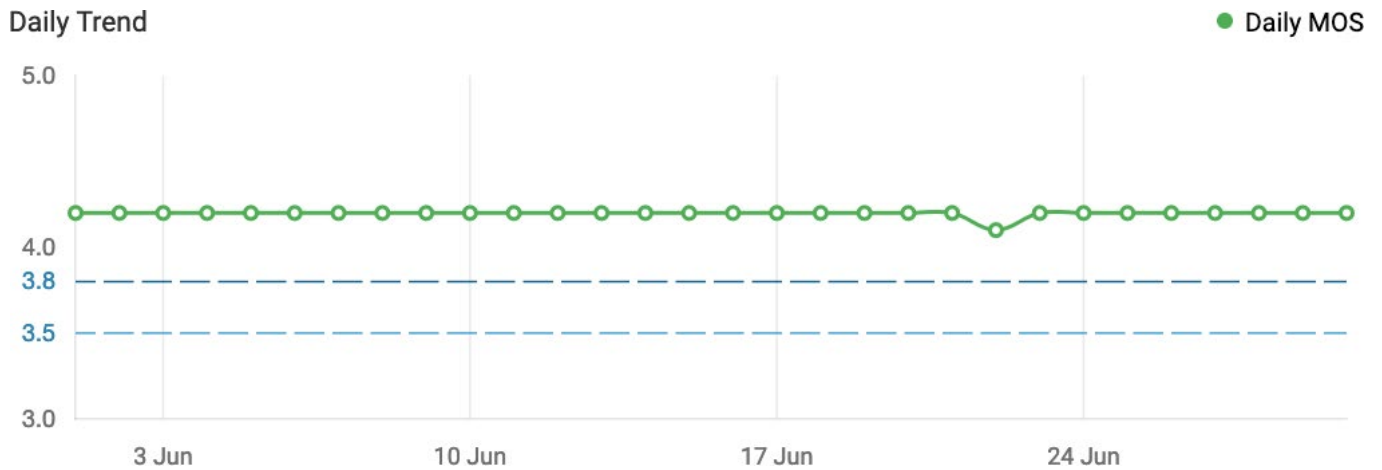


Figure 25

Upstream and Downstream MOS Performance

This section provides insights into the difference between the upstream and downstream MOS performance. All legs, not only Cloud Work core service, are taken into consideration.

Upstream & Downstream MOS Performance i

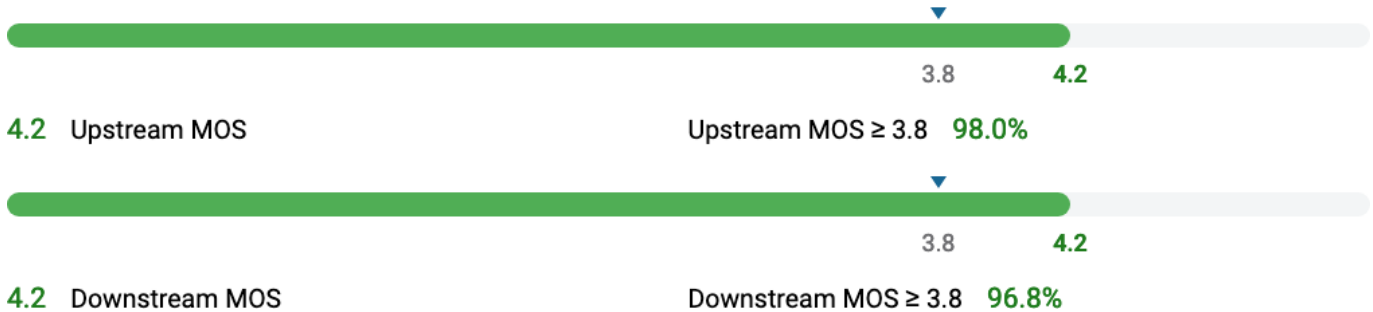


Figure 26

Locations

This table shows averages by Geo Location. The number of calls for the particular location are listed and the upstream and downstream call quality averages for those calls. The Geo Locations listed are the top 8 locations, in terms of number of calls, having an average MOS less than 3.5 and at least 1 call.

Needs Attention i

Total 8 Locations / 8 ISPs

Locations	ISPs		
Geo Location [MOS < 3.5]	Calls	Up MOS	Down MOS
Wakefield, RI, US 108.34.253.97	29	4.2	1.1
Los Angeles, CA, US 107.72.97.57	18	3.3	N/A
Sunnyvale, CA, US 24.130.151.5	15	4.2	2.2
Campbell, CA, US 98.234.77.54	15	3.4	4.2
Sydney, NSW, AU 59.102.123.110	11	4.2	3.4
Charlotte, NC, US 99.203.21.193	9	2.4	4.4
Denver, CO, US 73.95.132.252	9	3.1	4.3
Los Angeles, CA, US 166.176.58.109	9	3.2	4.3

Figure 27

ISPs

This section shows the MOS performance averages by ISPs. The ISPs listed are the most problematic: the top 9 ISP addresses, in terms of number of calls, having an average upstream or downstream MOS less than 3.5 and at least 1 call.

Needs Attention ⓘ

Total 8 Locations / 8 ISPs

Locations		ISPs		
ISP [MOS < 3.5]	Calls	Up MOS	Down MOS	
China Telecom Jiangsu	13	3.4	4.2	
Nessus Gmbh	9	3.0	3.9	
Onwifi Tarragona SI	7	3.3	4.2	
Bitrace Telecom Ltd.	5	1.3	N/A	
M247 Europe Srl	4	3.4	4.1	
Telecom Italia San Marino S.P.A	3	2.2	3.8	
Warian	3	3.0	3.7	
Vyve Broadband	3	3.1	4.1	

Figure 28

Endpoints

The Endpoints section shows a breakdown of MOS Performance by endpoints.

Endpoints

Total 16 Endpoints

↕ Endpoints	↕ Calls	↕ Up MOS	↕ Down MOS
PSTN	250940	N/A	N/A
App Desktop	146171	4.2	4.1
App Mobile	71139	4.1	4.3
Phone Desktop	62022	4.2	4.2

Meetings Page

Meetings page helps you respond quickly to any issues reported on video meetings by your organization's users and troubleshoot effectively by providing you access to granular data presented in an intuitive interface.

By default, when you land on the Meetings page, you will see a list of all video meetings for today across your company. You can filter out the meetings for different date ranges, locations, endpoints or ISPs. To access detailed data about each meeting, you can click on the blue arrow next to each meeting record and expand the card.

