nectar
Every Conversation Matters

Redeeming the "P" Word

Making the Case for Probes as an Effective UC Diagnostics Tools

WHITE PAPER

With the growth of Unified Communications, there is an increasing need to effectively identify, diagnose, and remediate network issues that are impacting communications quality and the user experience. There are a set of tool providers that try to solve these complex problems without any component capturing traffic information on the network in real time. These probe-less monitoring tool vendors have neither the capability nor data networking- paradigm knowledge to understand, let alone develop, the technology to effectively analyze UC traffic over the network. Instead, they try to undermine those tools that do effectively use appliances in the network to analyze UC signaling and media packets. These vendors blacklist "probes" that effectively narrow the problem domain and correlate network events to help IT Pros effectively identify, diagnose, and remediate network issues that are impacting communications traffic and the user. Without gathering critical data from the network path, these tools may produce some exciting reports, offer no actionable knowledge on how to fix the root cause of the problem.

The purpose of this paper is to reclaim the word probe as a device used to obtain specific information for diagnostic purposes.

What You Can Do With Probes

Since probes can sit on the network and analyze UC media and signaling packets in real time, they are able to better correlate network activity and identify the location and nature of network events that are impacting UC traffic. Specifically, the value of probes can be seen in these four use cases:

1. Tracking Real Time Voice Quality

Observing every packet in a UC conversation and capturing network call metrics, probes can track key measures of call quality like MOS, jitter, latency, and packet loss in real-time throughout the duration of the call. Most UC platforms neither capture, nor pass on this level of real-time detail, so a probe is the only way to gather it.

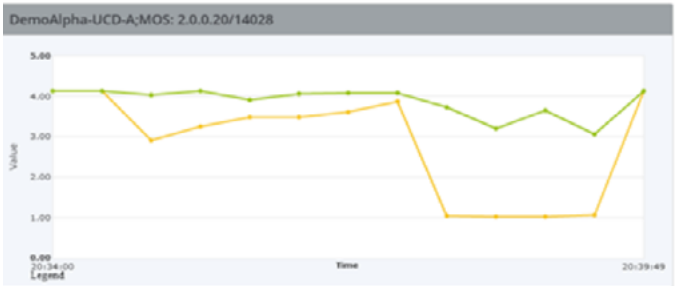


Figure 1: Real Time MOS Over the Course of Call

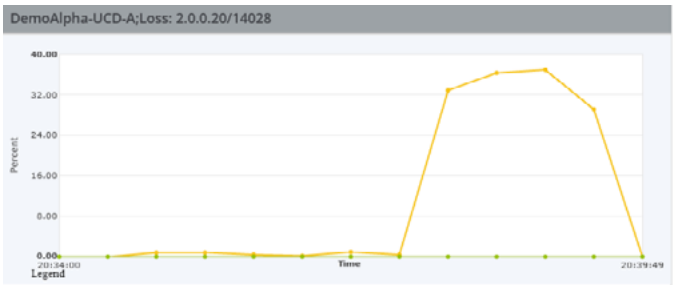
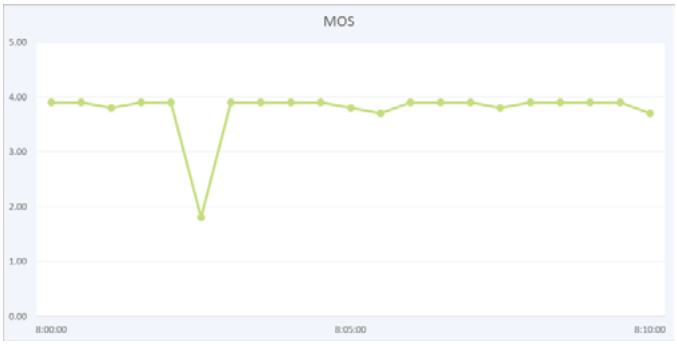
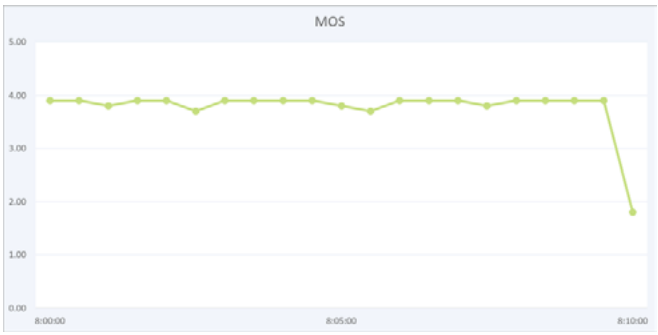


