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VANTAGE DX ANALYTICS

REAL USER MONITORING

RELEASE 3.5.0

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Real User Monitoring
Release 3.5.0 - June 7, 2022

Contents

Introduction

Document Purpose and Intended Audience

This document provides information about how to integrate the Microsoft Call Quality Dashboard (CQD) with Vantage DX Analytics to monitor real end-user data.

This document is intended for use by administrators and operators.

Revision History

Document Date	Description
June 7, 2022	Vantage DX Analytics Real User Monitoring Release 3.5.0

About Real User Monitoring

This document describes how to use the Microsoft Teams integration to monitor the call quality that your end users experience.

When you configure this integration, Vantage DX Analytics connects to the Microsoft Call Quality Dashboard (CQD). The CQD is a tool that is available in the Teams Admin Center. It monitors all voice and video calls made in Teams and provides call quality metrics within 30 minutes of the end of a call.

You can use this integration to correlate call quality data with factors that impact call quality, such as the ISP, the connection type, or the location of the user. For example, you can monitor the call quality delivered by different ISPs and view SLA data for each of them.

You can also use this integration to view the performance of your Teams service in the context of performance data from your other monitoring systems. This context is important to help you troubleshoot efficiently, because most voice quality issues are caused by problems in the network infrastructure. For example, you can see the status of network infrastructure components that are monitored by PRTG or SolarWinds and understand immediately whether a failed switch is impacting the voice quality experienced by your users.

Getting Started

Use the information in the following sections to complete the following tasks:

- Ensure that your system meets the "Requirements" on page 6.
- "Install the Integration" on page 7

Requirements

The following sections list the requirements for the Microsoft CQD integration.

- "Accounts" on page 6
- "Network" on page 7

If you are using this integration as part of an on-premises deployment, your system must also meet the requirements for VDX Analytics that are described in the *Vantage DX Analytics Installation and Upgrade Guide*. It is available on the Martello website at:

https://martellotech.com/documentation/analytics/

Accounts

Before you configure the integration with VDX Analytics, you must set up the Microsoft CQD and configure an Office 365 account that VDX Analytics can use to access the CQD. Ensure that the account meets the following requirements:

- The account is configured in Azure Active Directory (AD).
- Multi-factor authentication is disabled.
- The account is not federated.
- At a minimum, the account must be assigned a Teams Communication Support Engineer role or a Global Reader role. The account must have permission to access end user identifiable information (EUII). Refer to the information on the following Microsoft website to see the roles that can access EUII:
  https://docs.microsoft.com/en-us/microsoftteams/turning-on-and-using-call-quality-dashboard#assign-roles-for-accessing-cqd

We do not recommend that you use a Teams Administrator role for this purpose.

Network

The server where you install VDX Analytics must be able to access the following URLs:

- The CQD database discovery endpoint: https://cqdrepositoryapiprodv3centralus.azurewebsites.net/tenant/dataservice
- The Regional CQD database endpoint: usually cqd.teams.microsoft.com
- Microsoft Graph Endpoint: graph.microsoft.com
- Extreme-ip GeoIP lookup endpoint: https://extreme-ip-lookup.com/

Install the Integration

Use this procedure to integrate the Microsoft Call Quality Dashboard (CQD) with VDX Analytics.

Before you Begin

Log into the Microsoft Call Quality dashboard through the Office 365 portal and verify that the CQD is activated and accessible.

1. From the main menu, select **Settings**.
   The Integrations tab displays the currently installed integrations.
2. Click the **Add** button at the bottom of the page.
3. Select a monitoring system from the dialog box.
4. Enter the information required for the monitoring system.
5. Click **Save**.

Configure the following properties when you integrate Microsoft Teams with VDX Analytics to monitor remote users:

Property	Description
Source	Read-only. The name of the source system.
Agent	Select a server to communicate with the source system. This can be the VDX Analytics web server or a machine that has a VDX Analytics Remote agent installed on it.
Name	Provide a name for the integration; this name displays on the VDX Analytics interface.
Azure Login Name	The Microsoft 365 account that VDX Analytics can use to access the CQD.