The screenshot shows the RingCentral Meetings page with the following filters and table data:

Filters:

- Search Meeting ID · Topic · Name
- DATE RANGE: Today
- LOCATIONS: 4341 of 4341 IPs
- ENDPOINTS: 11 of 11 Endpoints
- NETWORK TYPES: 8 of 8 Network Types
- ISPs: 409 of 409 ISPs
- MEETING TYPES: 2 of 2 Meeting Types

Table Data:

Meeting ID Topic	Participants	Sessions	Host	Length	Start Time	End Time	Activities
RingCentral Video mee... 457750236	1	1	[Host]	Live	10/29/2021 10:20 AM	----	[Activities]
RingCentral Video mee... 479969697	1	1	[Host]	Live	10/29/2021 10:19 AM	----	[Activities]
RingCentral Video mee... 387947049	1	1	[Host]	Live	10/29/2021 10:19 AM	----	[Activities]
[Redacted]	1	1	[Host]	00:16	10/29/2021 10:19 AM	10/29/2021 10:19 AM	[Activities]
RingCentral Video mee... 513790750	2	2	[Host]	Live	10/29/2021 10:19 AM	----	[Activities]
RingCentral Video mee... 066665688	2	2	[Host]	Live	10/29/2021 10:19 AM	----	[Activities]

Troubleshooting Video Meetings

Troubleshooting video meetings is easy with the QoS Meetings page. In order to understand the Meetings page and troubleshooting flow, let's take an example.

- Nick, one of the employees in your company experienced Time quality issues during his meetings and reports to you, the IT administrator. As an IT administrator, you want to be able to,
- Quickly locate the problematic meeting and the session
- Spot the issues that occurred during the meeting, easily
- Follow the wire from user's device to network settings to identify the root cause

The Meeting page enables you to do all of these very easily and efficiently.

Locate the problematic meeting & session

To locate the meeting, you can search the meeting using the Meeting ID, Topic or the name of the user that reported to you the problem. You can search the name of the user irrespective of whether that user is a host or a participant.

You can also narrow down the search results by providing a specific date range if you know and other filter options on the Meetings page.

Search Meeting ID - Topic - Name

DATE RANGE: Today

LOCATIONS: 4341 of 4341 IPs

ENDPOINTS: 11 of 11 Endpoints

NETWORK TYPES: 8 of 8 Network Types

ISPS: 409 of 409 ISPs

MEETING TYPES: 2 of 2 Meeting Types

Meetings Total 4,061 Meetings Show: 10 < Prev. 1 2 3 4 5 6 7 ... 407 Next >

Meeting ID Topic	Participants	Sessions	Host	Length	Start Time	End Time	Activities
RingCentral Video mee... 457750236	1	1		Live	10/29/2021 10:20 AM	----	
RingCentral Video mee... 479969697	1	1		Live	10/29/2021 10:19 AM	----	
RingCentral Video mee... 387947049	1	1		Live	10/29/2021 10:19 AM	----	
432377511	1	1		00:16	10/29/2021 10:19 AM	10/29/2021 10:19 AM	
RingCentral Video mee... 513790750	2	2		Live	10/29/2021 10:19 AM	----	
RingCentral Video mee... 066665688	2	2		Live	10/29/2021 10:19 AM	----	

The search will return one or more results that matched the criteria. The meeting metadata such as start and end time, host and number of participants should help you identify if it is the meeting you are looking for. You can also expand each card to open and see a list of all participants in the meeting. If your search criteria returns only one meeting, it will be presented to you in the expanded state. This helps you locate the meeting in one simple search.

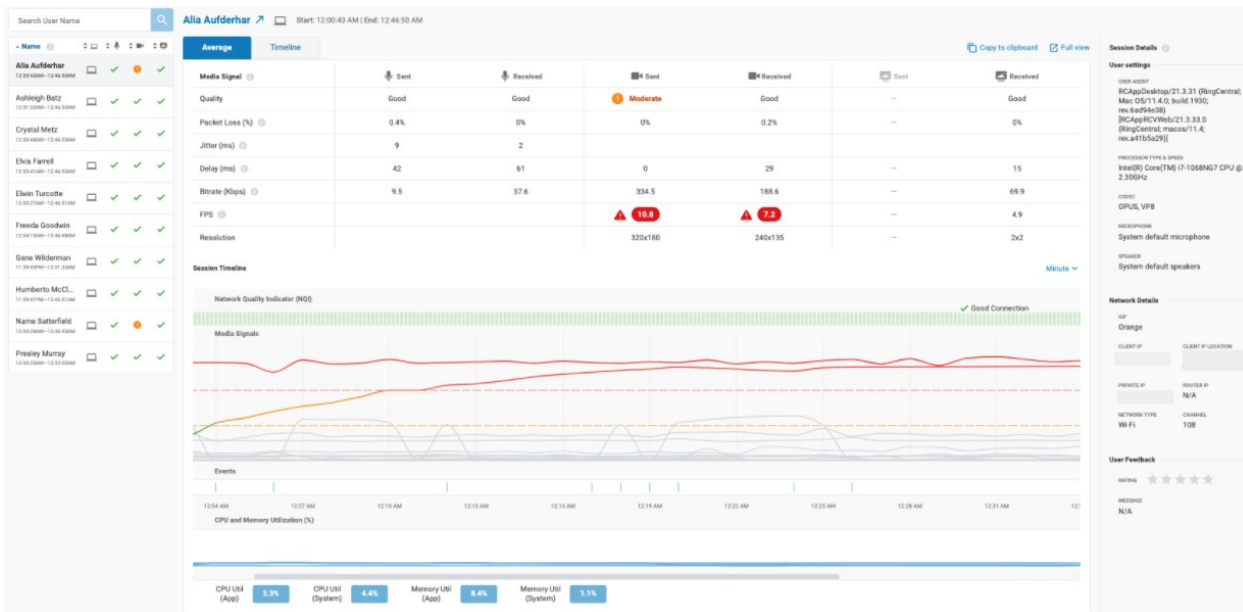
Filters

The filters you can leverage on top of the search function are:

- **Date Range** - Filters meeting data for user defined time range. The default value is Today.
- **Location Filter** - Filters based on the GeoIP location rendered by MaxMind; for example, particular sites in the United States. See GeoIP section on page 4 for more information.
- **Endpoint Filter** - Filter meeting data based on the type of endpoint connected in the Cloud Work network, for example CW App Desktop or CW App Mobile.
- **Network Type Filter** - Filter meeting data based on the network connection used by the user to Cloud Work SBC. For example, only include calls from WIFI or ethernet.
- **ISP Filter** - Filter meetings by the ISPs used in the enterprise network.
- **Meeting Type Filter** - Filter meetings by whether or not End to End Encryption was turned on.
- **Site Filter** - For premium and ultimate accounts, site filter is available for users to filter call legs or video streams by sites set up in customer portal.

Spot the issues that occurred during the meeting easily

Once you have located the meeting you need to troubleshoot, expand the meeting card, if it is not already expanded you will see following details:



On the left hand side is the “User Session table”. This table gives a list of all meeting sessions within the meeting. Each connection established by the participants of the meeting will show up as a separate session with additional information about the session such as:

- Name of the user the session belongs to
- Endpoint used by the user to for this session
- Quality of audio, video and screen share stream of the session

Green check mark indicating that the stream was of good quality

Orange circle indicating that the stream was of moderate quality

Red triangle indicating that the stream was of poor quality

This table allows you to both locate the session that you need to troubleshoot as well, quickly spot the nature of quality issues the user might have experienced.

User session table also provides the capability to search a specific user to help you quickly locate a session in case there were a large number of sessions in a meeting.

Once you have located the session, clicking on it opens that particular session’s details on the right hand side in the details pane. By default, the first user session will be expanded. If there’s a user name in the search box, the first session detail of the searched user will be expanded.