Figure 2: Real Time Loss over the Course of Call

Real time QoS tracking allows the IT Pro to fully understand the user experience. It provides a more exact MOS than a post-call average and demonstrates how much of the call was impacted and whether the impact was at the beginning, in the middle, at the end, or intermittent throughout the call. Without probes, the IT Pro is left trying to extrapolate details from an incomplete vague "picture" of the call. An example of why this is important is shown in the figures on the following page:



Session A



Session B

Although Session A and Session B have the same average MOS, 3.77, the user experience is very different. During Session A there was a period of poor audio quality near the beginning of the call. After the period of poor audio quality, the conversation continued for 8 minutes without issue. When the users ended the call, it is unlikely they recalled the momentary quality issue. During Session B the period of poor audio quality occurred at the end of the call and may have caused the users to terminate the call. In this second scenario the users are likely to believe the call had poor quality and be dissatisfied with their experience. From looking at only the average MOS reported at the end of each call, support personnel could not differentiate between these two call scenarios and the very different user experiences. Ironically, a 3.77 is generally considered a "Fair MOS", so neither call would have triggered an alert in those systems that only gather post-call averages.

2. Segmenting the Conversation

Since UC conversations are ultimately two, one-way streams, strategically placed probes can help identify which segment of the network impacted the conversation quality.

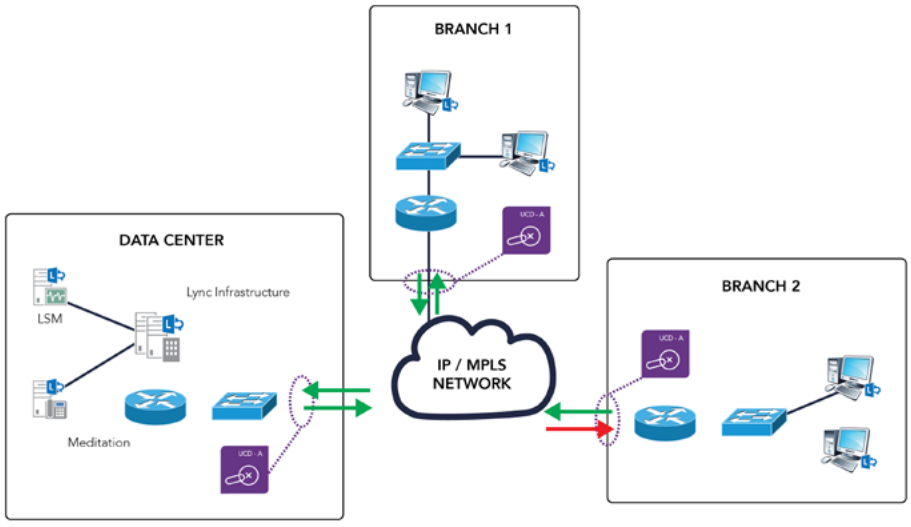


Figure 3: Segmented UC Conversation

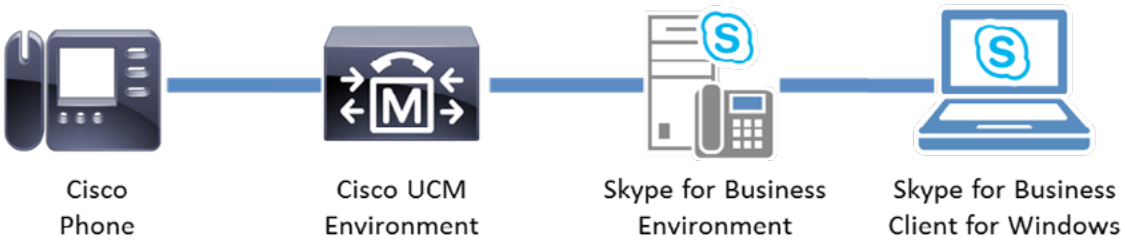
In Figure 3 above, if there is an impaired conference call with users in Branch 1 and users in Branch 2, the only way to determine which network segment created the issue is by capturing network call metrics at each point (marked by a UCD-A). The arrows indicate how the probes rate each one-way stream. Everything is green leaving the branches and entering the data center, but red entering Branch 2. With this analysis, an IT Pro can easily identify the issue is within the MPLS connection to Branch 2. Without probes, the IT Pro is left to trying to extrapolate details about the location of the call from a very broad "picture" of the call.

