



**QUINTUM**  
AN *net* COMPANY

The Perfect Fit.

W H I T E P A P E R

VOIP INFRASTRUCTURE  
FOR THE  
EVOLVING ENTERPRISE:  
HOW TO CONTROL COSTS,  
MITIGATE RISK,  
AND ENSURE SERVICE LEVELS  
IN AN EVER-CHANGING  
NETWORK ENVIRONMENT

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MARCH 2008

## EXECUTIVE SUMMARY

In the early stages of VoIP adoption, the main concern for enterprise IT organizations was achieving consistently acceptable call quality over their wide area networks. This issue has largely been resolved. In fact, there are now many infrastructure solutions that can effectively support basic VoIP transport.

Today's enterprise IT organizations, however, have significant requirements above and beyond the mere ability to simply carry a voice signal from one point to another. Because of the continued evolution of enterprise IT, managers responsible for corporate VoIP implementations have a variety of additional concerns. Among these top concerns are:

### **SUCCESSFULLY MANAGING PHASED MIGRATION**

Cost, risk, and logistical hurdles make "forklift" overhauls of the enterprise network impractical. Also, companies typically choose to initially deploy new communications solutions in the specific departments or locations where they will deliver the greatest immediate business benefit. Network managers must therefore be able to transition from any current network environment to any planned one in incremental stages. This kind of phased approach requires that some combination of legacy and/or IP-PBXs, legacy and/or SIP phone systems, Microsoft® Unified Communications, Cisco® Call Manager, analog fax machines, and PSTN access to 911 services be somehow made to peacefully co-exist with each other during each stage of the transition.

### **RELIABLE VOIP TRUNKING**

To reduce telecommunications costs, many companies are trunking their remote sites to a central point where there is a shared PBX and a shared connection to a service provider. For such trunking to be viable, however, network managers must be able to 1) support all remote sites in a common manner even if some of them are using different equipment, and 2) ensure the survival of voice services at remote sites even if the WAN trunking connection fails or under-performs.

### **MINIMIZING TOTAL COST OF OWNERSHIP**

Technology transitions have many costs – including equipment purchase and installation, integration and project management, ongoing infrastructure management, re-training of network staff. Network managers have to keep all of these costs as low as possible in order to conserve limited technology budgets and optimize total project ROI.

## MITIGATING RISK

As network managers navigate their technology migrations, they have to mitigate a variety of risks. These include the risks of voice service outages, of unforeseen incompatibilities, and of unexpected shifts in the broader technology landscape. Network managers must therefore implement “fail-safe” mechanisms that protect them against everything from hardware glitches to the emergence of new technologies that make it worthwhile to modify their long-term roadmaps.

VoIP hardware plays a critical role in successfully addressing these multiple concerns. There are significant differences in VoIP hardware functionality that affect the cost, risk and consumption of staff resources associated with an enterprise’s transition to a future converged state. The selection of the right VoIP hardware platform is thus crucial for IT.

This white paper outlines the key criteria to consider when selecting a VoIP gateway/switching solution, especially in support of an enterprise convergence strategy. By applying these criteria, IT decision-makers can effectively and cost-efficiently meet the immediate needs of the business today – while simultaneously easing their transition to whatever the future has in store for them.

## THE MIGRATING NETWORK

Enterprise computing and communications environments are constantly changing. Networks change, systems and applications change. Endpoint hardware devices change. This has been true since the first desktop PCs infiltrated corporate offices. And it is no less true today.

Change also tends to be piecemeal. Companies usually don’t rip out all of their hardware and software overnight and replace it all on a wholesale basis with something new. Instead, they pilot new technologies on a small-scale basis first – and/or deploy them in a particular area of the business where the ROI appears to be most compelling. Then, over time, those new technologies are rolled out over other departments and locations.

Also, in many cases, older technologies are not entirely removed from the environment at all. So various generations of “legacy” technology continue to co-exist with new ones.

