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STUDIO QoE Report

Overview

STUDIO, the HTML 5 adaptive broadcasting platform, collects activity to help gauge the viewing experience for each viewer during a webcast. With STUDIO, there are two quality monitoring tools.

- **Monitor Tool** - Provides a real-time view into the connection strength for the inbound webcast sources (speakers / moderators) and the outbound delivery of the media via CDN and /or Amplify servers. Drill-down to specific viewer connectivity and statistics is also provided. For additional information about the Monitor Tool, contact your Services representative.

- **QoE Report (Quality of Experience)** - Differs from the Monitor Tool in that it is not a view but a report that is available immediately following the end of the webcast from your Reporting Portal. This report takes more factors overtime into consideration when computing an experience score compared to the point in time as displayed by the Monitor Tool. The purpose of this document is to define how to use the report as well as how the quality value for a viewer is calculated.

QoE Report – Quick Facts

- Applies to STUDIO webcasts and broadcasts
- Report is available immediately following the end of the broadcast
- Available via your Reporting Portal… Contact your Service representative to have access provided

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- Report is a Summary of the viewer activity for each connection. By summary, for example, Errors, buffering, quality level changes and more are summed with each viewer update which is collected every 10 seconds
- iOS and Safari do not report viewer statistics back to INXPO. As such you will see “0” values for many of the columns and the computed quality score should not be used
- Chrome, Firefox, Edge, Safari and Android play Dash… IE 11 plays HLS via Flash-Player… iOS plays HLS using its native player
- Report may be exported in Excel format

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Factors Affecting Viewing Quality

Buffering: Content delivered via the global CDN and/or Amplify can encounter viewer buffering delays. Buffering can display itself in different ways including:

✓ video stops / black screen for 1 to a few seconds
✓ video quality drops
✓ video pixilation
✓ video stutters / freezes

While STUDIO, through the CDNs and Amplify, strive to deliver buffer-free experiences, corporate environments and public internet are outside of our control due to factors such as internet congestion, corporate network traffic fluctuations and the viewer's device which can be resource constrained at times.

Due to the above factors and the internet in general, buffering is a known part of the internet video viewing experience. STUDIO uses a benchmark where if upwards of 5% of an audience (minimum is 100 participants) are having on-going buffering or a specific location is reporting buffering then those need attention.

Multiple Connections: While most viewers will have a single entry in the Quality report, it is not unexpected to see a small number of viewers with multiple connections in the report. When a viewer initially connects to the webcast the connection is established and quality tracking begins and that tracking remains until the viewer leaves the webcast or the webcast ends. However, if a viewer refreshes their browser or someone in the presenter console restarts, then a new connection is established resulting in a unique viewer having multiple connections.

If it is seen that there is a high volume of connections for many viewers then this is an indicator that there was an issue with the webcast and that additional investigation may be required. Contact your Services representative if you encounter a high

number of viewers with multiple connections either for a given webcast or across multiple webcasts.

Quality Levels: STUDIO is adaptive bitrate delivery based, meaning it creates multiple streams ranging from high to lower quality. Adaptive enables a viewer to view a webcast at a quality level that aligns with the available bandwidth to the viewer. The player, not the viewer, automatically selects the quality level by continually sampling the available bandwidth and load times. Quality levels can go up/down based on the viewer's fluctuating bandwidth. It is not unexpected to see these level changes. However, if there is a wide swing (15 or more) in these values then the bandwidth at the viewer's location should be evaluated.

If there is not ample bandwidth for any of the video levels, STUDIO will deliver audio only (HLS only). A move to audio only will have a negative impact on that viewer's viewing experience quality score.

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QoE Columns Descriptions

Column Label	Description & How Interpreted
Name	Viewer's name from their profile
Email	Viewer's email address from their profile
First Report Date	The date and time when this viewer connected
Stream Type	HLS (from iOS, IE11 and Safari) and Dash (Chrome, Firefox, Edge, Android, etc.)
Player Type	Flash Player (IE11), HTML 5 (Chrome, Firefox, Edge, Android), iOS Browser
Duration	For that connection session, how long was the media played / viewed by the viewer
Buffering	For the above duration, what was the sum of all buffering for that viewer's connection
Bytes Downloaded	The volume of content measured in MB or GB that was delivered to the viewer
Avg. Quality Level	Displays the average adaptive bitrate level that was viewed by the viewer. (i.e. 800kbps, 400kbps, 200kbps).
CDN	Which Content Delivery Network (CDN) delivered the content. The standard entry here will be "Akamai FreeFlow EC" which is STUDIO's default content delivery provider. Akamai does not provide data to which specific node a user connects.
IAC Server	Only applies to those customers who have deployed Amplify (STUDIO's Adaptive Caching) technology. This will identify which of the customer's Amplify servers the viewer pulled the content from
Internal IP	Online applies to those customers who have deployed Amplify. This is the viewer's internal IP address, as identified by the Amplify server on the customer's network
Public IP	Viewer's external IP address as recognized by the INXPO platform and can sometimes be used to determine geographic location
Browser	The browser the viewer used to connect to the webcast. STUDIO, as an HTML 5 platform, requires a modern browser such as Chrome, Edge, Firefox and Safari. IE 11 is also supported.
OS	The operating system the viewer used to connect to the webcast
Quality Score	This is a platform computed value 1 through 4. With 1 being a poor-quality score and 4 being the best quality score. This 1-4 scoring directly correlates to the real-time Monitor Tool that uses colors (Red, Orange, Yellow, Green) to identify Quality. Refer to the following section to see the formula used to compute the Quality Score.
City	The city value stored in the viewer's profile (if applicable)
State	The state value stored in the viewer's profile (if applicable)
Country	The country value stored in the viewer's profile (if applicable)
Show Viewer Key	Unique viewer identification within an event / webcast. Is used when additional viewer activity research is required. This is only included in the export of the report.
Byte Count	This is a numeric, unformatted representation of the bytes downloaded. Use this for formulas with Excel. This is only included in the export of the report.

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Quality Calculation

Overview

Ranging from 4 (best) to 1 (poor), INXPO computes the Presentation Stream Quality considering four categories:

- Buffering
- Bitrate (This is defined for each webcast. 800kbps is an example of a targeted bitrate)

Every viewer starts with quality value of 4, then using the following that score will be adjusted downward as required.

Per viewer, computing that 4, 3, 2 or 1 is rather straightforward… If those categories were all good, then they get a 4. Otherwise, based on the severity and/or frequency and/or duration of each category, the Quality is lowered to 3, then possibly to 2 and then possibly even to 1.

Details

Buffering: Based on the column Buffering Seconds, Quality is lowered by 1 for each tier: 10 buffering seconds, 30 buffering seconds and 120 buffering seconds.

Bitrate: There are two ways for this to lower Quality. First, if a viewer had to go to Audio Only (HLS only). Second, if a viewer at less than half of the target bit rate, and their Quality Level changed down too frequently, then this was not a high-quality viewing experience. (That second calculation uses columns Average Percent of Target Bit Rate, Quality Level Changes Down and Duration Seconds to determine if the poor rate was 'bouncing' at least two times every five minutes)