The expanded view offers you two views to check the behavior of all the underlying media signals during the session.

Table View

Table view gives you a summary and deep dive of media signal trend through the meeting. There are two tabs in the table view, Average tab and Timeline tab.

The values displayed in the Average tab, which is the default tab, are the average values of each media signal throughout the session.

The values displayed in the Timeline tab are the values of each media signal at a specific time frame selected in the timeline graph beneath the table. You can switch to the timeline tab by either clicking on the tab or clicking anywhere in the timeline graph beneath the table.

Each of these media signal values are measured against their expected normal range and highlighted as problematic (red pill) when they cross those values, moderate (orange values) when they are not yet in problematic range but about to reach there. When a participant session does not include a specific stream, they are greyed out for clarity.

Average		Timeline		Copy to Clipboard		Full View	
Media Signals ⓘ	🎤 Sent	🎤 Received	📺 Sent	📺 Received	📺 Sent	📺 Received	
Quality	Good	⚠️ Moderate	Good	Good	Good	Good	
Packet Loss (%)	0%	0%	0%	0.2%	0.1%	⚠️ 9%	
Jitter (ms)	6	⚠️ 540	0	6	0	0	
Delay (ms)	⚠️ 132	56	5	5	109	0	
Bitrate (Kbps)	1.2	35.1	34.2	35.3	33.7	34.7	
FPS			29	26	5	6	
Resolution			320x180	320x180	1680x1050	1680x1050	

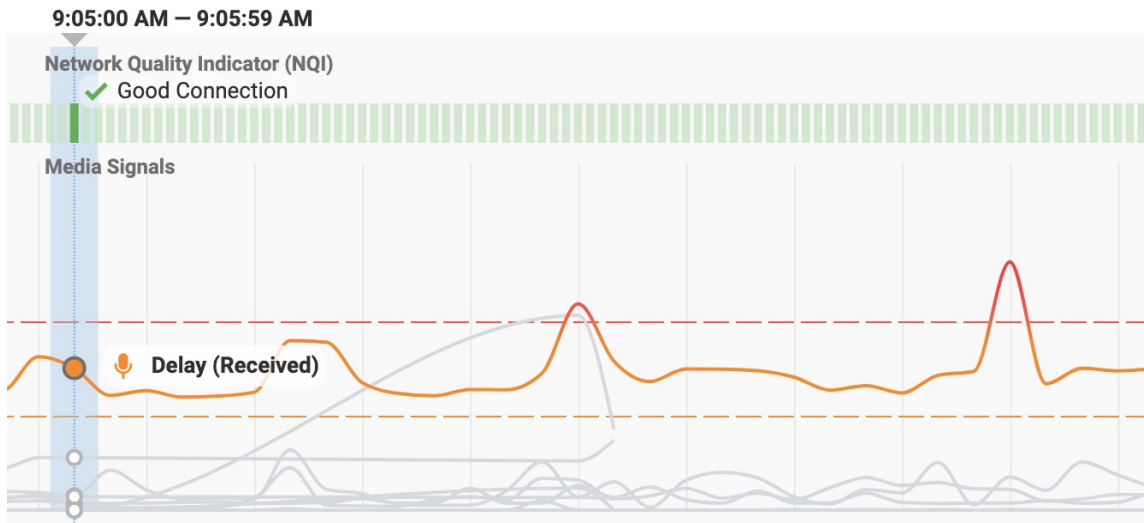
Average		Timeline		Copy to Clipboard		Full View	
3:08 PM - 3:09 PM							
<input type="checkbox"/> All Signals <input checked="" type="checkbox"/> Poor (1) <input type="checkbox"/> Moderate (2) <input type="checkbox"/> Good (25)							
Media Signals ⓘ	🎤 Sent	🎤 Received	📺 Sent	📺 Received	📺 Sent	📺 Received	
Packet Loss (%)	0%	0%	0%	0.2%	0.1%	⚠️ 9%	
Jitter (ms)	6	⚠️ 540	0	6	0	0	
Delay (ms)	⚠️ 132	56	5	5	109	0	
Bitrate (Kbps)	1.2	35.1	34.2	35.3	33.7	34.7	
FPS			29	26	5	6	

Timeline View

Timeline view plots the same media signals on a timeline graph. This view helps you monitor the media signal variation as they happen(ed) throughout the meeting.

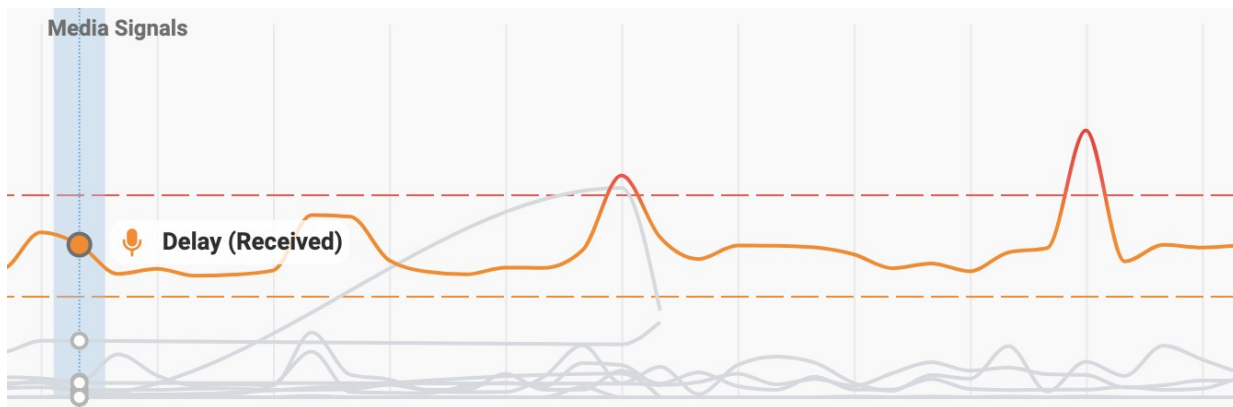
On top of the signal timeline graph, you can see the NQI (Network Quality Indicator) trend of the session. This metric corresponds to the NQI you are seeing in your CW App during a session.

You can identify potential correlation between drop in NQI and deterioration in media signal quality.



These are dynamic variations of the values updated every 10 secs. These signals are also color coded in the same manner as table view, red to highlight problematic values, orange to highlight moderate values and green to highlight normal ranges.

By default timeline view highlights only signals that are poor, but you can highlight as many signals you wish to monitor by selecting signals either by clicking on the signals in the graph or by clicking on the signal values in the timeline table. You can also bulk highlight signals by selecting the options (All Signals, Poor, Moderate and Good) on the top right corner of the timeline table.



When you click on the timeline graph, the graph will highlight the time frame that has the highest peak in the graph, and the timeline table will show the signal values for that timeframe. You can pick a different time frame by clicking on a different timestamp on the graph and dragging the blue timestamp bar to anywhere on the graph

Together, Table View and Timeline view further help you quickly scan and spot the anomalies in media signals that have occurred during the user's session.

How are Poor, Moderate, Good are decided?