In other words, to effectively apply evolving technologies to keep up with evolving business needs, IT organizations must develop strategies for keeping critical services up and running in a continuously changing and often heterogeneous IT environment.

This is particularly true today in the case of VoIP. IT organizations and technology vendors are still figuring out how they can best use convergence to deliver concrete business advantages. They’re also still figuring out how to best drive down costs and optimize service levels.

*Specific areas where enterprise environments are undergoing VoIP-related change include:*

### **NETWORK ARCHITECTURE**

Rather than simply overlaying replication of an existing voice network over the IP network, many companies are starting to consider alternative approaches. For example, some are trunking multiple remote sites to a central point where there is a shared PBX and a shared connection to a service provider. In some cases, all sites are being trunked at once in a single cut-over. In others, sites are being added incrementally as older remote PBXs are retired or service provider contracts expire. Companies are also experimenting with the use of WAN links for “hop-on/hop-off” international long distance bypass.

### **NETWORK INFRASTRUCTURE**

In addition to modifying the way voice traffic moves around the network, IT organizations also continue to make modifications to the network itself. These modifications may include the adoption of the latest “application-aware” capabilities of Cisco IOS or the implementation of enhanced traffic prioritization schemes for ensuring the performance of video conferencing on the WAN.

### **TELEPHONY EQUIPMENT**

Many companies are currently undergoing, or are planning a change in their telephony equipment. These changes can include the retiring of analog PBXs in favor of IP -PBXs, a transition (in some or all locations) to IP phones, and/or the use of PCs themselves as the voice service endpoints. At the same time, companies often have all kinds of other “legacy” equipment connected to the network – including analog fax machines and various types of HVAC, security, and manufacturing systems that communicate remotely using built-in conventional modems.

### **PRODUCTIVITY APPLICATIONS**

Above and beyond reduced telecom and network ownership costs, one of the most important potential benefits of VoIP has always been the ability to implement new converged applications. A prime example of this is Microsoft Unified Communications, which provides all sorts of valuable capabilities – such as making voicemail a part of the end-user’s Outlook environment and enabling management of phone extensions in Active Directory. VoIP also facilitates the integration of call distribution tools with CRM applications to enhance contact center operations.

Again, change in all these aspects of the computing and communications environment are taking place simultaneously at different times in different areas of the business. So any smart VoIP implementation strategy must be capable of supporting – and even enhancing – multi-faceted, ongoing technology change across the enterprise.

## **STONES IN THE SHOE**

It's hard to walk very far with a stone in your shoe. It may be a small stone, but it will stop you dead in your tracks.

The same is true of enterprise VoIP roadmaps. With so many moving parts, it's easy for a little "stone" of a problem to get into the "shoe" of a real-world implementation – and therefore bring the progress of a perfectly good roadmap to a standstill.

*These "stones" can take a variety of forms, including:*

### **SERVICE VULNERABILITIES**

Companies can reduce telecom costs by trunking of multiple locations to a single, central IP-PBX. They can, however, at the same time create unacceptable service vulnerabilities. What happens when the WAN connection to a remote location fails or begins to under-perform? How will voice services at that location be maintained under such conditions?

Similar contingencies must be considered with a solution such as Microsoft Unified Communications. If access to a Session Initiation Protocol (SIP) server is necessary for end-users to make and receive phone calls, what happens when that server hangs or needs to be re-booted? How can IT organizations maintain non-stop voice service in an environment where a problem with an email store can adversely impact the server that supports VoIP availability?

### **SIP INTEROPERABILITY AND OTHER INTEGRATION ISSUES**

While SIP theoretically provides a common "language" for resources in a convergent communications environment to interoperate with each other, the reality is a bit different. The implementation of SIP in Microsoft Unified Communications, for example, is not necessarily compatible with SIP functions in another vendor's IP-PBX or SIP endpoints. As a result, IT organizations often find themselves having to invest unanticipated time and effort into integrating resources that they expected would be inherently interoperable.

