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**Unified Communications & Collaboration Performance Management For Dummies®,
NETSCOUT Special Edition**

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Introduction



Unified communications and collaboration (UC&C) is all about improving teamwork, increasing agility, reducing costs, and boosting business productivity. The successful adoption of UC&C services, such as voice over IP (VoIP), collaboration services, video conferencing, telepresence, and desktop video, assumes that service quality will be sufficient for users to interact effectively and consistently as they engage with customers or clients, prospects, partners, vendors, and other employees.

Assuring the quality of UC&C services is not an easy task. UC&C services are complex and require unforgiving performance levels with always-on availability to meet the high expectations of users and the organization. Root cause analysis and problem resolution require effective collaboration between different IT teams, multiple vendors, and external service providers, which isn't always achievable.

The reality is that many UC&C deployments fail to achieve the internal traction desired because of poor user experiences. Underperforming UC&C deployments lead to an erosion in savings and lost productivity resulting from increased management costs and dissatisfied users.

UC&C performance management can provide real-time visibility into end-to-end service performance for voice and video sessions. This capability enables powerful analysis and troubleshooting for both proactive and reactive service management tasks, which means fewer headaches for IT staff and greater user satisfaction with IT services in general. Providing a service-oriented perspective of delivered UC&C services, UC&C performance management enables the IT organization to

- Deliver consistent and reliable service levels for voice and video services to enable a positive user experience
- Transform service management from reactive to proactive to predict and prevent emerging service performance issues before users are affected

- ✓ Quickly triage and identify underlying root causes of UC&C service performance problems in both the network and UC&C service applications
- ✓ Simplify managing complex multi-location, multi-vendor UC&C environments
- ✓ Optimize and accelerate new UC&C application rollouts

About This Book

Unified Communications & Collaboration Performance Management For Dummies consists of six short chapters that explore

- ✓ The business benefits of UC&C and the complexity in multi-location, multi-vendor UC&C environments (Chapter 1)
- ✓ The business and technical need for UC&C performance management (Chapter 2)
- ✓ The gap between the performance management tools you typically get with UC&C and what you actually need to resolve UC&C issues (Chapter 3)
- ✓ How to successfully implement a UC&C performance management solution (Chapter 4)
- ✓ What a complete UC&C performance management solution looks like (Chapter 5)
- ✓ What to consider when you're looking at UC&C performance management solutions (Chapter 6)

Finally, if you get lost in any of the acronyms or technical terms used throughout this book, there's a glossary in the back to help you out!

Foolish Assumptions

It's been said that most assumptions have outlived their usefulness, but I'll assume a few things nonetheless!

Mainly, I assume that you are an IT infrastructure and operations professional, such as an engineer, skilled technician, manager, or senior IT decision maker. As such, this book

is written primarily for technical readers who know a little something about modern IT networking, infrastructure, and enterprise systems.

I also assume that you're likely to be very familiar with data communications throughout the enterprise environment, but perhaps not as familiar with UC&C technologies, and their associated challenges, such as:

- ✓ Call signaling and media services
- ✓ Quality of service (QoS) issues
- ✓ Different collaboration services (for example, Cisco Jabber, Microsoft Lync, or Skype for Business)
- ✓ The impact of data and voice services on each other in converged environments
- ✓ The importance of service enablers as a critical component in the UC&C service delivery chain

Finally, I assume you're tired of blindly guessing at the root cause of your UC&C performance issues and the endless finger pointing between different IT teams and vendors — and you've thus begun a noble quest to find a UC&C performance management solution.

If any of these assumptions describe you, this book is for you! If none of these assumptions describe you, keep reading anyway. It's a great book, and when you finish reading it, you'll know enough about UC&C performance management to be dangerous!

Icons Used in This Book

Throughout this book, I occasionally use special icons to call attention to important information. Here's what to expect:



This icon points out information that you should commit to your non-volatile memory, your gray matter, or your noggin' — along with anniversaries and birthdays!



You won't find a map of the human genome here, but if you seek to attain the seventh level of NERD-vana, perk up! This icon explains the jargon beneath the jargon and is the stuff legends — well, nerds — are made of!



Thank you for reading, hope you enjoy the book, please take care of your writers! Seriously, this icon points out helpful suggestions and useful nuggets of information.



This icon points out the stuff your mother warned you about. Okay, probably not. But you should take heed nonetheless — you might just save yourself some time and frustration!

Beyond the Book

There's only so much I can cover in 64 short pages, so if you find yourself at the end of this book, thinking "Gosh, this was an amazing book, where can I learn more?" just go to www.netscout.com.

Where to Go from Here

With my apologies to Lewis Carroll, Alice, and the Cheshire cat:

"Would you tell me, please, which way I ought to go from here?"

"That depends a good deal on where you want to get to," said the Cat — er, the Dummies Man.

"I don't much care where . . . , " said Alice.

"Then it doesn't matter which way you go!"

That's certainly true of *Unified Communications & Collaboration For Dummies*, which, like *Alice in Wonderland*, is also destined to become a timeless classic!

If you don't know where you're going, any chapter will get you there — but Chapter 1 might be a good place to start! However, if you see a particular topic that piques your interest, feel free to jump ahead to that chapter. Each chapter is written to stand on its own, so feel free to start reading anywhere and skip around to your heart's content! Read this book in any order that suits you (though I don't recommend upside down or backwards).

I promise you won't get lost falling down the rabbit hole!

Chapter 1

Understanding the Importance and Complexity of UC&C

In This Chapter

- ▶ Appreciating the roles and benefits of UC&C in the enterprise
- ▶ Seeing the forest — and all the trees — in a UC&C architecture

This chapter explores the many uses and benefits of unified communications and collaboration (UC&C) applications and services in the modern enterprise, and examines the complexity in today's UC&C architectures.

Recognizing the Importance and Benefits of UC&C for the Business

Over the past decade, UC&C applications and services — such as video and web conferencing — have become an integral part of our day-to-day business communications. For many business users, *every* meeting requires booking a conference room, sending out a meeting invitation with dial-in information, then making small talk while waiting for everyone to connect before the meeting begins. These users might not even remember a time when meetings were done any other way!

In addition to video and web conferencing, end-users have become accustomed to and expect to use a host of other enterprise UC&C applications, including:

- ✓ Instant messaging (IM)
- ✓ Text/email
- ✓ Web browsing
- ✓ Social media
- ✓ Telephony/voicemail
- ✓ Audio conferencing
- ✓ Desktop video conferencing
- ✓ Telepresence
- ✓ Video broadcast
- ✓ Video on demand

UC&C provides communications and collaboration applications and services that are convenient and (ideally) easy to use for end-users in their day-to-day work, including one-to-one (point-to-point), many-to-many (multi-party) and one-to-many (information dissemination) communications and collaboration sessions.



Some less obvious, but no less important technologies and markets that interact with or use UC&C applications include:

- ✓ **Business continuity/disaster recovery:** The IP infrastructure at the heart of UC&C lends itself to architectures with redundancy and failover.
- ✓ **Service provider voice and video services and SIP trunking:** These are an integral part of any practical communications system, whether simply providing a peering point or delivering a service directly to the user. Connecting enterprise video islands still remains a challenge.
- ✓ **Fixed mobile convergence:** Wireless carrier networks can integrate with the enterprise IP infrastructure. One goal is to achieve seamless handover between UC&C voice and video systems and wireless carrier-provided services.

- ✓ **Security:** UC&C applications are used to transmit and store valuable and sensitive information. Intrusion detection and prevention is a key requirement, and forensic analysis can be used to confirm and verify misuse of UC&C applications.
- ✓ **Contact centers:** Businesses are increasingly using UC&C applications to engage with their customer base more effectively and cost efficiently. Many businesses use chat support, for example.
- ✓ **Over-the-top (OTT) applications:** Enterprises already endorse certain UC&C applications delivered by an OTT provider (for example, Skype). The distinction between cloud-based services and OTT services may blur as enterprises seek managed connections to the OTT provider.
- ✓ **Telelearning:** Demand for training and education services offered through online streaming, live video, and downloadable seminars is growing. Students who don't live near a program they need to attend, can't easily commute, have work or schedule challenges, or prefer studying online have made high quality telelearning offerings a new and rapidly growing revenue opportunity for many higher education institutions and training organizations.
- ✓ **Telemedicine:** Healthcare organizations are increasingly offering online access to doctors, specialists, and nurses in leading metropolitan hospitals and offsite clinics via telemedicine. Voice and video services enable these professionals to see and evaluate symptoms, make a diagnosis, and provide health plans for individuals who otherwise would not have access to the most skilled medical experts.

Of course, beyond meeting user expectations and keeping everyone happy, UC&C offers numerous benefits to the enterprise as well. Some of the many business benefits include:

- ✓ **Higher productivity** through more effective communication and collaboration from anywhere, at any time, and on any device
- ✓ **Increased flexibility** for teleworkers and home offices, better morale, and reduced commuting and office expenses (such as office space, furniture, and utilities)

- ✓ **Time and cost savings** by providing an enhanced ability to meet and collaborate online, often eliminating the need for business travel
- ✓ **A smaller carbon footprint** resulting from less commuting and travel, as well as smaller concentrations of employees in office buildings, requiring less heating, cooling, and electricity
- ✓ **Better business continuity and disaster recovery** capabilities with remote working during a snowstorm or hurricane, for example, as well as reduced risk exposure because of smaller concentrations of employees in a single office location affected by a disaster

Naturally, everyone expects your UC&C applications and services to always “just work”. After all, your users’ iPhones “just work” and enterprise UC&C applications and services basically do the same thing as an iPhone (like making calls and using FaceTime), right? How quickly users forget that their iPhones don’t work so well after they’ve been accidentally dropped in the toilet (the iPhone, not the user), or anytime they walk through a dead cell coverage area in the building!