When a video conferencing is underway, the network bandwidth, user’s device setup and several other technical parameters decide how the underlying media signals in a session behave and end up manifesting to the participant. As media signals fluctuate and cause different packet loss, delays and jitter, they have the potential of manifesting as quality issues to the end user. In order to provide IT admins an indication that there is a possibility of a quality issue, we measure the media signals as they vary throughout the meeting and compare them against their expected normal range. Depending on how far they go beyond their expected normal range, they are categorized as “Moderate” or “Poor”.

The following table describes how the table view & timeline view:

Audio (Sent & Received)

Signal	Good	Moderate	Poor
Quality	MOS >= 3.5	MOS 3.00 - 3.49	MOS < 3.00
Packet Loss	0-20%	20-30%	>30%
Jitter	<=30	30-150	>150
Delay	<=240	240-400	>400
Bitrate	If >= Expected Bitrate	If < Expected bitrate AND > 90kB/s	If < Expected bitrate AND <=90kB/s

Video/Screen Share (Sent & Received)

Signal	Good	Moderate	Poor
Packet Loss	0-5% (video) 0-7% (screenshare)	5-9% (video) 7-11% (screenshare)	>9% (video) >11% (screenshare)
Delay	<=240	240-400	>400
Bitrate	If >= Expected Bitrate	If < Expected bitrate AND > 90kB/s	If < Expected bitrate AND <=90kB/s
FPS	>20 (video) >1 (screen share)	12-20 (video) 1 (screen share)	<12 (video) 0 (screen share)
Resolution -Video	1280x720 (video) Any (screen share)	640x360 (video) Any (screen share)	320x180 or less (video) 2X2 or less (screen share)

Note: The categorization of signals as poor or moderate is only an assessment of possible quality issues based on their expected normal range but does not reflect the actual perception of quality by the human users. Hence, it is possible that the user may not have perceived any quality issues even when some of the signals were in poor range for parts of the meeting.

Known Limitation: When a participant is on mute, the audio signals sent to the server may indicate very low bitrate which will result in this value categorized as poor. This does not mean the participant indeed experienced poor audio quality.

Follow the wire to detect the root cause

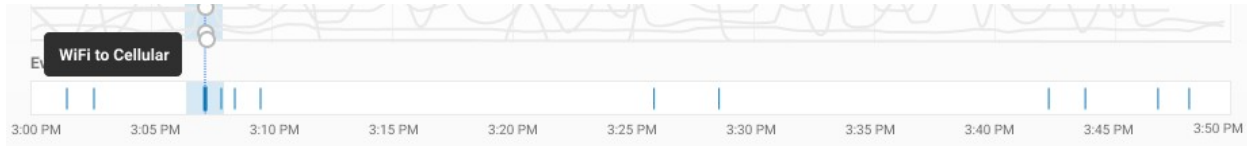
In our research involving IT administrators that work closely with video conferencing solutions, the majority of the quality issues can be traced down to either user’s device - hardware or software configuration or network bandwidth issues. Typically, IT administrators follow a mental model for troubleshooting that we have come to refer to as - “Follow the wire”.

In this model you start with the user's device, network settings and keep following the virtual “wire” connection through which the communication flows.

Meetings Record makes it easy to troubleshoot by providing you with necessary information for this mental model in four sections. Events graph and CPU and Memory Utilization graph beneath the timeline view and Session Details on the right panel.

Events Graph

Events graph helps users understand if changes in the meeting could have an impact on the quality of the experience. Users can hover over a blue bar and review the events for a time frame.



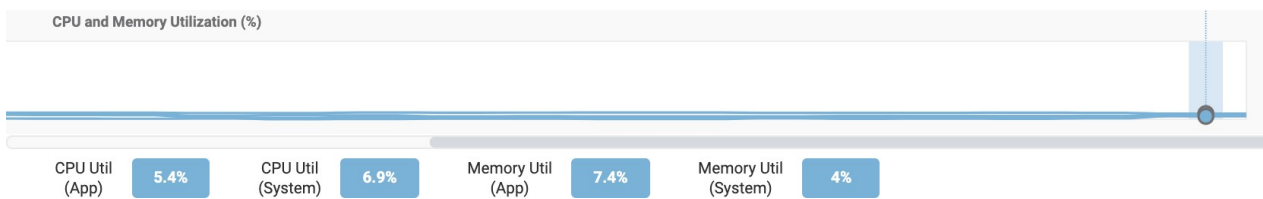
Events include:

- Audio on/off
- Video on/off
- Screenshot on/off
- Network Type, IP and ISP change
- Microphone, Speaker change

CPU and Memory Utilization

CPU and memory utilization graph shows users if the increase in CPU or memory utilization affects the meeting quality. High CPU or memory utilization can have a negative impact on FPS, and in turn lower quality for video and screen share streams.

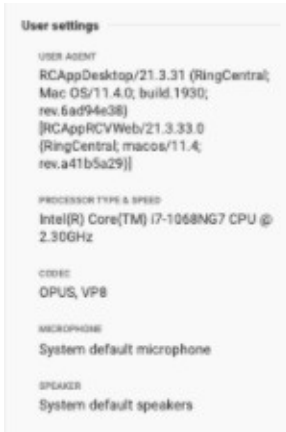
The max of the utilization is 100% in this graph, so in case of multi-core devices, the graph will show average utilization (total utilization/number of cores).



Session Details

There are 3 sections in Session Details. User Settings, Network Details and User Feedback. User Settings shows information about the user's device and peripheral information.

User Settings



User Agent gives you participants device make, model, OS and Cloud Work Client application name and version number used for the meeting session

Processor Type & Speed of the device used for the meetingsession

Codec name and version used for the session

Microphone(s) used during the session

Speaker(s) used during the session

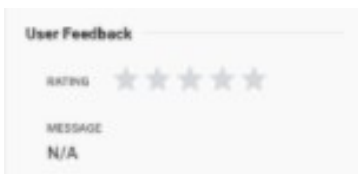
Network Details



- **ISPs** the participant was on during the session
- **Client IP(s) & Location(s)** can help you determine if the participant was at work or home
- **Private IP(s) and Router IP(s)** can help you determine if the participant's issue is related to a specific access point.
- **Network Type(s)** the participant was connected to during the session
- **Channel(s)** shows you if the participant is on a suboptimal WiFi Channel

Combination of all of these helps you identify if the participant's setup was optimal for the best meeting experience.

User Feedback



User's feedback that's submitted post the meeting session will be displayed here.