### **ANALOG CONNECTIVITY**

IT organizations can easily forge ahead with bold plans for unified communications and innovative convergence applications – only to find out that those plans leave their companies without basic necessities like analog fax service and local 911 services. VoIP planning also often fails to take into account other requirements in the business for analog connectivity. These other requirements can include HVAC equipment, security devices, and other facility management systems that utilize conventional modem-based access to the PSTN. Replacement of these systems is often impractical or inordinately expensive.

IT organizations must therefore diligently inventory the communications needs of the business outside of core end-user voice service. And accommodation for these needs must be made in both near- and long-term VoIP planning.

### **HARDWARE AND SOFTWARE “CREEP”**

To maximize convergence ROI, technology managers have to keep both capital costs and ongoing management burdens low. Unfortunately, the assorted vagaries associated with cobbling together different components from different vendors to fill different functional gaps can lead to unexpected additional purchases and an enterprise environment that is quite a bit more complex than originally planned. What was once projected to be a relatively simple implementation of a couple of pieces of hardware and software turns into a Rube Goldberg agglomeration of multiple gateways, protocol servers, custom code, and failover measures.

This hardware and software “creep” doesn’t just drive up TCO. It diverts limited staff resources away from other high-value tasks. It increases the likelihood of service failures. It makes those failures harder to diagnose. And it delays time-to-benefit for every phase of the convergence roadmap. Technology managers must therefore vigilantly protect their VoIP implementations from the threat of complexity.

There are other “stones” that can impact VoIP/convergence roadmaps. A major vendor such as Microsoft or Cisco can announce a change of strategic direction that directly impacts technology planning. A smaller vendor may introduce an innovative solution two or three years down the road that offers tremendous benefits – but which was never considered when the roadmap was first laid out. Businesses merge, acquire, and get acquired – forcing them to accommodate hardware and software that is substantially different from their own.

So, in order for any company to gain maximum business advantages from VoIP, technology managers must somehow keep all these stones out of their shoes. They must support convergence in a way that is highly interoperable and adaptable. They must implement solutions that are both cost-effective and multi-functional. And they must ensure that any underlying infrastructure they implement can support what they already have, what they’re planning to have, and what they’re not sure if they’ll ever have or not.

## THE QUINTUM SOLUTION

Quintum Technologies has been successfully addressing the evolving VoIP requirements of enterprises in transition for nearly ten years. In fact, Quintum’s uniquely effective approach to supporting customers’ changing needs has made it the second-leading provider of VoIP gateways and switches in the industry.

Quintum’s current convergence infrastructure solutions address the “stones in the shoe” faced by network planners and managers in several important ways:

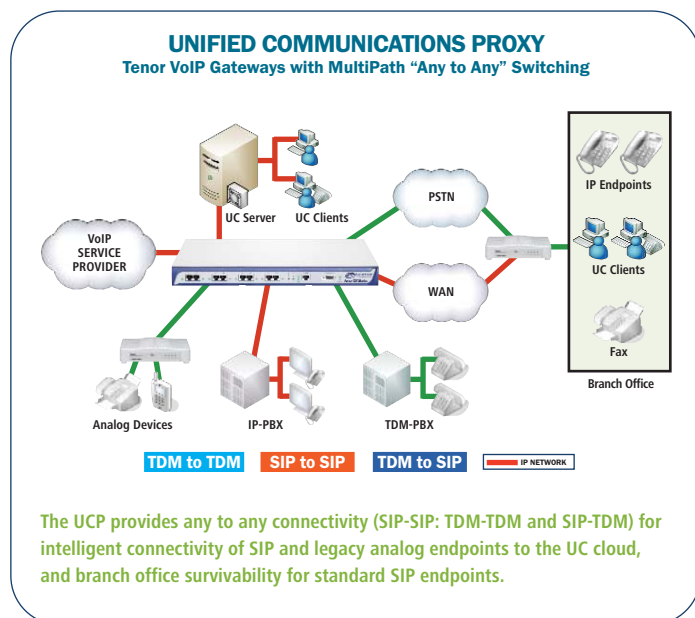
### ANY-TO-ANY CONNECTIVITY

Quintum solutions support the full range of digital and analog resources – including traditional PBXs, IP-PBXs, Unified Communications solutions, and both legacy and SIP endpoints. They also allow enterprise networks to interface with a full range of service provider environments – including circuit-switched networks and SIP-based digital architectures. Quintum’s UC proxy technology is even able to connect with the kinds of disparate SIP implementations that often create headaches for network management teams.