Property	Description
Azure Login Password	The password for the Microsoft 365 account.
Days to Look Back in Call Quality Dashboard	The number of days of data from the CQD to display in VDX Analytics.
Hours to Look Back for Health Status	The number of hours used to calculate the health status of objects. By default, the health status is calculated over 7 days; however, you can edit this value if you want to calculate the health status over a different period of time. For example, you can calculate the health status based on the past 24 hours but continue to display call quality data for the last 7 days.
Display TimeZone	Data collected by the Microsoft CQD is stored in UTC. You can use this setting to have VDX Analytics convert from UTC to another time zone.
Localize call times based on location	Select the checkbox to show calls in the local timezone of the participant. When you select this option, the local time is shown for each endpoint in the call. VDX Analytics uses the geolocation to determine the local timezone. If geolocation information is not available, the timezone defaults to UTC.
Poor Call Warning Ratio (%)	The threshold used by VDX Analytics to trigger a warning about the health status of a user device. Use this field to specify the percentage of poor calls that must occur during the time period used to calculate health status. The time period is set in the Hours to Look Back for Health Status field. By default, the call warning ratio is 20%.
Poor Call Critical Ratio (%)	The threshold used by VDX Analytics to trigger a critical alert about the health status of a user device. Use this field to specify the percentage of poor calls that must occur during the time period used to calculate health status. The time period is set in the Hours to Look Back for Health Status field. By default, the call critical ratio is 30%.

Property	Description
Jitter Threshold	Set the jitter threshold to use.
	Jitter indicates the size of the buffer that is needed to store packets before they are reconstructed in the correct order. Jitter can cause delays in calls and is an indicator of congestion of the network.
	Jitter is averaged over 15-second intervals for the duration of the call. Microsoft classifies call quality as poor when the average exceeds 30ms. By default, VDX Analytics raises an alert when jitter exceeds the 30ms threshold, but you can use this field to change the threshold that triggers an alert.
Round Trip Time Threshold	Set the round trip time (RTT) threshold to use.
	RTT is the time in milliseconds that it takes a data packet to travel from point A to B and return. It is determined by the physical distance between the two points, the speed of transmission, and the overhead taken by the routers in between.
	RTT is averaged over 15-second intervals for the duration of the call. A value over 500ms can cause poor call quality. By default, VDX Analytics raises an alert when RTT exceeds the 500ms threshold, but you can use this field to change the threshold that triggers an alert.
Packet Loss Threshold	Set the packet loss threshold to use.
	The number of packets lost in a 15-second interval. Packet loss is calculated as a percentage. For example, if 1000 packets are sent in a 15-second interval and 50 are lost, the packet loss rate is 5%.
	By default, VDX Analytics raises an alert when packet loss exceeds the 10% threshold, but you can use this field to change the threshold that triggers an alert.

Property	Description
Maximum Data Query Time (in minutes)	The maximum time allowed for a single CQD query. In deployments where there are 25,000 or more users, we recommend that you set this to 120 minutes to limit the amount of data that is returned for each CQD call.
Data Window Incremental Minutes	The amount of time the CQD query will look back from the last call that was loaded into the database. We recommend that you set this to 60 minutes to ensure that all data is captured. In deployments where there are 25,000 or more users, you can set this as low as 30 minutes.
Use Incremental Sync Start	Select this option if you do not want VDX Analytics to retrieve historical data but prefer to retrieve data beginning from the day of the integration.
Anonymize Data	Select this option if you do not want to show identifiable information for your users, such as names, email addresses, and IP addresses. User information displays as number strings.
Disable Caller Resolution	Select this option if you do not want to show identifiable information about call recipients. When you choose this option, VDX Analytics displays the name of the user who placed a call, but does not show the name of the call recipient
Randomize Names	Select this option if you do not want to show identifiable information for your users, such as names and email addresses. VDX Analytics displays randomly generated names instead of real user names.

Property	Description
Add Calls as Separate Components	Select this option if you want each call to display as a separate component in VDX Analytics. ⚠️ **Warning:** This option significantly increases the amount of data that VDX Analytics retrieves and stores. If you select this option, it may impact the performance of VDX Analytics.
Discovery Interval	The interval for collecting components and relationships from the integrated system. The default is 3600 seconds.
Operation Interval	The interval for collecting alerts, incidents, and component health states. The default is 120 seconds.

Data Collected

The following sections provide information about the real-user data that is available in VDX Analytics.

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Data Types

Each monitoring tool uses its own terminology to describe the components it monitors. VDX Analytics standardizes this terminology so that it is easy to correlate data from a variety of source systems. The following table lists the components that VDX Analytics retrieves from Microsoft CQD and how they are displayed on the interface.