The expectations from the enterprise are no different. After all, they’ve spent a small fortune on their UC&C investments, so it had all better work, right? Just like an expensive sports car. But does spending \$70,000 on a car mean you never have to get an oil change, or fill it with gas for that matter? No! And occasionally, you still have to take it to a mechanic or the dealer for some troubleshooting and repair. Similarly, enterprise UC&C applications and services have lots of moving parts under the hood — UC&C infrastructure is complex (which I discuss in the next section) and sometimes you need more than a dashboard gauge, a kick in the tires, and a wrench to diagnose and resolve an issue.

And just as a mechanical problem in your car can make you late for work or a dinner date, and put your safety in peril if it breaks down on a busy highway (or your date gets really angry), UC&C problems — such as poor performance, underutilization, application unavailability, and service disruptions — can have painful consequences for businesses or other organizations. These include:

- ✓ **Lost time:** Valuable time is lost when a business meeting is held up while IT attempts to resolve a UC&C issue, for example. At an even more basic level, poorly trained end-users may waste valuable time trying to figure out how to set up a video conference.
- ✓ **Lost opportunities:** A poor UC&C experience may discourage business users from attempting to use the collaboration tools provided for them. Worse still, a poor UC&C experience may create a bad impression for a prospective customer or client, resulting in lost revenue.
- ✓ **Increased risk:** Important information (or vital information when lives are at stake) may be missed if, for example, all the parties in a conference call can't hear clearly and participate in the conversation. Businesses that are subject to service-level agreements (SLAs) or statutory requirements may also risk costly violations.



Lost time and lost opportunities equals lost money!

Looking “Under the Hood” at Complexity in UC&C Deployments

To your end-users, UC&C applications and services should work like magic — you don't necessarily want them to know how it works. You simply want them to be delighted and awed every time you pull a rabbit out of a hat or make your CFO disappear!

But of course, behind the scenes, UC&C architecture today is complex and consists of many different systems and infrastructure components — all critical to the smooth and efficient operation of those “magical” UC&C services and applications.

UC&C applications run on top of a UC&C architecture (see Figure 1-1) consisting of many individual building blocks, including:

- ✓ **Voice over IP (VoIP) components:** These include presence and directory servers, call managers, call admis-

control (CAC), Session Initiation Protocol (SIP) trunks, session border controllers (SBCs), and media gateways (MGWs).

- ✓ **Conference bridges:** These enable more than two parties to engage in voice or video communications, and mediate between users connecting by way of different devices and link speeds.
- ✓ **Collaboration services:** These may include conferencing services, messaging and texting, business-to-business (B2B) video gateways, telepresence, and Microsoft SharePoint, among others.
- ✓ **Peering points:** Interfaces with the non-UC&C world and, where possible, extending UC&C capabilities to other businesses and/or customers.
- ✓ **Scheduling (calendar) platforms:** Allows users to find mutually convenient times and locations to collaborate and to reserve appropriate resources.
- ✓ **Clients:** In addition to various endpoints in the office — such as desk phones, soft clients, auto attendant consoles, and agent consoles — remote and mobile users, empowered by the “bring your own device” (BYOD) trend, require UC&C architectures that can support a practically infinite number and type of mobile phones and tablets.

Other critical components of a UC&C architecture that serve primary functions for the enterprise include:

- ✓ **Networks:** Various networks connect businesses to their customers, clients, partners, and employees at remote office locations, home offices, in the cloud, and everywhere else (on mobile devices). Network connectivity is typically comprised of a combination of multiprotocol label switching (MPLS) networks, public switched telephone network (PSTN) gateways, leased lines, digital subscriber lines (DSL), OTT services, 4G LTE (Long Term Evolution), Wi-Fi, and virtual private networks (VPNs).
- ✓ **Network equipment:** These include routers, switches, firewalls, and wireless access points, among others.

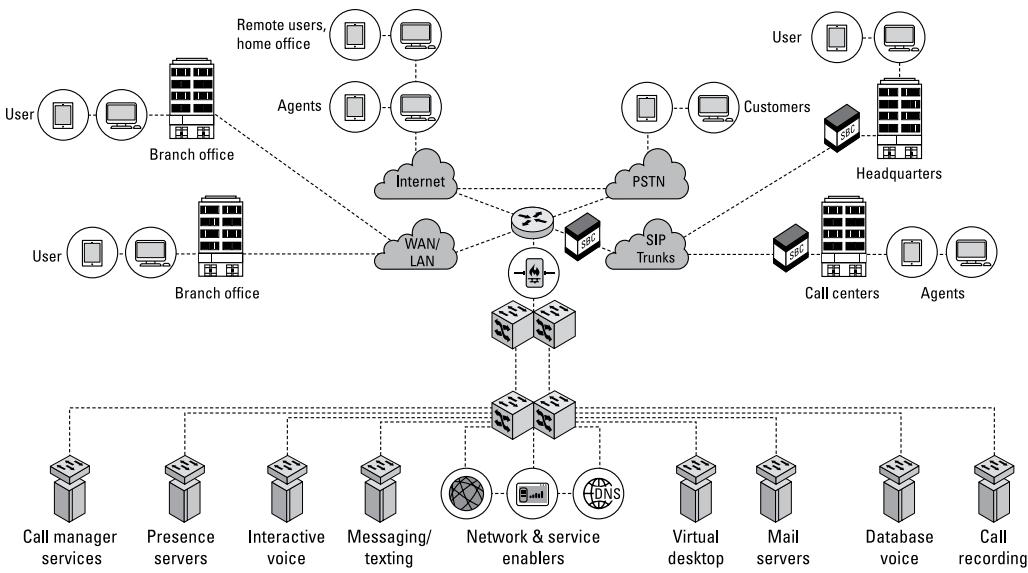


Figure 1-1: UC&C architectures are complex and consist of many individual building blocks.

- ✓ **Servers and storage:** Various systems and associated storage may include email and database servers, virtual desktop infrastructure (VDI) servers, and web and application servers.
- ✓ **Enablers:** These include directory servers (for example, Active Directory and Lightweight Directory Access Protocol, or LDAP), domain name service (DNS), Dynamic Host Configuration Protocol (DHCP), and authentication servers (such as Remote Authentication Dial-In User Service, or RADIUS). I discuss network enablers further in Chapter 2.
- ✓ **Integration to cloud (and hybrid) services and managed service providers (MSPs):** Various third-party software as a service (SaaS) applications, such as Salesforce, as well as managed cloud communications services, require integration to application programming interfaces (APIs), SIP trunks, and the PSTN.

UC&C performance management enables IT to ensure signaling and voice quality of Microsoft Skype for Business

A nearly half-century old personal/commercial insurance company ranked among the top property casualty insurers has campus-based employees and at-home agents that rely heavily on their phones to conduct day-to-day business. Maintaining the highest quality communication experience with other employees, partners, and customers is essential to the success of the business.

Challenge: IT unable to pinpoint the source of voice quality and call signaling issues

While undergoing a companywide migration to Microsoft Skype for

Business, call quality issues began to appear. For IT, there's nothing worse than unhappy internal customers — particularly during the rollout of a new technology initiative. The problem dragged on for months, with customers, service representatives, and insurance agents suffering through poor call experiences. Meanwhile the IT staff became embroiled in a classic multi-vendor finger pointing exercise, unable to isolate the source of the issues to the Microsoft Skype for Business servers, the AudioCodes gateway, or another vendor's gateway.

Solution: UC&C performance management solution reveals two sources causing call quality issues

To address the company's call quality issues, IT implemented a UC&C performance management solution that provided end-to-end visibility of the entire environment and helped reveal the root causes of the call quality problems. Empowered with the right performance management tools, IT teams were able to quickly and easily navigate through the complexity to pinpoint two problems that were affecting customer calls in the call center. Efficiently designed workflows leveraging advanced voice statistics helped the UC&C staff to uncover quality of service (QoS) configuration errors that were part of the problem affecting call quality. A quick reconfiguration of the networking equipment resolved the issue.

However, employees were still complaining of noise on some of their customer calls. The UC&C performance management solution enabled the IT staff to resolve the issue using mean opinion score (MOS) analysis capabilities to research the audio problem, which was occurring somewhere within the multivendor environment, and isolating the specific phones with poor quality. To rectify the problem, these headsets were upgraded with additional noise cancellation

functionality. Once the upgrade was complete, the service representatives heard calls clearly and could satisfy their customers' requests.

Results: Improved IT productivity and efficiency

The UC&C performance management solution helped IT rapidly solve a pair of vexing IT problems that had been persisting for months without resolution. The invaluable insights provided by this powerful solution have eliminated finger pointing, fostered greater collaboration between IT staff and vendors, and enhanced overall IT productivity and efficiency.

Having a complete UC&C performance management solution has dramatically improved the company's Microsoft Skype for Business service delivery for both signaling and voice quality, ensuring the highest quality communications for their employees, agents, and customers.

UC&C performance management enabled IT to:

- ✓ Quickly resolve problems, improving IT productivity and efficiency
- ✓ Eliminate vendor finger pointing while improving collaboration
- ✓ Improve confidence in their Microsoft Skype for Business service deployment

Chapter 2

Realizing the Value of Performance Management for UC&C

In This Chapter

- ▶ Getting to the bottom of common UC&C problems
- ▶ Seeing the entire UC&C environment
- ▶ Establishing proper signaling and media protocols
- ▶ Going above and beyond — across the entire IT portfolio
- ▶ Working well with others

In this chapter, you learn about common unified communications and collaboration (UC&C) problems and root causes, and how a holistic UC&C performance management solution can help you identify and resolve these common issues and better manage all of your organization's IT applications and services.