3. Diagnosing Across Multiple Platforms

In this era of transitioning infrastructures and hybrid deployments, many conversations pass through multiple platforms. In many large enterprises it is not unusual for conversations to traverse from an Avaya user to a Cisco or Microsoft user or vice versa. Only with probes can an IT Pro segment between the various platforms and correlate a singular view of the conversation. Imagine a conference call with internal users from a variety of platforms.

Consider this Use Case:

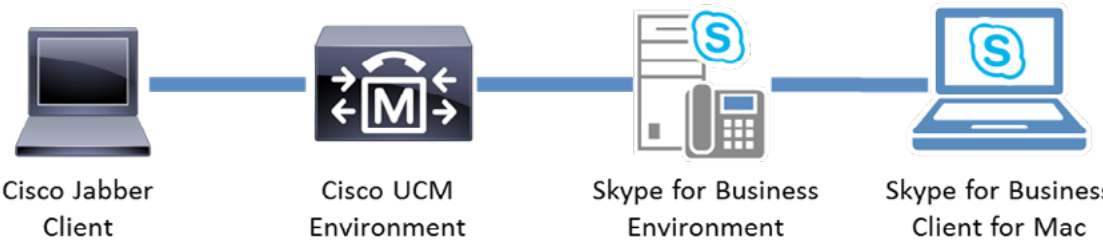
A user on a Cisco phone calls a user running the Skype for Business client on a Windows PC.



Without probes and the ability to detect calls and analyze the RTP media in real-time, the IT Pro monitoring this UC deployment would:

- Learn about the Cisco call leg at the end of the call via a call detail record (CDR) sent by the Cisco Unified Call Manager.
- Receive call quality information at the end of the call via a call management record (CMR). However, not all Cisco phones provide this information.
- Learn about the Skype for Business call leg in real-time via the Microsoft SDN API.
- Receive real-time call quality information if there is a problem via the Microsoft SDN API.

The above use case it the best case scenario. For example, a lot less information is provided if the Cisco end-point is a Jabber client and the Skype for Business client is running on a Mac.



In this case the IT Pro would:

- Learn about the Cisco call leg at the end of the call via a call detail record (CDR) sent by the Cisco Unified Call Manager.
- Not receive any call quality information for the Cisco call leg.
- Learn about the Skype for Business call leg in real-time via the Microsoft SDN API.
- Not receive any call quality information for the Skype for Business call leg.

As you can see, without probes the monitoring platform can only display information provided by the monitored devices. In many cases this is not enough to successfully troubleshoot and resolve problems when they occur. Also, much of the information is after the fact making the IT Pro reactive instead of proactive.

4. Correlating SIP Signaling

Since the T1 was introduced in the 1960', there have been challenges as voice left the private customer domain and entered the public carrier domain. That challenge lives on today in the form of SIP trunks and SIP carriers. The Nectar blog post, *Knowing Where to Place the Chalk*, details a specific example of where a Nectar probe took less than a day to identify and diagnose an error that the carrier and the UC managed service provider could not resolve in 7 months. The Nectar probe was able to correlate poor user calls with SIP errors and produce a SIP ladder diagram like the one below:

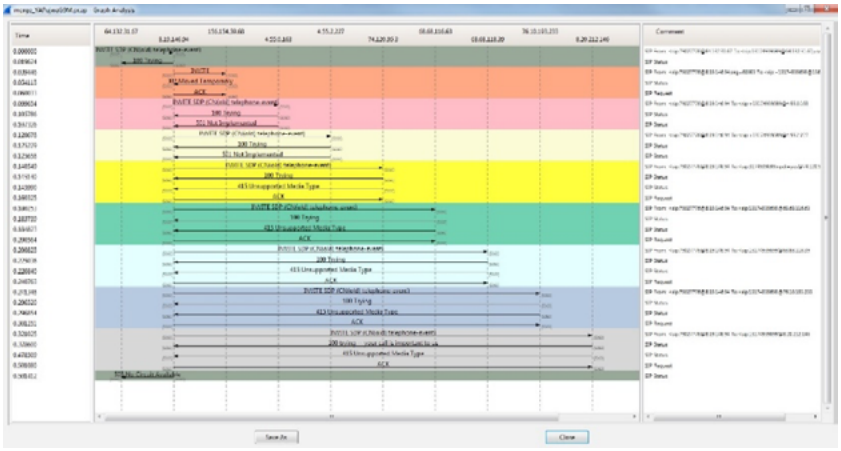


Figure 4 - Sample SIP Ladder Diagram

Based on the SIP messages, the carrier was able to identify an intermittent issue with load balance failover in their cloud. Without probes, the root cause would likely still not be identified and the users would still live with the risk of outbound calls never going through.

What You Have to Do If You Can't Produce Probes

So these monitoring companies that cannot leverage probe technology have to attempt to emulate the concept of network awareness. How do they do it?

Traceroute

Some monitoring tools will leverage a traceroute after the conversation is completed to try and recreate the network path of the call and capture network statistics. There are four fundamental challenges to the traceroute approach:

1. There is no guarantee that traceroute will report the same network path used by a call.
    a. The traceroute is independent of the call and initiates after the call is completed.
    b. This provides a single snapshot of the session path which may not be the path used during the call or even the path used when quality problems occurred.
2. Many routers are configured to not respond to traceroute.
    a. Routers are often configured to block incoming echo reply packets.
    b. When this occurs the path provided by traceroute will be incomplete.
3. Traceroute does not provide the egress interface.
    a. The IP addresses returned by a traceroute will usually be the ingress interfaces of each routed node along the path.
    b. These IP addresses will identify each device along the path but cannot identify the egress interface.
    c. Knowing the egress interface is critical to identifying QoS and congestion issues.
4. Network devices will not treat traceroute packets the same as the UC RTP packets.
    a. Traceroute does not use RTP protocol which is used by actual UC conversations.
    b. Routers are inherently designed and configured to handle each of these packets differently.
        i. If a router becomes busy it will delay responding to traceroute requests while continuing to switch packets. This will cause the traceroute information to report delay that may not impact the RTP packets.
        ii. In a properly designed network, RTP packets are placed in the real-time queue while traceroute packets are not. Therefore, traceroute packets may be buffered and/or dropped while RTP packets continue to be routed with little to no delay.
    c. Therefore, traceroute does not provide accurate measurements of the delay experienced by RTP packets

Regurgitate Manufacturer-Provided Data

Especially in the Microsoft UC world, most non-probe monitoring tools rely on the statistics provided by the UC platform. Like the tool, these platforms have no actual network awareness, so the monitoring tool is subject to the same limitations as the manufacturer-reported data.

Microsoft Skype for Business

The discrepancy of what is captured is rather dramatic in Microsoft UC environments. Consider the table below:

Statistic	Client Category	Client	MS QoE -	MS SDN API	Nectar UCD	Non-Probe
Post Call Average	Desktop	Lync 2010 Attendant	Y	Y	Y	Y
		Lync 2013 Basic for Windows	Y	Y	Y	Y
		Lync 2013 for Windows	Y	Y	Y	Y
		Lync for Mac 2011	N	N	Y	N
		Lync Windows Store App	Y	Y	Y	Y
		Skype4B Basic for Windows	N	N	Y	N
		Skype4B for Mac	N	N	Y	N
		Skype4B for Windows	Y	Y	Y	Y
	Hard Phone	3rd Party IP Phone (3PIP)	Y	Y	Y	Y
		Lync Phone Edition	Y	Y	Y	Y
	Web	Lync Web App	Y	Y	Y	Y
		Skype4B Web App	Y	Y	Y	Y
	VDI	Skype4B	N	N	Y	N
In Call Updates	Desktop	Lync 2010 Attendant	N	N	Y	N
		Lync 2013 Basic for Windows	N	N	Y	N
		Lync 2013 for Windows	N	N	Y	N
		Lync for Mac 2011	N	N	Y	N
		Lync Windows Store App	N	N	Y	N
		Skype4B Basic for Windows	N	N	Y	N
		Skype4B for Mac	N	N	Y	N
		Skype4B for Windows	Y	Y	Y	Y
	Hard Phone	3rd Party IP Phone (3PIP)	N	N	Y	N
		Lync Phone Edition	N	N	Y	N
	Web	Lync Web App	N	N	Y	N
		Skype4B Web App	N	N	Y	N
	VDI	Skype4B	N	N	Y	N
Real-Time QoS	Desktop	Lync 2010 Attendant	N	N	Y	N
		Lync 2013 Basic for Windows	N	N	Y	N
		Lync 2013 for Windows	N	N	Y	N
		Lync for Mac 2011	N	N	Y	N
		Lync Windows Store App	N	N	Y	N
		Skype4B Basic for Windows	N	N	Y	N
		Skype4B for Mac	N	N	Y	N
		Skype4B for Windows	N	N	Y	N
	Hard Phone	3rd Party IP Phone (3PIP)	N	N	Y	N
		Lync Phone Edition	N	N	Y	N
	Web	Lync Web App	N	N	Y	N
		Skype4B Web App	N	N	Y	N
	VDI	Skype4B	N	N	Y	N