Table 1: Data from the Microsoft CQD

Data Collected	Data Type in VDX Analytics	Description
Users	Object	VDX Analytics provides information about the status of the user, such as its health state, the amount of uptime, and the number of incidents and alerts. Raw properties from Microsoft CQD are also available, such as: • Display name • Email address • Department (if set in Azure AD) • Office location (if set in Azure AD)

Data Collected	Data Type in VDX Analytics	Description
User Devices	Object	This object provides information about a user's experience from a specific location and network connection type. It is based on the geographical location of the device, the network connection type, the operating system, and the IP address. Because this object is based on multiple properties, VDX Analytics may display more than one object for each device. For example, if a user receives a Teams call on a mobile device over broadband while that device is also connected to WIFI in the office or at home, VDX Analytics creates two objects: one for the mobile connection and one for the WIFI connection. Each object includes information about the status of the device, such as its health state, the amount of uptime, and the number of incidents and alerts. Raw properties from Microsoft CQD are also available, such as: • ISP and connection type • City and country • Setup information, such as the operating system and codecs • Call quality metrics for the device. See "Call Quality Metrics" on page 15
Geographical locations	Groups	Cities and countries display as groups. These groups are based on the location of user devices. VDX Analytics provides information about the status of the location, such as its health state, the amount of uptime, and the number of incidents and alerts. Raw properties from Microsoft CQD are also available, such as: • The top 25 users for each location • The top 25 ISPs • Metrics about the number of devices and calls. • The group type (City or Country)

Data Collected	Data Type in VDX Analytics	Description
ISPs	Groups	ISPs display as groups. The ISP group is based on the service provider information for user devices. VDX Analytics provides information about the status of the service provider, such as its health state, the amount of uptime, and the number of incidents and alerts. Raw properties from Microsoft CQD are also available, such as: • The top 25 locations that use this ISP • The top 25 users • Metrics about the number of devices and calls • The group type (ISP)
Conference Calls	Groups	Teams conference calls display as groups. The groups contain all of the user devices that were part of that meeting. You can view the group properties to see which users experienced poor call quality.
Dynamic Offices	Groups	A dynamic office is when three or more users participate in a call using the same IP address. VDX Analytics creates a group for that IP address.
TCP Calls	Groups	TCP call groups display all the users that make and receive TCP calls.
Microsoft Data Center	Groups	When a Teams call is initiated, the location of the server that hosts the call is typically determined by the first user to join the call. The call is hosted by the Microsoft data center that is in the same region as the first user. VDX Analytics creates a group for each data center and displays the users who participated in calls hosted by that data center.

Data Collected	Data Type in VDX Analytics	Description
Call rating information	Groups	The Call Rating is the score that users provide when they are prompted to rate the quality of a Teams call. The score is on a scale of 1 to 5 and it is optional for users to provide this rating. You can use this group to see which users are rating calls most frequently and how they are rating their experience. When you view the Raw Properties for the group, the Group Type is listed as CallRating.

Note: If the IP address of a device changes during the data collection period, VDX Analytics creates a new device. In this version, you may see multiple instances of the same device if the IP address of a device is changed.

Call Quality Metrics

VDX Analytics retrieves device-level metrics from the Microsoft CQD integration. The metrics are averaged over all the call streams for the device during the data collection window. Video frame rates are averaged separately for video sessions and for screen sharing sessions, and the highest average frame rate is displayed.

The following table lists the metrics that VDX Analytics displays for each device.

Table 2: Call Quality Metrics

Metric	Description
Last call time	The time of the last call on this device.
Client forward jitter	The jitter from the client to the destination.
Client forward RTT	The round-trip time from the client to the destination.
Client forward video frame rate	The video frame rate from the client to the destination.
Client reverse jitter	The jitter from the destination to the client.
Client reverse RTT	The round-trip time from the destination to the client
Client reverse video frame rate	The video frame rate from the destination to the client.

Metric	Description
Average MOS	A prediction of end-user audio quality experience. It is based on latency, the packet loss, jitter, and the codec used.
Call times	A list of calls, with their start and end times.
Number of poor calls	The number of calls with poor voice quality that occurred during the data collection period.
Poor call times	The start and end times of calls with poor voice quality.
Dropped streams call times	The start and end times when call streams were dropped. Calls do not necessarily fail when call streams are dropped. For example, the video stream may drop but the audio stream may continue.
Failed calls times	The start and end times when calls failed.