Understanding Common UC&C Problems and Root Causes

Managing the performance of complex UC&C environments (discussed in Chapter 1) — in which voice, video, and instant messaging are tightly integrated with email, scheduling tools, collaboration software, customer relationship management (CRM), and websites, among others — is a significant challenge for today's IT organizations.

Addressing this challenge is nearly impossible without holistic visibility and strong performance management capabilities. Without such capabilities, diagnostic information is often limited to little more than basic network connectivity tests and “there’s an echo on my phone line” or “the video is choppy”. To get to the bottom of UC&C performance issues, you need to dig deep for the root causes. Table 2-1 summarizes some common UC&C complaints and problem areas you might hear about from your end-users, as well as some typical causes.

Table 2-1**Common UC&C Problems and Possible Root Causes**

<i>UC&C complaint (problem area)</i>	<i>Possible root causes (security, network, server performance, interoperability)</i>
“That last call sounded terrible!” (Poor voice quality)	Network — bandwidth or misconfigured quality of service (QoS) issues affecting call quality Endpoint — bad microphone at remote end, soft client performance Gateway — echo cancellers not working effectively Call server — configuration issues negotiating wrong codec on call setup
“I can’t hear the other party.” (One-way calls)	Network — diverse routing in the network with no return path Network — issues with endpoints communicating with the call server Network — issue with call servers communicating with external peers Session border controller (SBC) — performance issues between the call server and the session initiation protocol (SIP) trunk

<i>UC&C complaint (problem area)</i>	<i>Possible root causes (security, network, server performance, interoperability)</i>
"Someone on our conference call has a bad connection that is affecting all of us."	Network — congested because of one participant's bad link Conference bridge — not servicing calls effectively A specific user — connection or equipment causing a problem for all
"Our video is jumpy and keeps freezing."	Network — bandwidth or misconfigured QoS issues affecting call quality Equipment — codec adaptation to cope with network issues Bridge — interoperability/codec selection issues

Enabling End-to-End Visibility of the Entire User Experience

Today's UC&C applications and services rely on multiple functional IT teams to deliver the performance and end-to-end user experience that businesses and their users demand. However, these teams are often forced to use silo-specific tools, each focused on assuring the performance of a particular component in the converged infrastructure, as well as point tools that focus on specific components — such as call managers and session border controllers (SBCs), conference bridges, or gateways — or on business UC&C applications, such as presence and messaging.

These UC&C components are often purchased from different vendors. Consider for a moment how different management tools for various UC&C components might operate for an enterprise IT department that is trying to achieve end-to-end service assurance and resolve UC&C performance issues. Siloed component tools may provide disconnected information at best, or worse yet, conflicting information, when used to troubleshoot a performance problem that is affecting call quality for your end-users and customers.

In particular, for media quality, typical UC&C component management tools rely on metrics and data, provided by the endpoint devices that signify whether the network is the cause of quality issues in the media.

This means that when problems arise, despite these tools being able to identify packet loss or jitter, they lack the granularity to focus in on the root cause of the problem. Knowing what is happening is always important. Knowing why it is happening tends to be even more important. For example:

- ✓ Why is there packet loss in my UC&C services?
- ✓ Why is there packet loss across all my applications?
- ✓ Why are we experiencing jitter problems in the afternoons?
- ✓ Why are remote employees experiencing one-way calls?
- ✓ Why do we have hundreds of our phones dropping calls every few weeks?
- ✓ Why are some users sometimes not able to get a dial tone, or can't dial outside numbers?
- ✓ Why is there excessive background noise on so many of our calls?

Identifying Critical UC&C Signaling and Media Protocols

A comprehensive performance management solution should be protocol independent and vendor agnostic to ensure maximum visibility across the entire UC&C and IT infrastructure.

VoIP and UC&C services depend on signaling and media protocols to establish a call or connection. These protocols perform basic call setup, number translation, feature negotiation, and call management functions. If the called device is available, the call server contacts it and instructs the calling and called devices to establish a peer-to-peer connection to each other, in order to exchange RTP (Real-time Transport Protocol) audio/video traffic.

The time required for the call manager servers (using the various signaling and media protocols) to successfully establish

a call can have a significant impact on user experience. To manage this part of a UC&C implementation requires tools that closely monitor performance of signaling protocol-related metrics, such as call setup times, incomplete/failed calls, and errors.

Once a call is established, the call begins and voice/video (media) flow across the network between the endpoints (for example, phones and video conferencing terminals).



Call signaling and media protocols can be either standards-based or vendor/proprietary-based. Many UC&C vendors support standard signaling protocols in addition to supporting their own proprietary protocols. Some important protocols include:

- ✓ **H.323:** The International Telecommunication Union (ITU-T) designed the H.323 protocol suite to define how multimedia, such as video and audio, travel over a packet-switched network. Although widely deployed because of its early availability, it is now being replaced by SIP in many UC&C environments.
- ✓ **Media Gateway Control Protocol (MGCP):** An Internet Engineering Task Force (IETF) standard (RFC 3435), MGCP operates at the backbone of the network and is typically used by network elements, such as call agents, that route calls between gateways and the PSTN. MGCP has widely been replaced by SIP in many UC&C environments.
- ✓ **Session Initiation Protocol (SIP):** SIP is becoming ubiquitous for interoperability reasons. An IETF standard (RFC 3261) for call/session setup, modification, and termination. SIP has broad applicability in enabling voice and video connectivity, as well as instant messaging, across the IP-based Internet, enables better interoperability among vendors, easier application development, and easier operation through firewalls.
- ✓ **Skinny Client Control Protocol (SCCP):** A lightweight IP-based signaling protocol used by Cisco Unified Communications Manager, SCCP is one of the most commonly deployed proprietary signaling protocols. It is primarily designed for hardware endpoints with limited processor/memory resources.



Codecs (COders and DECoders) are another important element affecting the quality of UC&C services. Codecs play a role in both the quality of voice transmission sound and the bandwidth consumed by the UC&C session. For that reason, different codecs provide different levels of quality. A codec defines the way analog voice (audio) is compressed and converted into digital IP packets as they flow across an IP network infrastructure and are then decompressed into analog audio for the receiver on the other side of the conversation. The endpoints encode the input media signal so that it can be transmitted more efficiently over the network. This process is often called *compression* because it reduces the bandwidth required for the media. The encoded media must then be decoded on the receiving endpoint.

Several standards-based and proprietary codecs are in common use today. Some examples of International Telecommunications Union (ITU-T) standard codecs include:

- ✓ **G.711:** Used for compressing and expanding (“companding”) audio signals, G.711 is commonly used in telephony applications, including fax.
- ✓ **G.722:** Commonly used on LANs for VoIP applications due to higher bandwidth consumption. G.722 generally provides superior audio quality to G.711 because it transmits a wider audio bandwidth.
- ✓ **G.729:** One of the most commonly used codecs in VoIP applications (particularly conference calling), G.729 offers generally good voice quality with low bandwidth requirements.

Issues with codecs can affect the quality of the user experience with UC&C services. For example, if a remote network has a bandwidth limitation, using a G.711 or G.722 codec that consumes higher bandwidth may cause performance issues at that location. In other situations, a mismatch in the codecs used at different points in the global environment may cause UC&C issues.



When it comes to UC&C service assurance, single component management tools simply don't have the broad visibility necessary to identify, troubleshoot, and resolve codec-related problems.

Once coded, the media is typically transported over the network using the Real-time Transport Protocol (RTP) and is transmitted over UDP to minimize delay. However, despite the high speed of networks today, RTP packets are susceptible to delay, jitter, and packet loss because they are transmitted through multiple hops, routers, and switches along the network path. Endpoint buffering helps to smooth out jitter and delay in order to help preserve the quality of this latency sensitive traffic. Unfortunately, packet loss is harder to fix. When RTP packets start to drop in the network, audio/video quality suffers.



Some other important UC&C protocols and services include Extensible Messaging and Presence Protocol (XMPP), chat, presence, instant messaging, collaboration, and various database services.

Managing the Performance and Delivery of All IT Services

To effectively manage your UC&C environment, you need to effectively manage your entire IT portfolio of applications and services, including call setup efficiency and codecs (discussed in the previous section), bandwidth, quality of service (QoS), and network enablers.

Bandwidth

You need to manage bandwidth utilization to ensure that a bandwidth intensive application, such as imaging, doesn't compromise UC&C services during an annual board meeting or, conversely, that a sudden uptake of desktop video services doesn't compromise other mission-critical business applications.



Monitoring bandwidth utilization — and particularly SIP trunk and wide area network (WAN) utilization — is also important to ensure your organization is realizing the expected cost savings and efficiencies of a converged voice and data network.

Quality of Service (QoS)

IT organizations often implement QoS policies on their network routers to define priority levels that optimize the delivery of networked applications. For example, latency-sensitive voice, video and collaboration services are typically assigned the highest priority, revenue-impacting or mission-critical applications are assigned the next level of priority, and email and web surfing are assigned the lowest priority.

QoS policies are automatically applied when the network is congested (or otherwise bandwidth limited), ensuring that sufficient bandwidth is available for the highest priority traffic to be delivered first, followed by the next highest priority, and so on.

When voice, video, and data services are prioritized (or “tagged”) correctly, they are delivered in the correct order, with little to no discernible impact for users and customers. When not tagged correctly, users and customers may experience significant performance issues that can be extremely difficult to troubleshoot and resolve.

Some examples of common QoS configuration issues and mistakes include:

- ✓ Different QoS classes are in effect for outgoing and incoming voice over IP (VoIP) services.
- ✓ Voice and video services are not assigned the proper QoS class, so they aren’t sent with the right priority.
- ✓ Data applications are given the same priority class as voice and video services.
- ✓ A router or third-party WAN provider effectively ignores your QoS priority class assignment or changes it to a different one.