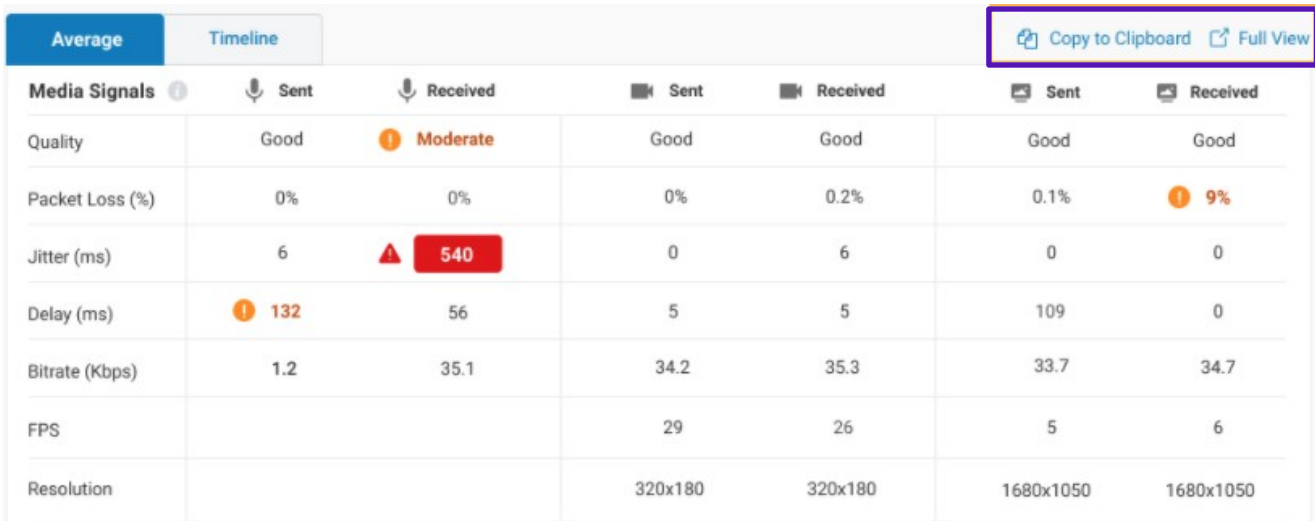
Note: We are continuing to add many more useful data about participant's device, network settings to help you effectively troubleshoot.

Other useful features

The meeting card also offers some additional features to make your troubleshooting experience better.

Full View: Helps you open up the meeting card you are looking at in a full page view in a separate tab. This helps you open as many sessions within the meeting you want in a separate view and compare their signals side by side. Also, to view timeline signals’ real-time update during a live meeting, open the session in the full view.

Copy to clipboard: Copies the raw data behind the table view for you to save for the record, to share it with others on your team for troubleshooting.



Average		Timeline		Copy to Clipboard		Full View	
Media Signals ⓘ	🎤 Sent	🎤 Received	🎧 Sent	🎧 Received	📺 Sent	📺 Received	
Quality	Good	⚠️ Moderate	Good	Good	Good	Good	
Packet Loss (%)	0%	0%	0%	0.2%	0.1%	⚠️ 9%	
Jitter (ms)	6	⚠️ 540	0	6	0	0	
Delay (ms)	⚠️ 132	56	5	5	109	0	
Bitrate (Kbps)	1.2	35.1	34.2	35.3	33.7	34.7	
FPS			29	26	5	6	
Resolution			320x180	320x180	1680x1050	1680x1050	

Frequently Asked Questions

Cloud Work Quality of Service Reports provides near real time information on the global health of the phone system. It allows for proactive monitoring of potential call quality issues as well as targeted investigation to determine the cause of problematic calls.

This feature is available to Cloud Work Office Enterprise, Premium, and Standard editions and can be viewed by Administrators with super administrative permission.

In addition to the Quality of Service feature, you should be familiar with the Cloud Work support article titled [Cloud Work Network Requirements and Recommendations](#). Sometimes problems you may face are due to issues outside of Cloud Work control. This article helps to identify those issues.

How does the Calls QoS Reporting work?

When making a voice over IP (VoIP) phone call, the sound of your voice is broken into thousands of packets. These packets travel various paths on the Internet to Cloud Work and on to their final destination, where they are reassembled. Many factors can affect packets on this

journey, and thus impact the quality of the call. The three most common are latency, jitter, and packet loss.

By collecting quality of service (QoS) information on both media streams (upstream and downstream) for each call participant, Cloud Work can provide in-depth analytics for quick identification of any poor quality calls and patterns in problematic calls for immediate isolation, troubleshooting, and resolution.



Figure 1 How QoS Reports Work

Can I see the details for a particular call?

You can search for a particular call on the Calls Page. Once you have found the desired call, click on it and the Call Card will pop up. The Call Card allows you to see the QoS details for each call participant in separate tabs. Each tab contains QoS details for the upstream: from the client to the Cloud Work grid (green arrow on the picture above); and for the downstream: from the Cloud Work grid to the client (blue arrow).

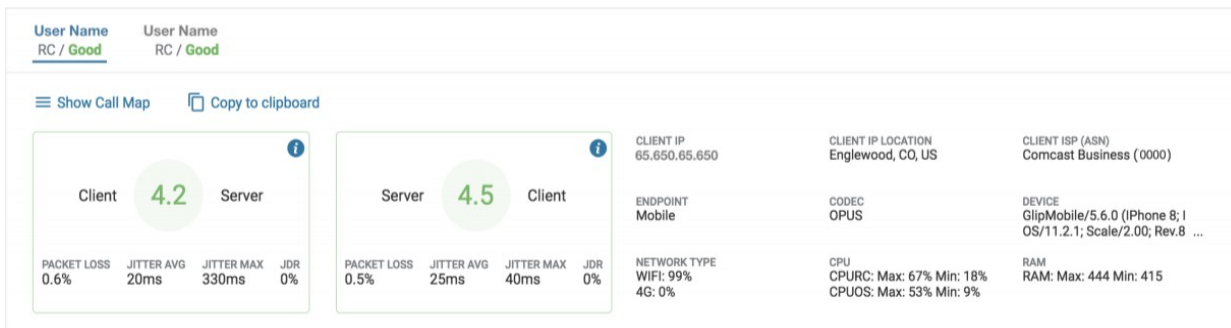


Figure 2 Call Details

What is MOS? What do the good, moderate, and poor qualities mean?

Mean Opinion Score (MOS) is a measure of the quality of experience (over voice or other media domains in telecommunications). It is used to estimate the human users' opinion of call quality. Cloud Work MOS scores are based on algorithmic estimates and rely on the transport measures such as bandwidth, jitter, packet loss, latency and on codecs. For more information view Mean Opinion Score on page 3.

How is the call scored?

The overall quality of a call is determined by the minimum quality of all data streams involved, irrespective of which leg of a call caused the quality reduction. Therefore, for a call to be considered “Good” all legs of the call must be of “good quality”.

Clicking on a particular call record opens a Call Card with detailed information related to both parties involved in the call, information related to each party’s upstream and downstream quality, as well as a detailed breakdown of call metadata.

- The quality score is broken down to these major factors:
- Packet Loss—Packet loss occurs when one or more packets of data traveling across a computer network fail to reach their destination
- Jitter—Related to the variation in the delay of delivery of packets, causing some packets to arrive out of order. See also, Call Card on page 17
- Latency—measure of delay; how much time it takes for a packet of data to get from one designated point to another in a system. See Call Scoring and Data Gathering on page 3.
- Calls receive quality scores only after they are completed.
- Calls are marked N/A (Not Available) if the information is unavailable. For example, when a call went to voicemail or was not answered.

When I see red on the QoS Monitoring Chart, what can I do?

Take Call overview as an example, the red section on the Quality Monitor is showing the percent of calls that have poor quality. The overall quality of a call is determined by the minimum quality of all data streams involved. So, for a call to be considered “Good” all legs and all media streams of the call must be of “good quality” with MOS ≥ 3.5 .