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Alerts and Thresholds

VDX Analytics displays alerts for calls where the user experienced poor voice quality. The alerts are based on the settings that you configure for the integration, as well as thresholds that are pre-defined in the Microsoft Call Quality Dashboard (CQD).

VDX Analytics displays alerts for calls made during the data collection period, which you specify when you configure the integration. Alerts are automatically cleared when they are outside of the data collection period. To manage alerts in VDX Analytics, see the *Vantage DX Analytics User Guide*. It is available on the Martello website at:

https://martellotech.com/documentation/analytics/

Alerts are indicators of the call quality experienced by your end users, but they do not impact the SLA calculations. SLA calculations are based on the availability of the business service.

The following table lists the metrics and thresholds that trigger alerts.

Table 3: Metrics and Thresholds for Alerts

Metric	Description
Packet Loss (Reverse Packet Loss and Forward Packet Loss)	The number of packets lost in a 15-second interval. For example, if 1000 packets are sent in a 15-second interval and 50 are lost, the packet loss rate is 5%. If the packet loss rate is greater than 10%, the call is marked as poor by Microsoft.
Video Frame Rate Avg	The average number of frames per second received for a video stream, calculated over the duration of the session. Video sessions in Teams include screen sharing and application sharing. An alert is raised if the average is less than 7 FPS (frames per second). A frame rate of 0 indicates that the video failed to stream.

Metric	Description
Round Trip (Forward and Reverse)	The average round-trip network propagation time, in milliseconds. If this is greater then 500 ms, call quality is marked as poor.
Jitter (Forward and Reverse)	Jitter indicates the size of the buffer that is needed to store packets before they are reconstructed in the correct order. If jitter is above 30 ms, the call quality is marked as poor.
Video Local Frame Loss Percentage Avg	The average percentage of video frames lost as they are displayed to the user, including frames recovered from network losses. If this value is greater then 50% on any video stream, the call quality is marked as poor.
Degradation	The average Network Mean Opinion Score (NMOS) for an audio stream. It is a measure of how network loss and jitter have degraded audio quality. If the value is greater than 1.0, the call quality is marked poor.
Concealed Ratio	The average ratio of concealed samples generated by audio healing compared to typical samples. The audio output at an endpoint is classified as either "normal" or "concealed." 'Concealed samples help improve sound quality by smoothing transitions when packets are lost. High values indicate packet loss or jitter, and result in distorted or lost audio. When the Concealed Ratio is greater than .07, the call is marked as poor.
Client Bandwidth Estimate and End Point Bandwidth Estimate	The average estimated bandwidth available between the first and second endpoint in bits per second (bps). The estimate is based on packet latency.

Working with Data

This section provides information about the default boards that VDX Analytics creates when you configure an integration with the Microsoft CDQ. It also provides some examples of how you can organize and view call quality information.

Default Boards

After you configure an integration between VDX Analytics and the Microsoft CDQ, VDX Analytics automatically creates a set of boards that contain Teams data for that specific Microsoft CQD integration. The following table lists the boards that VDX Analytics creates for each integration.

Table 4: Default Boards for Microsoft CDQ Integrations

Board Name	Description
By Symptom <integration name>	The By Symptom board contains the following sub-boards: • **Users with high jitter <integration name>**—Displays users whose forward jitter or reverse jitter exceeds 30 ms. Forward jitter is the jitter from the client to the destination; reverse jitter is the jitter from the destination to the client. • **Users with high RTT <integration name>**—Displays users whose forward or reverse round-trip time exceeds 100 ms. Forward RTT is the round-trip time from the client to the destination; reverse RTT is is the round-trip time from the destination to the client. • **Users with low bandwidth <integration name>**—Displays users whose average available bandwidth is estimated as low. The estimate is calculated based on packet latency. • **Users with failed calls <integration name>**—Displays users who experienced more than four failed calls over the time period specified in the lookback period configured in the integration settings. • **Wifi Users with poor calls <integration name>**—Displays users who are connected through WIFI and who experienced calls with poor call quality over the time period specified in the lookback period configured in the integration settings.
Teams ISPs <integration name>	This board displays all of the ISPs that provide connectivity for users in the organization.
Teams Locations <integration name>	This board displays all of the countries where your users are connected.

Saved Searches

To monitor end users efficiently, we recommend that you create a saved search and then pin it to a board or business service. The saved search dynamically updates objects on a board or business service when the data changes. For example, if you create a saved search for all Teams users and pin that to a board, the objects on the board update dynamically when Teams users change.