UC&C component management tools typically lack the end-to-end visibility needed to identify exactly where in the call path an incorrect QoS policy may have been applied, making these problems among the most challenging to pinpoint and correct. You need visibility of QoS metrics and configurations to preserve the quality and delivery of all critical IT services, including UC&C applications and services.

End-to-end visibility means having visibility in multiple locations along the call path. This provides information about the call as it traverses the network infrastructure, and helps determine where the quality degradation has occurred. For example, degradation may have taken place across a WAN or firewall, or while coming in from a SIP trunk, a gateway, or a particular location.

Network enablers

UC&C is dependent on many network enabling protocols, such as Domain Name System (DNS) and Lightweight Directory Access Protocol (LDAP) which, just like the networks on which they run, are converged services that are commonly used by other systems and applications in the enterprise.

Similarly, IT administrators use DNS to replace IP addresses with meaningful names for various UC&C components, like “CallManager1” or “FrontEnd005”. DNS is a critical service in enterprise networks. If it is configured incorrectly, access to UC&C services will either be degraded or unavailable to users, even though the UC&C service or application itself may be up and running.

DNS lookups are another common cause of service slowdowns and congestion. If a DNS lookup is initially unsuccessful, the DNS service retries the lookup using multiple methods that may be configured on the client devices. For example, if multiple domain suffixes (such as company.com, company.net, and company.local) are configured on a desktop PC, the PC performs lookups using all the configured methods (DNS name, address type, and domain suffix) in the order listed, until it gets a successful response from a DNS server. The multiple lookups can cause excessive traffic on the network and unnecessary load on the DNS servers. If several thousand clients are configured in this way, DNS lookups can drive a DNS server and network to its knees, preventing access to UC&C and other critical business services on the network.

LDAP (and Active Directory) provides a means of authentication for enterprise users, and also provides information on the services available to the users once they have authenticated. This means that if LDAP services aren’t functioning correctly,

service availability may be negatively affected, even though the UC&C applications and services themselves are up and running.



Integration and interoperability with other backend IT systems — such as identity and access management (IAM), directory services, and domain name system (DNS) resolution, among others — all over a converged IP network, further complicate UC&C performance management.

Cloud and mobility trends

Many organizations are beginning to move UC&C onto a virtual platform inside the enterprise (on-premises or private cloud), outside the enterprise (public cloud), or both (hybrid cloud). The cloud may still be owned and managed by the enterprise, or the UC&C solution may be wholly owned and managed by a third party — for example, as a managed service. The move to the cloud adds further complexity to the UC&C environment, as more tools and people (both within and outside the organization) are needed to support the various UC&C services across multiple infrastructures.

Finally, as mobile devices become more ubiquitous among end-users in organizations that support “bring your own device” trends, IT must likewise ensure performance and delivery of UC&C services and applications to ever growing numbers and types of mobile devices. BYOD, Wi-Fi networks, and mobile devices add a litany of potential challenges and issues for IT, including:

- ✓ Multiple device types, brands, models, and operating systems
- ✓ User-installed UC&C and over-the-top (OTT) apps, such as Skype and Facebook Messenger
- ✓ Personally owned devices that are frequently changed or upgraded by users and difficult for IT to identify on the network because of frequently changing IP addresses and non-standard naming conventions, for example
- ✓ Wi-Fi network security and QoS



- ✓ Voice over Wi-Fi (VoWiFi) applications, infrastructure, and Wi-Fi/cellular handoffs

A comprehensive performance management solution enables you to support applications and infrastructure with a holistic view beyond UC&C, to include networks, security, Wi-Fi, servers, storage, applications, databases, and more.

Improving Communications and Collaboration among IT Teams

A recent Forrester Research report finds that “large IT organizations are split by specialty, so they don’t view communications and collaboration infrastructure (CCI) as a united common goal” and warns that “a less than perfect CCI road map can lead to disaster.”



The inefficiencies between siloed IT teams using disparate performance management tools can have disastrous consequences for the business, especially when it comes to problem escalation to a third party, such as a managed service provider (MSP) or SIP trunk provider. These inefficiencies can lead to several problems:

- ✓ Needless and unproductive finger pointing increases mean-time-to-know (MTTK) and mean-time-to-resolution (MTTR).
- ✓ Longer MTTK and MTTR means more downtime.
- ✓ When critical systems are down, employee productivity is severely reduced.
- ✓ Lower employee productivity leads to lower customer satisfaction, which ultimately causes lower revenues.
- ✓ Employee frustration can drive employees to seek alternative solutions (the “consumerization of IT”) to get their jobs done, creating a “shadow” IT culture.
- ✓ A “shadow” IT culture introduces major business risks, such as unknown security threats, regulatory non-compliance, support issues, and process breakdowns.

However, when IT teams have access to the same performance management tools and indisputable actionable intelligence, the “blame game” ends and problem solving begins. A comprehensive, vendor independent UC&C performance management solution can help IT teams improve communications and collaboration among themselves, leading to a more efficient IT organization and a more productive business.

Chapter 3

Discovering a Better Way to Solve Your UC&C Issues

In This Chapter

- ▶ Understanding the challenges of using multiple proprietary tools
 - ▶ Recognizing the value of real-time data across the entire call path
 - ▶ Deploying synthetic call agents with real-time performance management
 - ▶ Addressing inefficiencies in the IT “war room”
-

This chapter explains why resolving unified communications and collaboration (UC&C) performance issues can be a real challenge for IT teams when using “out-of-the-box” tools from individual UC&C component vendors that don’t provide an end-to-end picture of the entire UC&C environment.

Standalone UC&C Vendor Solutions Don’t Always Play Well with Others

As discussed in Chapter 1, not only are there lots of different types of equipment in a typical UC&C architecture, there are lots of different vendor solutions, as well. Different vendors specialize in different hardware and software, such as networking equipment, servers, storage, UC&C equipment, and applications — all of which you need in your UC&C architecture!

Even when organizations attempt to standardize on a single vendor — for example, servers — they inevitably end up with a mix of servers from numerous vendors in their data centers, although the servers may be predominantly one brand. This situation is common in business environments where mergers and acquisitions occur frequently. For example, two companies that have standardized on different UC&C solutions may suddenly find themselves with a hybrid environment — along with all the interoperability challenges of a hybrid environment — as the result of a merger or acquisition.



The difficulty with having multiple vendor solutions is interoperability. Although most vendors work hard to achieve interoperability with other technology solutions — even those of their competitors — full and seamless interoperability is rare. This is true even when vendors strictly follow the established standards for the technologies and protocols they use in their solutions or expose application programming interfaces (APIs) to facilitate integration.

Many vendors also develop proprietary solutions to deliver a competitive advantage, which may stray away from an established standard, or don't attempt to implement standards in any way. In other words, forget playing well together — they don't want to play with others at all!

The challenge for UC&C performance management is that individual UC&C component vendor management tools see only part of a UC&C environment — usually the part that directly affects the performance of their component and, in some instances, the immediate upstream and downstream network path.

UC&C components and software also typically provide only very basic and limited configuration and troubleshooting tools, with little or no proactive performance management capability.

For example, vendor management tools may be able to indicate if a component is functioning properly and is configured correctly, as well as perform some basic network connectivity tests to verify connectivity. These tests may provide some limited information about the quality of the connection during the test, but they usually must be run manually and typically don't provide any historical context or trend analysis.

Some of these UC&C vendor management tools also report data about voice quality, but they are not specifically designed for troubleshooting. Instead, these management tools provide current status information and, of course, they're limited to the vendor's specific components, not the entire environment in which they're operating, including the network and integration with other components.

The challenge in troubleshooting UC&C services is that siloed vendor management tools can't provide visibility into the relationships and interrelated nature of the overall network infrastructure, application services, and enabling protocols necessary to deliver UC&C services.



As discussed in Chapter 1, UC&C architectures are complex and consist of many components and services provided by many different vendors. Unfortunately, individual UC&C vendor component management tools typically don't integrate with other vendor solutions. Separate tools can't provide a complete picture of the problem because they don't have holistic visibility of the entire UC&C environment.

Too Many Tools Providing Inconsistent and Proprietary Data

In addition to the limited visibility challenges (now UC&C me, now you don't!) of standalone UC&C vendor management tools (discussed in the preceding section), these tools also lack the metrics to provide a view of end-to-end UC&C service performance across system components, which impedes the detection of emerging service issues.

The complexity is compounded by the multitude of vendor-specific management tools, with their own metrics, unique interfaces, and views of their individual service components. The data these tools provide often consists of current status information and is primarily focused on ensuring that a specific component (that is, that vendor's specific component) is operating correctly — a classic case of "not me" when IT is looking for the cause of a performance issue. Even when these UC&C vendor management tools indicate a problem, they

rarely provide enough information to identify the root cause of the problem: Is it congestion or packet loss in the network, a quality of service (QoS) configuration error, a firewall issue, or something else?

The result is incomplete and inconsistent data for IT teams that need to know the overall status of the UC&C service experience. For faults and failures, a lack of consistent, integrated data also leads to inefficient workflows with time consuming re-work and wasted efforts where one team attempts to translate and verify the information from the other teams. The last thing your internal customers and management want to hear is “everything looks good on our end.” In order to provide real solutions, IT needs performance management tools that provide consistent and meaningful metrics and data across the entire UC&C environment.

Endpoint Data Versus Call Path Information

The data provided by many UC&C vendor management tools is limited to a particular endpoint or component in the UC&C environment. These tools are primarily focused on ensuring that the individual component is working optimally, rather than on the entire ecosystem. The lack of call path information in these diagnostic tools significantly impedes their ability to provide a complete picture of performance across the entire environment.