You can click on the red section of the chart. This will navigate you to the calls page and will only display the calls with poor quality. While looking at a list of all the problematic calls may be informative, it is often easier to gain insights using the widgets and tools from the Overview page.

The various filters at the top of the Overview page, widgets, and tables are there to help you pinpoint where exactly the quality degradation is happening and what to do about it. In many cases, there could be a simple explanation. For example, the majority of poor calls could be

directed to the mobile endpoints, where the quality is heavily relying on the connectivity to the cellular system networks.

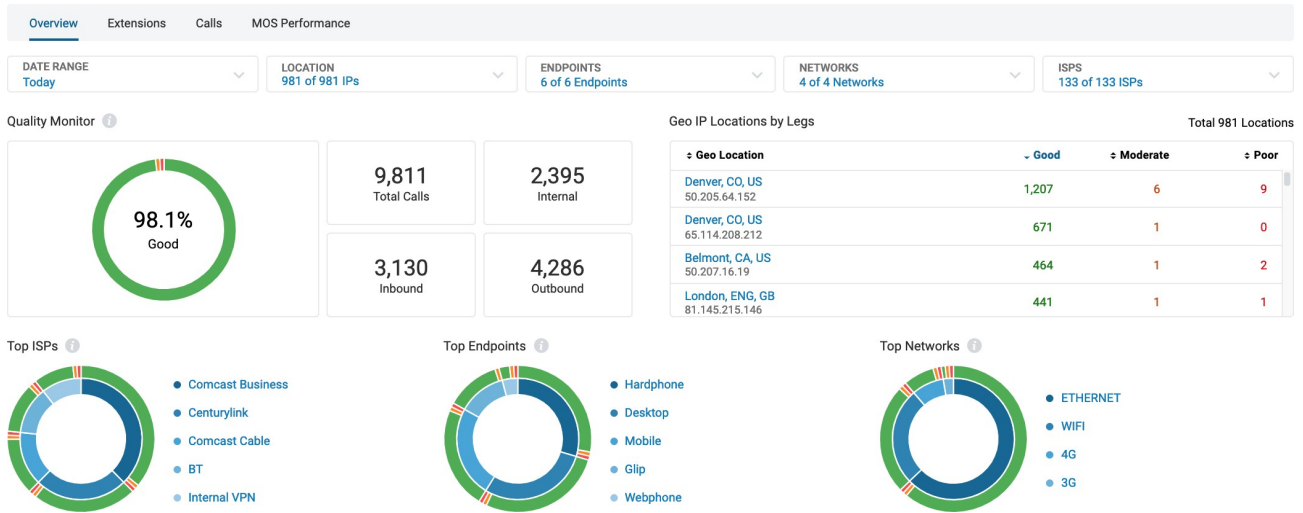


Figure 4 Overview Page

Often you can tie an issue to a specific location. The easiest way to do this is with the table on the Overview page titled “Geo Ip by Legs.” Simply click on the column called ‘Poor’ twice, and the table will display the locations with the highest number of poor calls. Once you have done this, clicking on the IP location in the leftmost column will filter the Overview page to only display information about the selected location.

Another common way to pinpoint the problem is to check the Quality vs. Volume chart at the bottom of the Overview page. This chart can help you identify specific days or times of day when volume is affecting call quality. Repeated behavior of a particular time range in a specific weekday may indicate some scheduled tasks that affect the network bandwidth.

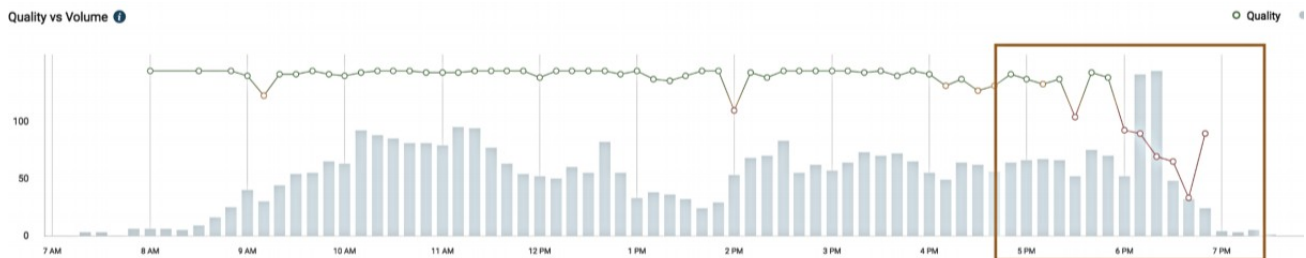


Figure 5 Quality vs. Volume Example 1

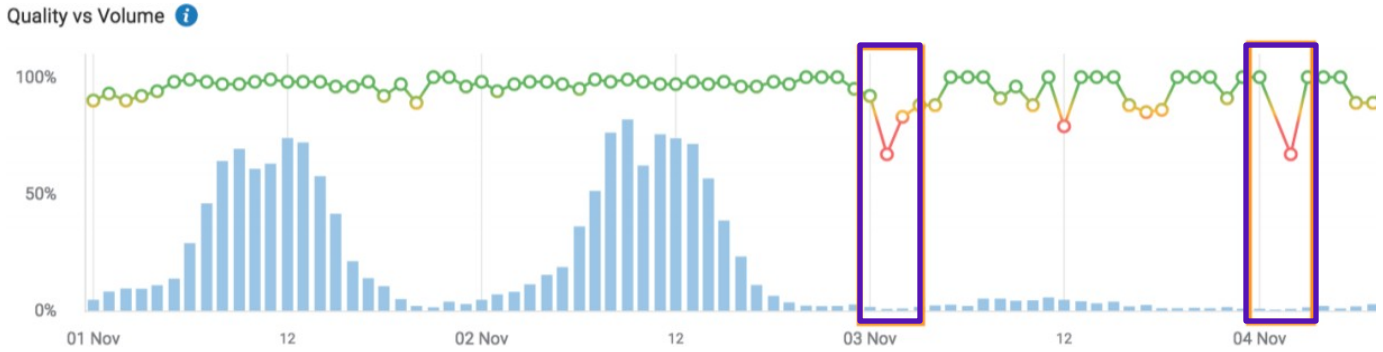


Figure 6 Quality vs. Volume Example 2

If quality does not depend on the number of calls, and is steadily poor, look at the call details.

How do I use double donut widgets?

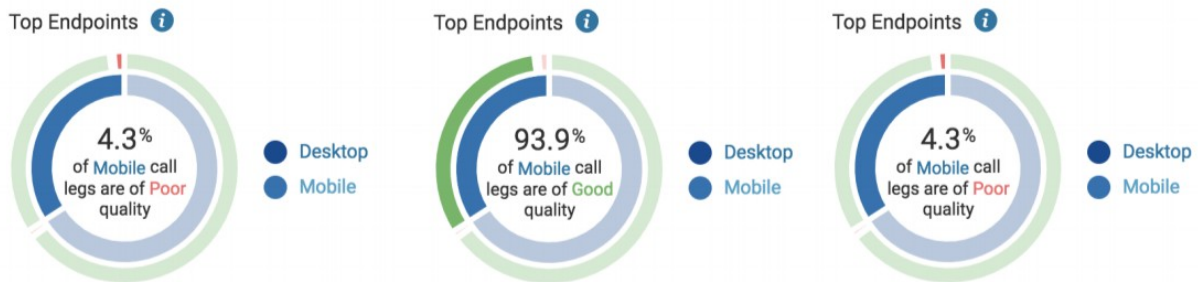


Figure 7 Using Double Donut Widgets

Interactive widgets like the double donut allow users to view QoS data for a particular group of calls and also to add filters to the Overview page. Hovering over any segment of the double donut displays current details of the information over which you are hovering. Clicking on that area adds a filter in-line with the area of the donut to which you are pointing.