In addition to providing this “any-to-any” connectivity, Quintum solutions are available in a full range of port sizes and configurations – so IT organizations can implement a single, coherent set of network devices across all sites, from the largest central headquarters to the smallest remote office.

### CALL QUALITY

Quintum convergence solutions protect call quality in several ways. They multiplex voice packets from multiple calls over the IP network and apply highly efficient compression technologies to significantly reduce bandwidth consumption. This helps safeguard call quality even in very low-bandwidth environments by mitigating the impact of contention.



Quintum solutions also incorporate sophisticated echo cancellation algorithms that safeguard call quality in regions with problematic PSTN environments.

In addition, Quintum solutions allow voice traffic to be transparently re-routed to either alternative IP connections or the PSTN in the event that the primary network connection fails.

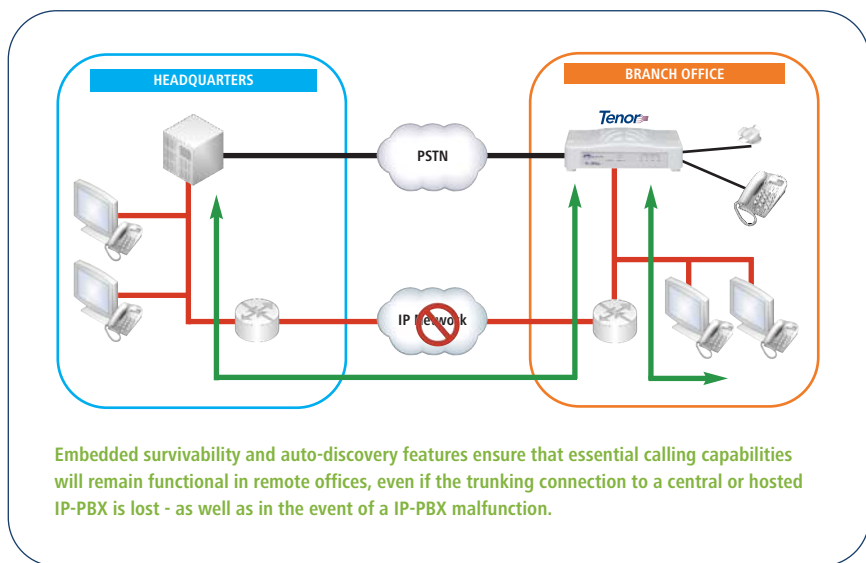
### SURVIVABILITY

Quintum solutions safeguard voice service availability in several ways. First, they combine embedded SIP and auto-discovery to ensure that essential calling capabilities will remain functional in remote offices even if the trunking connection to a central or hosted IP-PBX or UC server is lost – as well as in the event the PBX or UC server itself malfunctions. Because

a Quintum device can auto-discover phones (including their phone numbers and authentication) in the remote office, its SIP proxy will provide sufficient routing intelligence to maintain dial-tone to the desktop and support basic calling capabilities.

Just as important, this auto-discovery means that network administrators don't have to update Quintum hardware every time there is a change at the remote site. Quintum solutions automatically maintain their own survivability without requiring intervention by a technician. Quintum also provides PSTN failover as further protection against the loss of essential voice services in the event of a network failure.