In order to effectively troubleshoot and triage UC&C performance issues, IT teams need the ability to get end-to-end visibility of the entire call path and endpoints. Complete visibility enables IT teams to rapidly determine the root cause of a performance issue, regardless of whether it is related to a network, endpoint, application, or component.

Real-Time Versus End-of-Call Data

Another limitation of many out-of-the-box UC&C vendor management tools is the lack of real-time data. Often, the

performance metrics provided aren't available until the end of a UC&C session — when it's too late for your end-users! You don't want to have to tell your users to wait until after a long (and painful!) conference call is over because you don't have the data you need to properly diagnose the problem and resolve the issue.

End-of-call data may be helpful for preventing the same issues in future sessions, but it does nothing for the users who have suffered through a bad experience.



Real-time UC&C performance management tools enable IT teams to proactively identify issues in the UC&C environment and potentially resolve an issue before end-users notice or report the issue.

Synthetic Call Agents Complement Real-Time Performance Data

Real-time UC&C performance management is crucial for understanding the end-user experience of actual calls, as well as for identifying and troubleshooting problems as they are occurring in your UC&C environment. Synthetic call agents combined with real-time performance management enables a more comprehensive approach for IT teams by helping IT to confidently answer two simple additional questions:

- ❑ Can my users make a call?
- ❑ What will the quality of that call be?

Agents re-create the end-user experience using scripts to automate a series of typical end-user tasks that might be performed during a UC&C call session. Because a UC&C call session can consist of two or more endpoints connecting from a practically infinite combination of locations, networks, and endpoint devices, it's important that agents can be deployed in the cloud as well as the enterprise in order to account for as many scenarios as are feasible.

In order to identify UC&C performance problems that a user might experience — such as poor voice or video quality, latency, or not being able to hear one or more parties at the other end of a call — agents must be able to report on more than whether or not a call can be made and whether or not a script runs successfully. In addition to placing a call, an agent must be able to measure actual metrics — such as mean opinion score (MOS), loss, latency, and jitter — observed in media (such as an audio playback file) for both sides of the call.

When user-specified performance thresholds are observed that are considered unacceptable, the UC&C performance management solution should proactively alert the appropriate IT teams and provide the data from the agents to help identify and troubleshoot the source of the problem.

Multiple IT Teams Looking in All the Wrong Places

Turning to the broader enterprise network objectives to deliver high quality voice and video, as well as data application services, you face an even greater challenge. The challenge for IT teams today is that most organizations have multiple groups within the department that are responsible for specific voice, video, and business data components or applications in the enterprise environment. These teams work with various monitoring and diagnostics tools that are specific to a particular application or component in the IT environment.

These standalone tools provide inconsistent — often proprietary or otherwise incompatible — analysis data and views that can't be integrated or easily correlated with other components, applications, or systems for the UC&C environment. The lack of holistic service visibility and collaboration produces an inefficient, iterative process for triage and root cause analysis of UC&C performance issues (see Figure 3-1).

For example, when a user reports an incident to the help desk, the help desk technician first creates a ticket, logs the incident details, verifies that the problem exists, and performs basic root cause analysis and troubleshooting.

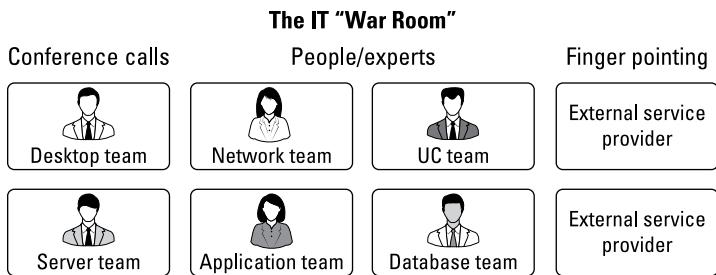


Figure 3-1: Multiple, siloed IT teams are inefficient.

If the technician can't quickly resolve the issue, the issue is escalated to another team. However, determining the correct team to escalate the issue to can be a challenge in and of itself. Is it a desktop issue? Networking? Server? Application? Database? Third-party, session initiation protocol (SIP) trunking, or wide area network (WAN) provider? Or some other UC component? If the teams are geographically dispersed, they may need a few more conference calls to get the right people “in the room.”



As more teams become engaged and various “experts” are brought into the problem, territorial defenses escalate and finger pointing quickly spreads. This counterproductive situation also exists for organizations that simply “throw the problem over the wall” for a third-party service provider to sort out. This approach doesn’t necessarily resolve the problem and can result in more finger pointing and pushback from the service provider. This is where it becomes apparent that no one is looking at the same information. In fact, it is likely that some of the data from the different vendor management tools conflict with each other. IT “war rooms” such as this defeat the purpose and ultimately harm the organization.

Understanding the Potential Impact of Business Data Services

The root cause of many UC&C performance issues isn’t necessarily associated with a direct component of the UC&C environment, but rather some other business system, application, or component on the network.

For example, if QoS isn't configured correctly for other applications, an enterprise resource planning (ERP) system may consume excessive bandwidth at certain times (such as a warehouse inventory or month-end financial closing), causing unanticipated UC&C performance issues. Or perhaps a misconfigured network switch is "chatty" and is flooding the network with broadcast traffic.

Conversely, as adoption and usage of a UC&C solution in an organization takes off, other mission-critical business applications, such as an ERP or customer relationship management (CRM) application, may be adversely affected by the UC&C solution.



In addition to identifying potential problems in the UC&C environment, a UC&C performance management solution can also help you identify and troubleshoot problems in other mission-critical business applications and services, as well as application and service usage throughout the environment.

Ultimately, IT teams need a holistic UC&C performance management solution that is vendor agnostic, is intuitive and actionable, and provides real-time end-to-end visibility of the entire user experience and IT environment. These tools must be available to all IT teams so that all groups have a consistent version of "the truth" and can work together in a collaborative and effective manner.

Reconciling voice quality issues and banking on better customer experience in financial services

For more than a century, a large U.S. commercial bank has been serving customers through more than 3,000 offices in 25 states. The bank offers a full line of services, including 24-hour banking at branches or through customer-facing call centers available to nearly 20 million customers.

Challenge

In the banking industry, a differentiated and engaging customer experience is key to attracting and retaining customers, which ultimately drives revenue. To improve the customer experience, the bank engaged in a

high profile, multi-faceted, and costly UC&C upgrade project across its call centers and data centers, moving to SIP trunking from a traditional time-division multiplexing (TDM) model. The initiative was projected to save the company \$1 million per month. However, the multi-vendor voice environment required 24-hour uptime, which was being compromised by QoS issues.

Queues began filling up as calls flooded into the call centers, resulting in long delays, which in turn hurt the customer service experience. IT was faced with the significant challenge of finding the source of the problem among different session border controllers (SBC), media, intranet, and voice over IP (VoIP) technology vendors. Lacking vendor-independent visibility into this complex environment resulted in massive finger pointing and long delays in resolving issues.

Solution

To identify, isolate, and quickly pinpoint the root cause of the bank's call quality problems, a UC&C performance management solution was deployed. The solution immediately identified that call traffic had the proper QoS tag (46) when entering the SBC, but was incorrect (0) as it exited the outsourced interactive voice response (IVR) system. As a result, calls were being given best-effort

delivery, which explained why they were queuing. The traffic intelligence gained from the UC&C performance management solution provided IT with critical insights and enabled it to pinpoint exactly where within the environment the misconfiguration was located.

Results

The bank's IT team had the enormous responsibility of ensuring that call centers were working at their peak levels to assure the best customer experience. UC&C performance management provides critical insights into the performance of packet-based traffic, allowing IT to rapidly pinpoint the reason behind QoS issues in the call center. This critical intelligence effectively reduced mean time to knowledge (MTTK), which led to an accelerated mean time to resolution (MTTR), and enabled IT to:

- ✓ Gain critical information useful to both network and voice teams to resolve the root cause of problems
- ✓ Reduce lost time and frustration caused by finger pointing among vendors
- ✓ Facilitate a collaborative approach to solving network problems affecting UC&C
- ✓ Stop the blame game and help reduce MTTR

Chapter 4

Ensuring Success with Essential Visibility and Measurement

In This Chapter

- ▶ Getting a complete view of the users' UC&C experience
 - ▶ Identifying issues in the network
 - ▶ Looking at voice, video, and media metrics
 - ▶ Examining signaling metrics
 - ▶ Supporting multi-vendor UC&C environments
-

In this chapter, you learn about the important components of a holistic unified communications and collaboration (UC&C) performance management solution, including key metrics.

Seeing the Complete Picture

UC&C applications are becoming increasingly business critical as they form integral parts of business processes and are used to develop new business models. As a result, enterprises are investing significantly in UC&C technologies with the expectation of improving collaboration and business productivity across their organizations.

The adoption of UC&C services to enable better collaboration assumes that service quality will be sufficient for end-users to interact effectively across a full suite of UC&C applications and technologies.

Today's UC&C deployments, however, are complex with various multi-vendor products and traverse a number of IT domains. While traditional performance monitoring approaches have focused on the component performance of these services, a myriad of issues — in and beyond the components and into the network — can impair voice and video quality. What's important is how these various components interact with each other. This interaction provides important clues about the root cause of an issue — not only an indication of the quality of the UC&C service. Some important interactions to look at include:

- ✓ Signaling between the user device and the call server
- ✓ Connections from the call server to the session initiation protocol (SIP) trunk
- ✓ Voice quality from the user device to the firewall, through the session border controller (SBC) and the SIP trunk

The rapid rise of cloud-based services, including cloud communications and consumer-oriented software as a service (SaaS) applications (such as Dropbox and Google Apps), adds another dimension to these challenges because many traditional performance-monitoring tools don't provide instrumentation beyond an organization's network demarcation point. Thus, IT teams must be able to look at the endpoints and call path together — at the network edge and beyond — in order to get a complete picture of the UC&C environment.