In Figure 7, you can see the information shown while hovering over Mobile calls, part of the internal ring of the donut. Clicking on that portion adds a filter to select only Mobile devices. The second and third donuts represent hovering over the outer ring for Mobile devices (good and poor calls respectively). Clicking on that part of the donut shows the corresponding calls.

When I drill into the ‘Good Legs’ from the GeoIP Location table, I see poor and moderate calls listed on the Calls Page?

When you click on the number of good legs in the GeoIP Location table, you are choosing all the calls associated with your selection.

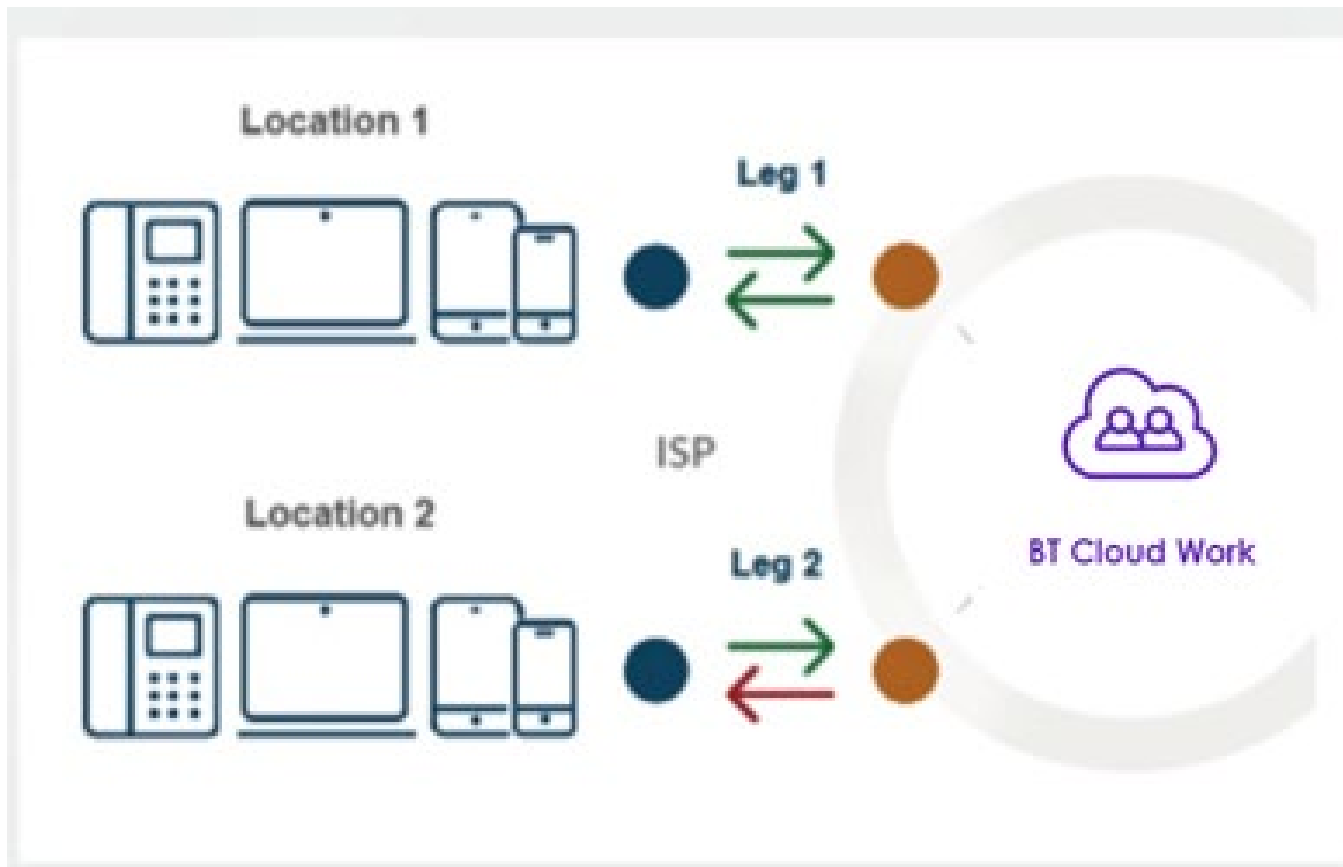


Figure 8 Poor and Moderate Calls

A leg is just a part of the call, one side. Calls have at least two legs, one for the caller and one for the recipient. For the overall call quality we consider the minimum score for all available media streams from all involved legs.

Those calls that have a poor or moderate quality on the side of another participant from a different location or PSTN, will show lower quality for the overall call.

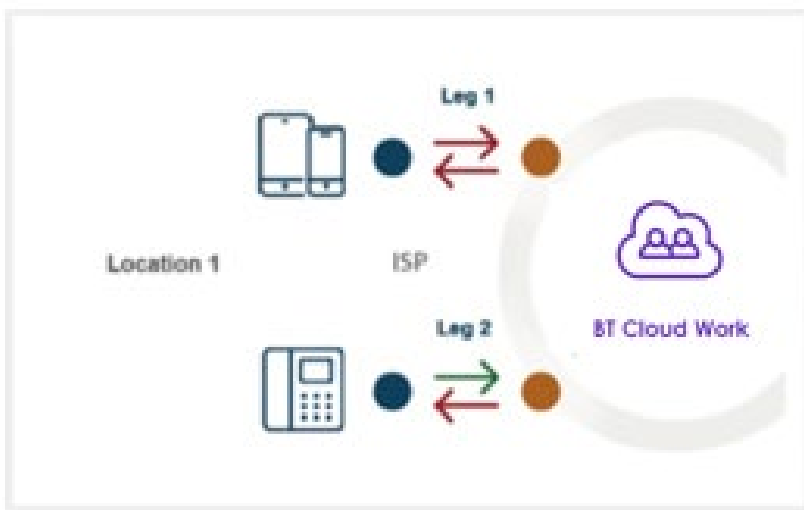


Figure 9 Call Leg Quality

When I drill into the ‘Poor Legs’ from the GeoIP Location table, the number of calls on the Calls Page does not match the data from the Overview page?

Data in the GeoIP Location table is based on the leg’s quality, the part of the call that was initiated or terminated at the particular location and belongs to that location.

In Figure 9, we show a call between employees of the same location with poor quality on both legs (min. of media streams, so Leg 2 also has poor overall quality). In the GeoIP Location table, this results in 2 poor legs quantity. However, in the call list there is one call with overall poor quality. You can see all the details for each participant by accessing the call card.