For real end-user monitoring, we recommend that you configure the following saved searches:

- **All Teams users**—Find all Teams users:
  ```
  source.Office365CQD.Name:* AND source.Office365CQD.Devices:*
  ```
- **Countries**—Find countries when Teams users are located:
  ```
  source.Office365CQD.groupType:Country
  ```
- **Geographical regions**—Find all Teams users in a specified geographical region, such as the following:
    - Europe:
      ```
      source.Office365CQD.groupType:Country AND
      (source.Office365CQD.Name:France OR
      source.Office365CQD.Name:Switzerland OR
      source.Office365CQD.Name:"United Kingdom" OR
      source.Office365CQD.Name:Netherlands OR
      source.Office365CQD.Name:Spain)
      ```
    - North America:
      ```
      source.Office365CQD.groupType:Country AND
      (source.Office365CQD.Name:"United States" OR
      source.Office365CQD.Name:Canada OR
      source.Office365CQD.Name:Mexico)
      ```
    - The Asia-Pacific region:
      ```
      source.Office365CQD.groupType:Country AND
      (source.Office365CQD.Name:India OR
      source.Office365CQD.Name:Australia OR
      source.Office365CQD.Name:Singapore)
      ```

Other helpful searches include:

- **ISP and average MOS**—Determine whether poor voice quality is associated with a specific ISP. You can use this information to see whether degradation is related to bottlenecks at specific times, and determine whether your bandwidth is sufficient. The following search finds calls with degraded voice quality that were associated with a specific ISP:
  ```
  source.Office365CQD.ISP:"<ISP Name>" AND
  source.Office365CQD.AverageBandwidthEst:(>0 AND <1) AND
  source.Office365CQD.AverageMOS:(>0 AND <=3.6)
  ```
  , where `<ISP Name>` is the name of a specific ISP, such as "Bell Canada."
- **AudioDevices**—This search allows you to see if a device that you supply to your users, such as an IP phone or headset, is impacting call quality. You can also use this information to see the audio devices in use, and then compare that to Microsoft's list of devices that are certified for use with Teams. The following search finds devices that have a MOS score of less than 3.6:
  ```
  source.Office365CQD.AudioDevices:"Built-In input" AND
  source.Office365CQD.AverageMOS:(>0 AND <=3.6)
  ```
- **Connection Type**—The following search allows you to see which users are connected through WIFI:
  ```
  source.Office365CQD.ConnectionType:"Wifi"
  ```
- **Data related to a specific ISP**—To find data for a specific ISP, create a saved search using the following search

string: `source.Office365CQD.ISPs:"<ISP Name>"`. You can create a saved search for each of your ISPs and compare their performance.

For information about searches and search operators, see the *Vantage DX Analytics User Guide*. To see the entire guide, visit the Martello website at:

https://martellotech.com/documentation/analytics/

To go directly to information about searches and search operators, use the following link:

https://martello-docs.s3.us-east-1.amazonaws.com/iQ_current_web/User/Content/iQ_User_Guide/Perform_a_Search.htm

Boards and Business Services

You can organize boards and business services in any way that meets your needs. Below are some suggestions for how you can use these features to organize call quality data.

- Create a board for all Teams users and pin your saved search to it. This allows you to see the call quality status of all of your end users in one place.
- Create a board for each city or country where your end users are located.

For other examples of boards and business services, refer to the Application Notes for Vantage DX. For information about how to configure boards and services, see the *Vantage DX Analytics User Guide*. The documentation is available on the Martello website at:

https://martellotech.com/documentation/vantage-dx/

View User Data

VDX Analytics provides several ways that you can quickly find and view user data.

- **Search** bar—On the **Home** page, enter the name of the user in the Search bar. When you enter a search term, VDX Analytics returns results on all tabs, not only on the currently selected tab.
- **Component Explorer**—When you view information for a user, you can use the Component Explorer to see all of their devices. A user may not always use Teams from the same device, or the user may use Teams on one device but access it from multiple places or networks. For example, users may connect from the office, from home, from an airport, or on a wired or wireless network. You can search for a user and then use the Explorer tab on the Component page to see the user's devices and setups, and see which one experienced poor quality calls.

For information about how to view data, see the *Vantage DX Analytics User Guide*. It is available on the Martello website at:

https://martellotech.com/documentation/vantage-dx/

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