You can't manage what you can't measure, and you can't measure what you can't see! Many departments and individuals are increasingly using SaaS-based apps for business. These apps aren't visible to many vendor-specific performance monitoring tools. *You need a UC&C performance management solution that provides end-to-end visibility of the entire UC&C environment.*

IT teams must assess the performance of all interaction across the components involved in a call session across the entire network from endpoint to endpoint, including call signaling and evaluating call quality from the perspective of the users — all of them. Voice and video calls in a UC&C environment may involve multiple users or groups of users, each with a different perspective of the UC&C experience.

UC&C performance management instrumentation in the call path, particularly at demarcation points, helps IT teams to determine where in the network a problem is occurring, which component is causing the issue, and which teams need to be engaged to resolve the problem quickly. Midpoint data complements endpoint data by pinpointing the root cause of an issue — rather than just telling you there is a problem.

Poor user experience, especially early on after an organization adopts a specific UC&C solution, can leave expensive UC&C applications and technologies underutilized or unused. The consistent delivery of excellent quality of experience (QoE) is hence a key factor in reaping the benefits of UC&C. QoE may be human-to-human (for example, voice and video quality between two people) or human-to-machine (for example, call setup time for the person making a call).



UC&C performance management instrumentation should be deployed at the demarcation between service components, such as public switched telephone network (PSTN) gateways, session initiation protocol (SIP) trunks, and wide area network (WAN) segments.

Connecting All the Dots with Network Performance Metrics

Network monitoring tools typically provide limited data to help network engineers understand and troubleshoot performance issues in the UC&C environment. These tools typically provide connectivity, availability and basic performance metrics such as delay, packet loss and jitter. However, these metrics alone are insufficient to quickly and effectively troubleshoot and resolve UC&C performance issues. Instead, network engineers and other IT support teams need to have visibility into and an understanding of voice and video quality and service degradation issues, among others, to understand specifically what problems are occurring, investigate the root cause, and identify and implement appropriate problem resolutions.

Basic metrics such as average packet loss and jitter are useful when troubleshooting; however, they are not accurate predictors of the quality experienced by an end-user. MOS calculations are more sophisticated. These calculations

consider factors such as the potential for packet degradation and variations of jitter over time to produce a much more accurate indication of customer call experience.

Some critical network performance metrics available in a UC&C performance management solution are described in Table 4-1.

Table 4-1 Critical UC&C Performance Metrics

UC&C metric	What it is	Why it matters
Voice IP mean opinion score (MOS)	A measure of voice quality that reflects distortions caused by voice coding and IP transmission errors	Determines the impact of IP impairments on the end-user's perceived listening quality
Video IP MOS	Reflects the quality of the video and reflects distortions caused by video coding and IP transmission errors	Determines the impact of IP impairments on the end-user's perceived viewing quality
Video MOS degradation	Provides an indication of the MOS degradation that is caused by compression alone (without the effect of the IP network)	Can be useful to separate the effects of video compression (for example, lower bit rate or frame rate) from those of the IP network performance
QoS, QoS mismatches, and QoS changes	Provides an understanding of how the UC&C traffic has been classified in the network	A QoS mismatch in either call direction, or QoS changes along the call path, can be an indication that QoS is configured incorrectly on the network
Single direction — one way calls	The ability to see calls in which voice traffic is running in one direction only	Used to assess how traffic is routed through the network and establish the root cause of performance issues

UC&C metric	What it is	Why it matters
Codec metrics and analysis	Tells you which codecs are in use, how many calls are using each codec, and if codec surprises or anomalies are coming from certain locations or SIP trunks	Different codecs provide different quality levels, and also require different amounts of bandwidth, so it's important to determine if the correct codecs are being used, and if incorrect codecs are possibly causing network bandwidth to be oversubscribed
Short calls	Tells you if there are lots of short calls	Indicative of bad call quality causing people to hang up and try again

Recognizing the Importance of Signaling Metrics

Signaling metrics are a key component of UC&C performance management and provide important insights into potential performance issues, including endpoint registrations, call setup, and call tear down.

Additional insights into signaling provide more data points on how your UC&C infrastructure is performing. For example, if your phones aren't connecting, where are the phones trying to register, what is the nature of the registration failures, have the endpoints been assigned, and do the phones have the correct security profile? Some important derived signaling metrics are summarized in Table 4-2.

Table 4-2 Derived UC&C Signaling Metrics

UC&C metric	What it is	Why it matters
Network Effectiveness Ratio (NER percentage)	The proportion of successful connections (of the detected signaling legs) to those that failed to connect for network or end-user reasons (calls connected/total attempts)	Provides an indication of network efficiency: Lower values indicate congestion in network/call servers

(continued)

Table 4-2 (continued)

UC&C metric	What it is	Why it matters
Answer/ Seizure Ratio (ASR percentage)	The proportion of successfully connected signaling legs that were associated with answered calls (calls answered/total connected)	Provides an indication of usage patterns: Lower values indicate many calls are not getting answered
Average Setup Time/ Session Request Delay (SRD) or Post Dial Delay (PDD)	The time elapsed between the completion of dialing and when the caller hears the indication tone (ringing or busy)	Indicates network performance issues: Higher values indicate delays between dialing and the user hearing a ring tone or busy signal
Signaling requests	Provides an indication of how busy your servers are	Can be used to establish whether your systems are being used or load balanced effectively

Making Sure Your UC&C Diagnostics Are Vendor Agnostic



UC&C performance management diagnostics must be able to support highly complex, multi-location, multi-vendor environments. Quality measurements and assessments should be agnostic of any particular vendor platform and able to assess virtually any UC&C technology vendor component or application in the UC&C environment. Whether the service is voice or video, desktop or room-based, soft-client or fixed-phone, assessment methods should be applied in a consistent manner. Measurements must be made across service types and for complex multi-vendor environments.

Chapter 5

Delivering UC&C Service Assurance

In This Chapter

- ▶ Accelerating MTTI and reducing MTTK
 - ▶ Using dashboards and drilldowns effectively
 - ▶ Monitoring the right UC&C performance metrics
 - ▶ Designing proactive workflows
-

This chapter explains how a unified communications and collaboration (UC&C) performance management solution helps IT teams reduce the mean-time-to-resolve (MTTR) UC&C performance issues, using intuitive dashboards and drilldowns, meaningful metrics, actionable information, and proactive processes and workflows.

Getting to the Right Escalation — MTTI and MTTK

Triaging capabilities in a UC&C performance management solution are critical for reducing mean-time-to-identify (MTTI) — the time it takes for IT to become aware of an issue so that the right resources can be mobilized. Some IT teams also refer to MTTI as “mean-time-to-innocence” — the time it takes to prove the problem isn’t their responsibility and “throw it over the wall” to another team or a third-party service provider.



Unlike siloed performance management tools that alert certain teams based on a limited view of the IT infrastructure, an effective UC&C performance management solution provides a holistic view of performance issues so that all the right teams can have the same information to analyze the situation correctly and be immediately engaged.

Once all the right IT teams are aware of an issue, they can work together to determine the root cause and solution to the problem — mean-time-to-knowledge (MTTK). MTTK is the biggest variable in the time needed to resolve an issue, from MTI to mean-time-to-fix (MTTF) and verify (MTTV). See Figure 5-1.

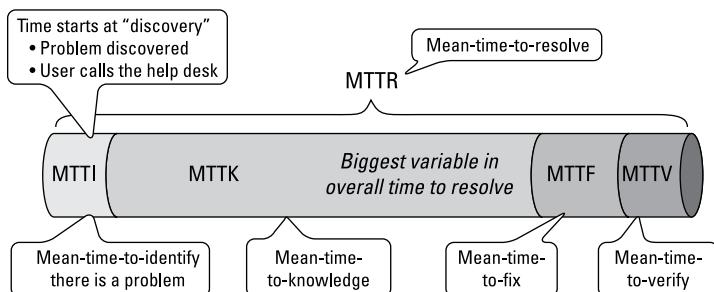


Figure 5-1: Reducing mean-time-to-knowledge is the key to reducing the impact of a performance issue.

Determining Root Cause with Dashboards and Drilldowns

Rather than sifting through volumes of logs and deciphering cryptic error messages while your users suffer through a painful UC&C experience, you can use a graphical dashboard to quickly spot potential or actual problems in your UC&C environment so that you can resolve issues more quickly. A complete UC&C performance management solution helps IT teams address UC performance issues with an intuitive, graphical dashboard and power drilldowns, including:

- ✓ **Service dashboard** provides real-time, at-a-glance, holistic status visibility of all UC&C voice and video services as well as their network and application components, enabling delivery of alarms and intelligent early warnings so IT can focus its triage efforts where needed.

- ✓ **Service dependency** visualizes the current state of the environment via automatic discovery and mapping of client-server relationships and other interconnected components to help determine exactly which part of the infrastructure is failing or creating a bottleneck.
- ✓ **Performance analysis** enables comprehensive analysis of UC&C transactions such as call setup performance, voice and video quality, and traffic analysis to identify the root cause of UC&C performance issues by leveraging key performance metrics.
- ✓ **Call analysis** provides visibility of both the call setup (signaling) and call quality in a single workflow, enabling hop-by-hop analysis for signaling protocols, to determine the root cause of call setup failures or drops, plus media views showing the call quality along the call path — not only at the endpoints.
- ✓ **Packet analysis** enables deep-dive, protocol-level analysis, such as replaying calls and signaling traffic data for escalation of interoperability issues between vendors and other issues.

