Lync Call Quality Methodology

This poster is a companion visual to CQM as defined in Appendix C of the Lync Server Networking Guide. Download the complete document here:

CQM: Three Roads to Improving Voice Experience

The Server Plant Road

Start

1: Server Plant-Server Health

Assert: Use Health definitions in KHI spreadsheet

Achieve

Maintain

2: Server Plant -AV MCU Server to Mediation Server Streams

Achieve

Use detailed queries to find AVMCU and Mediation server pairs with poor streams:

- Investigate cause of poor streams
- Look at network equipment in the poor stream paths.
- Remediate poor streams
- Define optimal or "gold" configuration for network equipment

Determine your target for poor stream thresholds. Poor streams are:

PacketLossRate > .01 or PacketLossRateMax > .05

Assert (suggest PoorStreamsRatio < 2%)

Maintain

Implement process and tools to manage configuration drift.

3: Server Plant - Mediation Server to Gateway Streams

Achieve

Use detailed queries to find Mediation and Gateway server pairs with poor streams:

- Investigate cause of poor streams
- Look at network equipment in the poor stream paths
- Remediate poor streams
- Define optimal or "gold" configuration for network equipment

Determine your target for poor stream thresholds. Poor streams are:

PacketLossRate > .01 or PacketLossRateMax > .05

Assert (suggest PoorStreamsRatio < 2%)

Maintain

Implement processes and tools to manage configuration drift and to report new problem areas.

4: Server Plant - Gateway Health

Assert (Relevant Gateway statistics)

Identify the Gateway Statistics that show health and define targets against them.

Achieve

Remediate problematic Gateways and define the optimal or "gold" configuration.

Maintain

Implement process and tools to manage gateway configuration drift and to report new problem areas.

When you are confident your Lync servers are running well, look at how media streams between servers are doing.

Maintain

Achieve

Assert (Suggest 0% TCP)

Identify problem subnets and investigate firewall rules, packet shapers and other relevant network equipment configuration.

4: End Points – Media Transport

Achieve

Maintain

IP Packets can use either Transmission Control Protocol (TCP) or User Datagram Protocol (UDP). TCP is optimal for data streams. UDP is connectionless and is more efficient for media since TCP recovery mechanisms cannot address loss in real time media. Lync always prefers UDP, but will revert to TCP if a UDP session cannot be established. Media sessions over TCP will exhibit poorer quality than over UDP.

The network path an audio stream takes from a Lync endpoint can cause poor audio quality.

If audio travels over a VPN connection you might see latency issues. If an internal Lync client cannot establish a direct media stream to another internal Lync client for a two-party or peer-to-peer call, it will fall back to a path that relays through a Lync Edge server, again leading to latency issues as well as increased potential for loss and jitter.

Maintain

3: End Points – Media Path

Achieve

Identify problem subnets and investigate firewall rules, packet shapers, and other relevant network equipment configuration.

Assert (Suggest 0% Media over VPN)

Maintain

2: End Points - System

Achieve

Define "golden" PC configuration including driver versions.

Assert (suggest AudioMic GlitchRate <= 1)

Maintain

1: End Points - Devices

The device or PC processing the audio for a call is the system in this context.

Identify problematic devices and come up with strategy to fix or replace.

Achieve

Assert (suggest AvgSendListen MOS > 3.6 for #Streams > 100)

Users must be sure to use headsets and other devices known to produce acceptable quality when used with Lync.

Start

The End Points Road

2: Last Mile – Wireless

Achieve

Remediate subnets ordered from worst to best.

Implement QoS.

Assert (suggest PoorStreamsRatio < 10% for sites with > 300 streams)

Maintain

Maintain

1: Last Mile – Wired

Achieve

Remediate subnets ordered from worst to best.

Implement QoS.

Assert (suggest PoorStreamsRatio < 5% for sites with > 300 streams)

Start

The Last Mile Road

Of the two ways clients connect to the network, wired is expected to deliver the highest quality and correspondingly this must be your initial focus for last mile issues. Use the CQM Wired query (*LastMile_0_Wired*) and the Poor Streams ratio data it provides.

After you optimize the quality of your wired connections, improving wireless quality becomes easier because the wireless infrastructure sits atop the wired core at each location. Poor wireless streams in a site with good wired quality must be attributed to the specific wireless components. The CQM Wireless query (*LastMile_1_Wireless*) operates on a date range and will return all internal wireless streams in your environment from Lync clients to or from either conferencing servers or mediation servers.