Do we have QoS on live calls?

We are using tools that monitor live media streams. However, we are receiving quality information reports after call completion. The data on the Call Card represents this information for different media streams.

What quality information is available on the PSTN legs for the incoming or outgoing calls?

The public switched telephone network (PSTN) is the aggregate of the world's circuit-switched telephone networks operated by national, regional, or local telephony operators, providing infrastructure and services for public telecommunication. The PSTN consists of telephone lines, fiber optic cables, microwave transmission links, cellular networks, communications satellites, undersea telephone cables, and fixed-line analog telephone systems, all interconnected by switching centers, thus allowing most telephones to communicate with each other. It includes mobile and other networks, as well as fixed telephones.

QoS information is not available inside the PSTN. The call can start from a fixed telephone on the old fixed-line analog system and go through a number of switching centers before reaching the Cloud Work’ PSTN Gateway. From that moment we begin to capture QoS information.



Figure 14 Capturing QoS Information

Cloud Work captures the QoS data from the last switching center to the Cloud Work core: bright orange arrow above.

On the PSTN calls list, I see a good quality, but experience some voice issues? Because Cloud Work does not have full control over the PSTN, we do not have all the PSTN quality information. The reported value is from portions that are known to us. If there was a significant loss of data prior to reaching the point from which Cloud Work can monitor the quality, we will not be able to identify it.

How is quality in meeting streams calculated?

Audio quality is calculated using standard industry MOS scoring.

Video and Screen share quality is calculated using

- requested resolution, available resolution, actual resolution
- requested FPS, available FPS, actual FPS

Why is packet loss not considered in calculating video or screen share quality?

Packet losses can be compensated by using different tools like NACK and FEC, so packet losses don't directly affect the quality. Also video freezes caused by packet loss are better indicated by frame rate decrease, which is included in the quality calculation for video and screen share quality.

What are the potential root causes for the media signals to have poor quality in an CWV meeting session?

Here is a table of all the media signals shown in the media signal table, their definition and potential root causes for poor quality.

Media Signal	Stream Type	Definition and Impact	Potential RootCauses for Issues
Packet Loss	Audi o Vide o Screenshare	Bits that were lost during streaming because it has not reached its destination. Packet Loss will cause someone’s video to be frozen, have pink dots, etc, and will cause choppy audio.	Network congestion, device performance, etc
Jitter	Audio	When there is a time delay in the sending of the data packets over your network connection	Network congestion, router changes

		A higher level of jitter can cause connectivity problems such as static and echos, distortion and choppy audio	
Delay	Audio Video Screenshare	Round Trip time + playout delay	Server location, network congestion, etc
Bitrate	Audio Video Screenshare	the number of bits that are conveyed or processed in a given unit of time	Bandwidth, speed of internet
FPS	Video Screenshare	Frame per second The higher the resolution and FPS, the higher bitrate it requires	Bandwidth, FPS from source, CPU/memory utilization
Resolution	Video Screenshare	The number of horizontal lines in a video frame. If the resolution is low but the video frame is high, then the video needs to be scaled up, then the video quality becomes suboptimal	Bandwidth, resolution from source, etc

Why do I see poor sent streams on video/screen share even if I don't see any poor media signals in the stream?

It could be a viewer requested higher resolution but the actual sent resolution was lower, which could result in poorer sent stream quality because it didn't satisfy viewer's requests.

Why do I see poor FPS in the video stream, but the stream quality is good?

FPS has static thresholds for quality, i.e. if FPS is lower than 12, it is of poor quality. However, this may be due to the fact that sent stream has low FPS. If the stream quality is good with a poor FPS value, it means that the problem is with the sender of the video stream, that's why the service Cloud Work provides for the received stream is still of good quality.

How is NQI (Network Quality Indicator) calculated? NQI is calculated the same way as shown in your CW App. It uses the metrics below for different streams:

- Audio: Packet Loss, RTT and Jitter
- Video and Screen share: Packet Loss and RTT

Some IP addresses in the GeoIP Location table are missing location data associated with them. Why?

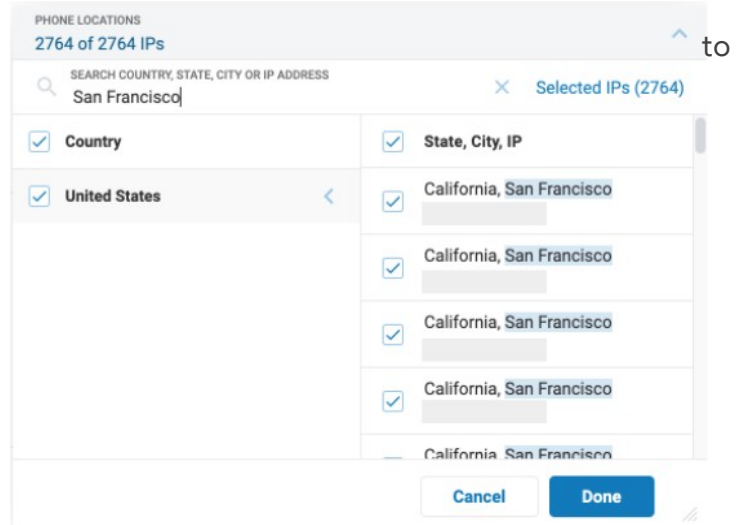
Cloud Work is using industry leading IP intelligence services by MaxMind® to associate customer's IP addresses with Geo Addresses. VPN IP addresses cannot be associated with the Geo Addresses and are displayed as actual IP addresses that are easily identifiable.

What can I do if some IP addresses in the GeoIP Location table do not match our office locations?

You can submit a request for a GeoIP data correction MaxMind.

Use the following link to submit a GeoIP data correction request:

<https://support.maxmind.com/geoip-data-correction-request/>



What time zone is used for the QoS information details?

QoS time zone defaults to the logged in user's settings in Customer Portal. You can edit the time zone on the Settings & Permissions tab under User Details in Customer Portal as shown in Figure 10.

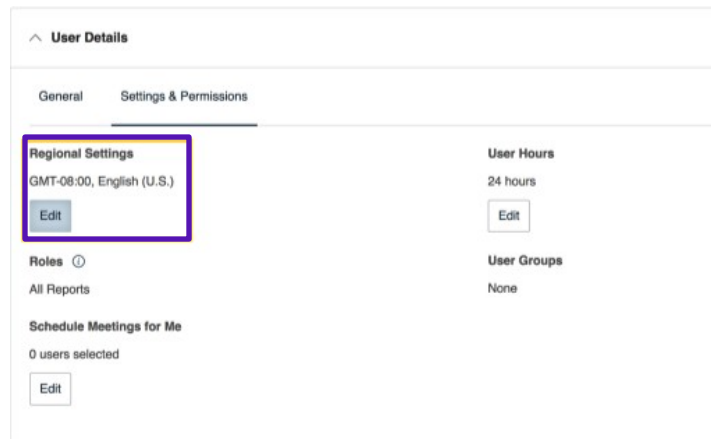


Figure 10 Time Zone

Can I access QoS Reports using the Mobile App?

Yes, you can access QoS Reports on your Mobile App. Under My Profile tap Reports, then tap Quality of Service.

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