Using the Correct Metrics for Call Setup and Media Quality

When physicians and medical professionals triage patients, they obtain baseline information such as height, weight, age, temperature, and blood pressure, and they make visual observations about the patient's appearance to obtain an initial contextual point of view. They also try to learn about medical history, trauma, medications, and all relevant facts and circumstances that provide insight into the patient's health.

Similarly, important UC&C performance metrics to consider when diagnosing a performance issue go well beyond the typical metrics found in network monitoring solutions — packet loss and jitter. These metrics include:

- ✓ Voice and video IP mean opinion score (MOS), MOS degradation, packet loss, jitter, delay, and minimum MOS (showing the overall quality of calls and degradation of quality, as well as when a problem occurred during the call)

- ✓ Quality of service (QoS), QoS mismatch and/or QoS change because if latency sensitive traffic is not classified correctly, it may get dropped in congested classes
- ✓ Single direction calls (indicating a routing or setup issue)
- ✓ Codec configuration issues (which determine fidelity and bandwidth used)
- ✓ Signaling load, errors, and latency on call servers, such as call managers, front-end servers, session border controllers (SBCs), gateways, and SIP trunks, and how they all interrelate
- ✓ Dropped calls



Several of these key UC&C performance metrics are explained in greater detail in Chapter 4.

Understanding the Difference Between Proactive and Reactive Workflows

UC&C performance management enables proactive processes and workflows that can reduce the number of reactive “fire-fighting” issues for your IT organization.



A UC&C performance management solution needs to support both proactive and reactive IT processes.

UC&C performance management alerts, baseline charts, and graphical dashboards can provide the necessary data and tools for various IT teams to identify potential performance bottlenecks and service degradation issues before they become problems that negatively affect their end-users.

However, IT organizations need to define proactive processes, procedures, and workflows to properly leverage UC&C performance management tools and data. Far too often, an IT organization implements a new technology solution but fails to update any supporting processes, procedures, and workflows. The organization therefore fails to realize the full benefit of the new solution.

UC&C performance management tools and data must be presented in an uncluttered manner that is simple and intuitive for the various IT teams. Otherwise, UC&C performance management alerts simply add to the noise — with too many alerts that can't be easily correlated to actionable remediation. Ultimately, the alerts will be ignored.

A typical reactive workflow for a UC&C issue might begin when a user emails or sends an IM to the IT help desk about poor voice quality at the start of an important conference call. The help desk technician logs the pertinent information, creates a ticket, and validates that the call is actually bad, and the problem is not simply a user error — for example, Equipment Exceeds Operator Capability.

If the help desk technician can't quickly diagnose the root cause, the next step is to decide which IT team the issue should be escalated to and reassign the ticket. However, by this time the call may already have ended in frustration and an important business opportunity may have been missed.

IT support, by its nature, always has some reactive processes and workflows, but when implemented with proactive processes and workflows, UC&C performance management can help an IT organization effectively reduce the number and impact of reactive issues. A key step in reducing the impact of reactive issues is to enable your first line of support — your help desk — to quickly identify the correct escalation and thereby reduce the mean-time-to-knowledge (MTTK). This could mean fewer headaches for you!

UC&C applications and services provide critical business services to your end-users, but today's UC&C environments are increasingly complex. Successfully managing the performance of UC&C applications and services requires a holistic view of the entire UC&C and IT environment. The key is to use protocol independent, vendor agnostic tools that provide real-time data and historical context through intuitive and actionable graphical dashboards. Proper tools enable the right IT teams to respond quickly and effectively to resolve performance issues.

Diagnosing and curing VoIP quality issues in healthcare

A Fortune 50 health and well-being company delivers insurance and pharmaceutical coverage approvals, premiums costs and invoices, and payment histories, as well as websites for subscriber services and support for its millions of customers.

Challenge

With a major UC&C project underway, this healthcare insurance provider was faced with the challenge of ensuring call quality at its customer call centers. New SIP trunk services were suffering from degradations in performance, resulting in the poor call quality. With a high volume of calls routed through the organization's contact centers out to its more than 200 home-based agents, voice quality issues presented a significant problem with the customer service experience.

The IT team faced months of intermittent voice over IP (VoIP) problems that manifested as poor voice quality on contact center calls being transferred to home-based agents. IT required visibility into UC&C services in order to analyze service quality and to pinpoint and resolve the issues.

Solution

To help the healthcare insurer improve triage activities for its new UC&C deployment and isolate and pinpoint the root cause of call quality issues, a UC&C performance management solution was deployed to gain visibility into the source of the quality issue.

Using the solution, the IT team determined that transfers within the gateway from one card to another were responsible for noise 98 percent of the time. Once the cause was identified, the team was able to quickly replace the faulty card, eliminating the problem.

The traffic intelligence provided by the UC&C performance management solution also helped identify the IP telephony devices and associated virtual private network (VPN) tunnel—for calls going out to the home-based agents—that had been misconfigured. The misconfiguration was responsible for dropped packets, resulting in poor call quality. After configuration of the IP telephony equipment was corrected, call quality to home-based agents vastly improved.

Results

The UC&C performance management solution has been instrumental in ensuring the success of this healthcare insurer's UC&C deployment. By providing critical insights into the performance of packet-based traffic, IT pinpointed the reason behind call quality degradations in call centers and with home-based agents, and quickly addressed the problems. The solution enabled IT to:

- ✓ Ensure high quality customer experience in the call centers
- ✓ Reduce time lost to researching complex, multi-vendor issues
- ✓ Improve customer service and overall user experience

Chapter 6

Ten Tips for UC&C Performance Management

In This Chapter

- ▶ Seeing the complete picture with deep and meaningful insights
 - ▶ Being proactive about UC&C performance management
 - ▶ Preparing for what's next with trending and reporting
-

This chapter presents ten things you should be thinking about as you consider a UC&C performance management solution for your organization.

Take a Holistic View of the Environment

A holistic view of the IT environment enables different IT teams to work together to solve the issue, rather than focusing on “it’s not me” and moving on. Some organizations are quick to throw problems over the wall to a third-party provider. However, escalating a problem to a third party doesn’t necessarily resolve a problem to your organization’s satisfaction, or in a timely manner. A third party’s service-level agreement (SLA) requirements may be different from those of your internal organization, and getting a nominal service credit from a third party when it fails to meet an SLA requirement does nothing to relieve internal complaints about the quality of IT services.

Seeing how all of the components in a UC&C architecture work together, and how other applications and services may also be affected by or causing a UC&C issue, IT teams can get to mean-time-to-identification (MTTI) faster and provide evidence to the correct party to help them fix the issue quickly.

Dig Deeper When Packet Loss and Jitter Aren't the Problem

Network packet loss and jitter are among the usual suspects when it comes to UC&C performance issues. The problem is that packet loss and jitter are symptoms — not root causes.

In order to resolve UC&C (and other IT infrastructure) performance issues, you need to dig deeper to determine what is causing packet loss and jitter. Are quality of service (QoS) policies set and applied correctly? Are congested network segments or devices dropping packets? What other applications or services are running on the network that may be causing packet loss and jitter?

Collect Meaningful End-to-End Metrics

Metrics must go well beyond the speed of a network link and whether or not an endpoint is up or down. In order to assure the quality and performance of UC&C environments, meaningful end-to-end metrics must be available to identify performance issues.

Go Beyond Break-Fix and Clean Up the System

The visibility and insight that a comprehensive UC&C performance management solution provides into your UC&C environment, as well as the entire IT infrastructure, empowers you to do more than react to performance issues.

By proactively addressing performance bottlenecks and QoS settings, verifying the codecs, and so on, you can potentially simplify parts of your network infrastructure and improve overall performance and efficiency.

Monitor Your Video

Video is an important service that your UC&C performance management solution must be able to monitor. Don't get so caught up in network instrumentation and other traditional endpoints that you forget to monitor your video applications and services.

Baseline Performance Throughout Your Environment

UC&C performance management collected over time paints a picture of the activity in your entire network environment, providing a useful baseline of normal performance throughout the environment. This snapshot includes the signaling protocols and codecs in use, QoS classes assigned to all of your applications, normal jitter and packet loss levels, and average bandwidth utilization for UC&C services, as well as other business data services.

This baseline information can be invaluable when you're planning major new projects and initiatives, enabling you to make decisions based on hard facts — and validating whether UC&C performance after the initiative matches or improves the end-user experience before the project was undertaken.

Having a UC&C performance management baseline also helps to uncover "changes" to that baseline. The root cause of many IT performance issues is often a change — for example, a new router is deployed to a regional office but lacks the correct QoS policy configuration. Users at that site may quickly experience poor UC&C performance and report it. Having a baseline enables IT to compare performance levels and reduces mean-time-to-resolution (MTTR) in uncovering the root cause of the issue.

Trend and Report for Planning and Monitoring Purposes

UC&C performance management collects a wealth of trend information that can be useful in planning for the future

UC&C needs of your organization. For example, rather than over-provisioning bandwidth that you don't yet need, or panic buying additional bandwidth when performance bottlenecks have already become endemic, you can stay a step ahead with trend reporting and monitoring of current usage in your network environment.

Provide Clear Management Reporting

Don't let management hear only about problems in your UC&C environment! Report your successes as well. Clear and engaging management reports demonstrate UC&C adoption by users in your organization and can be used to gain support for further investments. You can also provide helpful reports to others in order to support their initiatives, such as a teleworking policy for human resources.

Train End-Users and Verify Proper Setup

To ensure your users don't encounter "equipment exceeds operator capability" errors, you need to provide training on how to properly use UC&C equipment and applications, including basic and (for some users) advanced functionality.