Service Management

Congratulations! You have reached the end state of CQM. To maintain high levels of call quality, monitor these areas:

1. **Users** - Remediation activities should show a measurable increase in user satisfaction. You can measure this by problem tickets or other feedback mechanisms. You can also publish quality metrics.
2. **Process** - define daily, weekly and monthly processes to operationalize CQM. Monitoring rhythm starts at a higher frequency while you are remediating (daily) and moves to a lower frequency (monthly) as you stabilize.
3. **Tools** - identify tools to both measure and remediate. You may find it useful to automate running the CQM queries to support your processes. Remediation may require additional tools for example to enforce standardized configurations on network elements or troubleshooting loss in poor streams.

Prioritize: Run Trending Queries

The first step in CQM is to run each of the trending queries for two weeks and then analyze the results. Prioritize corrective action by the largest stream contributor, the highest poor stream ratio, and managed areas (ones you control). If the AVMCU or Mediation queries show poor results, start on the Red or Server Plant road. If the Wired or Wireless queries show poor results, start on the Blue or Last Mile road. If the VPN or External queries show poor results, start on the Green or End Points road. In the example data below, you would start with Blue or Last Mile road, given the high number of streams and poor streams in the Wired client results.

After you choose a road to start with, define a target for each area (**Assert**), work to meet that target (**Achieve**) and then implement procedures to stay on target (**Maintain**). You can also use this poster as a game to understand the principles behind CQM.

Stream Type	All Streams	Poor Streams	Poor Streams Ratio	Trending Queries
AVMCU to Mediation	4,254	353	8%	Trend_1_AVMCU_Mediation
Mediation to Gateway	11,157	627	6%	Trend_2_Mediation_Gateway
Wired Client MCU/MS	5,153	644	12%	Trend_3_Wired
Wired Client P2P IP	4,000	526	13%	Trend_4_Wired_P2P
Wireless Client MCU/MS/P2P	2,238	407	18%	Trend_9_Wireless Trend_10_Wireless_P2P
VPN	453	59	13%	Trend_7_VPN
External	12,113	1,104	7%	Trend_8_External

KHI

The first thing to look at on the Server Plant Road is the health of your Lync servers. See the companion poster.

PCD

The PreCall Diagnostics tool (PCD) will help you identify and diagnose problems in your perimeter network (the QoE database doesn't collect information on your edge or perimeter network) and also to troubleshoot connections in the Last Mile. The tool is available as both a Windows 8 Modern App or a Windows Desktop App.

Place Cards Here

The Rules

You can use this poster either as a reference to a CQM implementation or as a game to practice the concepts. To play, you will need one six-sided die and the cards provided. A downloadable version of the cards is available to print on standard Avery 5871 business cards.

The game is for 3 players. There are three paths the players can use to achieve the desired quality and reach the center Service Management state: Server Plant, End Point, and Last Mile. Each path has stops along the way where you **Assert** quality targets, **Achieve** goals, and **Maintain** an aspect of your system. Place the cards in the indicated area above, and then draw 5 cards. Review the cards you've drawn and place them on the relevant board segment. Each player moves through the cards on their path step by step, asserting quality targets, achieving those targets, and maintaining the service levels. The game is completed when all players reach the center Service Management state. More detailed rules are provided with the game card download.

Assert — To **Assert** a quality target, review the parameters applicable to that target, and state out loud what you will and won't choose to accept. We have recommended beginning points, but you must make the final call. The exception is KHI data, where the standards established by Microsoft should be used. See the accompanying KHI poster.

Achieve — To **Achieve** in the game, use the cards provided in place of KHI data and system queries. If at the start of the game you did not draw a card relating to a given aspect, you can continue past it. If there is a relevant card, roll the die. If you rolled under the number indicated on the card, you have succeeded. If you roll at or over the indicated number, you must draw another card from the deck. If the card indicates two or more players need to roll, they must all roll successfully.

Maintain — To **Maintain** in the game, state out loud the service management plan regarding that aspect of the Lync environment.

Managed/Unmanaged

The Lync Server deployment and network infrastructure can usually be divided into *managed* and *unmanaged* spaces.

The managed space includes your entire inside wired network and server infrastructure. The unmanaged space is the wireless infrastructure and the outside network infrastructure.

Making this distinction increases the clarity of your data and helps your organization focus on workloads that will have a measurable impact on your users' voice and video quality.

Users have a different expectation of quality if the call is placed on infrastructure that you own (managed) versus infrastructure that is partly under the control of some other entity (unmanaged). This is not to say that wireless users are left to their own devices to have excellent Lync Server experiences.

Improving voice quality in the unmanaged space requires you to have high quality in the managed space. Whether wireless (Wi-Fi) is considered managed or unmanaged space is up to your organization. The techniques to achieve a healthy environment are different in the two spaces, as are the solutions.

Search the download center for this poster to get the cards used to play this game.

Lync

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