If Skype for Business doesn't know and the monitoring tool doesn't have a separate component analyzing packets, how does the monitoring tool communicate what happened?

Cisco

Cisco Unified Call Manager provides post call records (CDRs) and call quality data (CMR) for some Cisco hard phones. Call quality data is not provided for Cisco Jabber.

Statistic	Client	Cisco CDR	Cisco CMR	Nectar UCD	Non-Probe
Post Call Average	Jabber	Y	N	Y	N
	Hard Phone	Y	P – Some devices	Y	P
In Call Updates	Jabber	N	N	Y	N
	Hard Phone	N	N	Y	N
Real-Time QoS	Jabber	N	N	Y	N
	Hard Phone	N	N	Y	N

(1) Cisco CDR provides session information.

(2) Cisco CMR provides RTP quality information.

Avaya

Avaya Communication Manager provides call detail records at the end of the call. Avaya devices also send real-time call quality data via RTCP throughout the life of the call. Avaya therefore provides the most data of the three vendors. However, the call records are not available until after the call terminates and the call quality data does not directly identify the session to which it belongs. This makes it impossible to report session level call and quality data in real-time.

Poll The Network

Without probes, you could leverage SNMP or other protocols to poll the network. There are two challenges with this approach:

1. How Do You Correlate the Packets with A Given Conversation?
    a. If your tool is not specifically analyzing the packets, how do you know for sure the network devices are reporting on the right packets or conversation?
2. Network Devices Don't Capture MOS
    a. If the network devices are not capturing MOS and packet loss, you cannot effectively nor accurately calculate the key heuristics of conversation quality.

If You Can Do It All Without Probes, How Would You?

If you are considering monitoring tools that brag that they serve all your needs without probes, maybe you should probe a bit deeper into their offer and ask them how they would answer the following:

1. How would they address the multi-vendor use case table above?

2. How would they fill out the "Non-Probe" column in the Skype for Business client table above?
3. Network Correlation
    a. How do they identify the actual network path of a call?
        i. relying on traceroute for a UC call, do all clients support traceroute?
            - When do they run the traceroute?
            - Can you validate it is the actual path and statistics of the call?
            - How do they identify a path change?
            - What is the impact of the traceroute data on the UC platform databases?
    b. Can their product identify path changes during a call?
4. Real Time Analysis
    a. How can they determine quality over the entire life of the call?
5. SBC Monitoring
    a. How do they capture, in real time, media and signaling passing through an SBC?
    b. Can they provide a signaling packet capture to debug signaling issues through an SBC?

About Nectar

About Nectar Services Corp

Nectar is a global market leader providing the most comprehensive monitoring and diagnostics software solution for Unified Communication services, and enables IT and operation organizations to proactively ensure the end-user experience. Our flagship offering, the Unified Communications Management Platform (UCMP) improves visibility and service delivery across integrated voice, video and data application solutions by providing unique and critical performance information. Nectar provides monitoring and diagnostics for millions of enterprise endpoints to over 1,200 enterprises in over 86 countries— including some of the largest global banking, search engine, service provider, healthcare, and manufacturing organizations in the world.

For more information:

www.nectarcorp.com

North America – **americas@nectarcorp.com**
Europe, Middle East, and Africa – **emea@nectarcorp.com**
Asia Pacific – **apac@nectarcorp.com**
Latin America – **latam@nectarcorp.com**

Corporate Headquarters
366 North Broadway, #201
Jericho, NY 11753
+1 (888) 811-8647