Also, ensure end-user equipment is set up properly. Desks frequently get rearranged and cables inevitably get disconnected. Microphones may not be positioned correctly. Video conferencing equipment may be moved to different meeting rooms and may not be connected properly — just because a cable connector fits in an outlet doesn't mean that's where it goes!



Start with the basics: Verify proper setup and operation of end-user equipment before delving into more complex troubleshooting scenarios — particularly when your end-users tell you “it worked just fine yesterday.”

Get Ready for Next-Generation UC&C and IT Transformation Initiatives

A comprehensive UC&C performance management solution empowers you with advanced analytics that can help you understand what your users need and how they use UC&C to be more productive.

Use these insights to be more innovative as you introduce new, next-generation UC&C and IT transformation initiatives to your organization, and plan your evolving IT infrastructure accordingly to be ready.

Glossary



4G LTE: *See* Long Term Evolution.

answer delay: The average time before a call is answered or rolls to voicemail (for example, a delay of more than 30 seconds triggers a warning status; calls that go to voicemail after 30 seconds trigger a critical status). Answer delay indicates answering usage patterns: Higher values indicate calls are not picked up immediately within the threshold amount of time.

answer/seizure ratio (ASR): The proportion of the successfully connected signaling legs that were associated with answered calls (calls answered/total connected). ASR provides an indication of usage patterns: Lower values indicate many calls are not being answered.

API: *See* application programming interface.

application programming interface (API): A specification for input data and output data for a system.

ASR: *See* answer/seizure ratio.

B-frame: A bi-predictive picture that references changes in preceding and forward frames to achieve maximum video compression. *See also* frame type, I-frame, and P-frame.

bring your own device (BYOD): A popular trend in which employees use their personal mobile devices, such as smartphones and tablets, in the workplace for work-related and personal business.

BYOD: *See* bring your own device.

CAC: *See* call admission control.

call admission control (CAC): Mechanisms used during call setup to prevent oversubscription of voice and video over IP networks.

codec: A device or program for encoding and decoding a digital stream or signal. Popular voice codecs are G.711, G.729, and G.722. The most common video codec is H.264.

CRM: *See* customer relationship management.

customer relationship management (CRM): Software used to manage and analyze customer interactions and data throughout the customer lifecycle.

DHCP: *See* dynamic host configuration protocol.

digital subscriber line (DSL): Most commonly, an asymmetric link used to provide Internet connectivity for small businesses and residential customers. DSL provides variable downstream and upstream speeds.

disconnect delay: The average number of seconds from hang-up request to disconnection of a call. Disconnect delay indicates network performance issues: Higher values indicate UC sessions are not being terminated immediately.

DNS: *See* domain name service.

domain name service (DNS): A hierarchical, decentralized naming system for computers, services, and resources connected to a network, such as the Internet.

DSL: *See* digital subscriber line.

dynamic host configuration protocol (DHCP): A network protocol used by a host to automatically request an IP address from a server.

echo loss: The difference in volume between echo (sound returning to the user) and the original speech. More echo loss is better because it means that the returning signal (echo) is quieter. The effect of echo loss is exacerbated by the corresponding delay of the returning speech. Understanding where the echo comes from allows you to examine faulty or misconfigured equipment, or environmental issues.

frame type: Describes the different compression algorithms used on video frames. *See also* I-frame, B-frame, and P-frame.

I-frame: An intra-coded or fully specified picture or picture slice that doesn't require other frames to decode, but

provides minimal compression. *See also* frame type, P-frame, and B-frame.

LDAP: *See* lightweight directory access protocol.

leased line: A private telecommunications circuit between two or more locations that provides a guaranteed data rate, for example T1 (1.544 Mbps) or DS3 (44.736 Mbps).

lightweight directory access protocol (LDAP): An open standards protocol for accessing and maintaining distributed directory information services over an IP network.

Long Term Evolution (LTE): A fourth generation wireless communication standard for high-speed data on mobile devices.

mean opinion score (MOS): A numerical indication of the perceived quality, from the users' perspective, of received media after compression and/or transmission. Represented in a range from 1 (poor) to 5 (excellent).

mean-time-to-identification (MTTI): The time it takes for an issue to be detected. Also known as mean-time-to-identify.

mean-time-to-fix (MTTF): The time it takes to implement a solution to an issue.

mean-time-to-knowledge (MTTK): The time it takes to determine the root cause of an issue and identify a solution. Also known as mean-time-to-know.

mean-time-to-resolution (MTTR): The total time to resolve an issue, including MTTI, MTTK, MTTF, and MTTV. Also known as mean-time-to-resolve.

mean-time-to-verification (MTTV): The time it takes to test that a solution has resolved an issue. Also known as mean-time-to-verify.

media gateway (MGW): A translation device or service that converts media streams between different telecommunications technologies.

MGW: *See* media gateway.

MOS: *See* mean opinion score.

MPLS: *See multiprotocol label switching.*

MTTI: *See mean-time-to-identification.*

MTTK: *See mean-time-to-knowledge.*

MTTR: *See mean-time-to-resolution.*

MTTV: *See mean-time-to-verification.*

multiprotocol label switching (MPLS): A high-speed, protocol-independent data transport that uses labels to route individual packets across virtual links in a network.

NER: *See network effectiveness ratio.*

network effectiveness ratio (NER): The proportion of successful connections (of the detected signaling legs) to those that failed to connect for network or end-user reasons (calls connected/total attempts). NER provides an indication of network efficiency: Lower values indicate congestion in network/call servers.

OTT: *See over-the-top.*

over-the-top (OTT): Delivery of audio, video, or other media content by a third party over an Internet service provider (ISP) network, with no control or guarantee of performance.

P-frame: A predicted picture that uses previous frames to decompress the current frame. *See also frame type, I-frame, and B-frame.*

PDD: *See post dial delay.*

plain old telephone service (POTS): Basic voice-grade telephone service using analog signal transmission over copper lines.

post dial delay (PDD): The time elapsed between the completion of dialing and when the caller hears the indication tone (ringing or busy). PDD indicates network performance issues: Higher values indicate delays between dialing and the user hearing a ring tone/busy signal.

POTS: *See plain old telephone service.*

presence: Notification to other users of the location or presence of another user. For example, the user updates his or her availability through the UC&C interface software using status indications such as “available,” “in a meeting,” or “out of office.”

PSTN: *See* public switched telephone network.

PSTN gateways: The interconnects to traditional TDM telephone services (POTS). *See* time-division multiplexing and plain old telephone service.

public switched telephone network (PSTN): The circuit-switched telephone network operated by telephony operators worldwide.

QoE: *See* quality of experience.

QoS: *See* quality of service.

quality of experience (QoE): A measure of a user’s experience in the UC environment.

quality of service (QoS): The overall performance of the network and a means of prioritizing different types of traffic over the network.

RADIUS: *See* remote authentication dial-in user service.

remote authentication dial-in user service (RADIUS): A networking protocol that provides centralized authentication, authorization, and accounting management of users.

SaaS: *See* software as a service.

SBC: *See* session border controller.

session border controller (SBC): A device used in UC environments to control the signaling and media streams involved in UC&C networks.

session initiation protocol (SIP): A communications protocol commonly used for signaling and control of voice/video calls and instant messaging over IP networks.

signal to noise ratio (SNR): The difference between the speech volume (level) and the background noise volume

(level). The greater the ratio, the better the speech stands out from any background noise.

SIP: *See* session initiation protocol.

Skype: An application that allows users to make telephone calls over the Internet. Additional features include instant messaging, file transfer, and video conferencing.

SNR: *See* signal to noise ratio.

software as a service (SaaS): A category of cloud computing services in which the customer is provided access to a hosted application that is maintained by the service provider.

speech activity: The amount (percentage) of speech in one direction of a call (speech versus total call time). Normal two-way calls have around 35 percent speech activity in each direction — allowing for people not talking over each other, and for pauses between words and sentences. For voicemail or interactive voice response (IVR) access, the speech activity is much higher in one direction than the other.

TDM: *See* time-division multiplexing.

Telepresence: Immersive multi-screen video conferencing systems in which the video software controls other elements, such as lighting, camera motion, and presentations, to create the effect of a remote participant being in the same room.

time-division multiplexing (TDM): A method of transmitting and receiving independent signal over a common signal path.

VDI: *See* virtual desktop infrastructure.

virtual desktop infrastructure (VDI): Desktop virtualization technology that logically separates the desktop environment, including the operating system and installed applications, from the physical hardware.

Voice over Internet Protocol (VoIP): Technology that enables voice communications over IP.

VoIP: *See* Voice over Internet Protocol.

Wi-Fi: Wireless networking technology defined by the Wi-Fi Alliance.

UC&C SERVICE ASSURANCE

Act now to avoid painful service degradations or unplanned outages of your Unified Communications & Collaboration services by monitoring and managing of your environment.

- Accelerate deployment success of your UC&C roll outs and upgrades
- Simplify management of complex, multi-location, multi-vendor environments
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- *Reduce costs, boost productivity while cutting the risk of unavailable or impaired UC&C services.*

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- *Lower costs and boost productivity — reduce the risk of unavailable or impaired UC&C services*
- *Find and fix complex problems rapidly — avoid the threat of unavailable or impaired services*
- *Keep users connected — deliver consistent and reliable service levels in today's complex, multi-vendor environments*



Open the book and find:

- Resolve problems quickly and reduce mean-time-to-resolution
- Minimize the impact of painful service degradations or unplanned outages
- Improve the productivity, efficiency, and effectiveness of IT staff
- Evaluate quality and pinpoint problems by mapping a call end-to-end
- Consolidate tools with a single solution for voice signaling, call quality, and data services

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