Quintum solutions thus allow IT organizations to deliver more reliable converged voice service than VoIP devices that lack auto-discovery or embedded proxies – even as conditions across the enterprise change. This reliability is achieved without the costs associated with the purchase, installation, and ongoing maintenance of separate SIP servers at each remote location.



## ANALOG SUPPORT

Quintum solutions can be readily configured to provide as many analog ports as required to support “legacy” communications devices – including fax machines, intercoms, paging systems, non-IP phones, and the various types of modem-enabled systems in common use today for remote monitoring of HVAC equipment, security systems, etc. By efficiently packetizing analog signals, Quintum solutions enable IT organizations to address all the communication needs of the business across all remote locations.

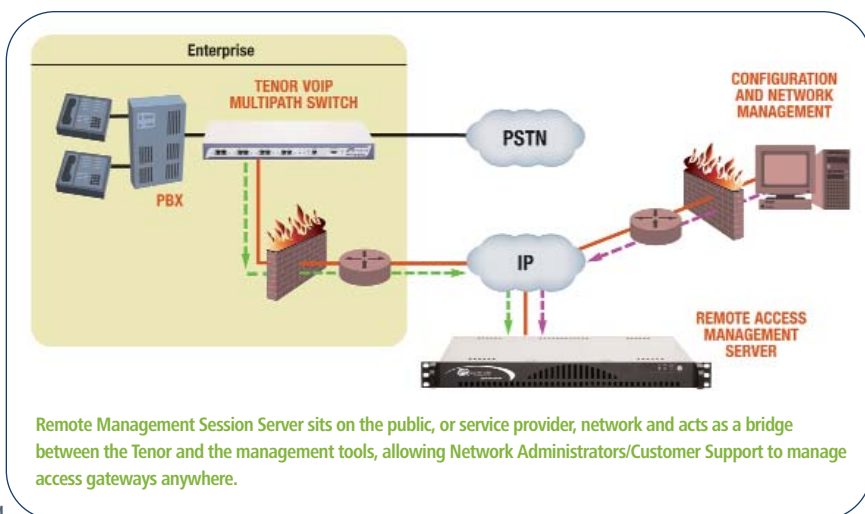
## PSTN CONNECTIVITY

In addition to providing an “on-ramp” onto the IP network for analog devices, Quintum solutions provide an “off-ramp” for packetized voice onto the PSTN. This also allows calls to be made and received via the local loop. Plus, as noted above, this PSTN connectivity provides a ready failover capability in the event of IP network problems.

Analog PSTN connectivity also ensures the ability of all users at all remote locations to communicate with local 911 emergency services. Quintum solutions thus ensure employee and facility safety even as companies and emergency services transition from analog to digital voice.

## REMOTE MANAGEABILITY

Quintum solutions can be remotely managed via telnet, FTP or Quintum’s own graphical Tenor Management Console. Using the Tenor Remote Management Session Server (RMSS), they can even be managed across NAT firewalls. The Tenor Management Console provides the complete system configuration, performance monitoring, diagnostics, troubleshooting, and remote upgrade functionality needed to maintain and optimize VoIP service levels.





## W H I T E P A P E R

### **EASE OF USE**

In the branch office, Quintum solutions don't require nearly the same amount of care and attention as the typical IP PBX vendor's remote office server. Once a Quintum device is configured, it passes signaling through to the central IP-PBX and is therefore transparent to IP endpoints – so new phones can be installed by simply pointing them at the CPE. This eliminates a significant amount of “housekeeping” work in changing enterprise environments.

### **FAST, SIMPLE INSTALLATION**

Broad technology support and MultiPath switching make it easy to quickly implement Quintum solutions in any kind of environment. They are transparent to existing PBX and IP network infrastructure – so they don't require modification to that infrastructure. Quintum also provides installation wizards that intuitively guide technicians step-by-step through the installation process for standard configurations and for deployment with third-party solutions.

Tenors can also be set up to automatically identify themselves to a provisioning server in a network operations center (NOC), allowing them to acquire their own configuration settings directly from a central provisioning system. This automated, non-disruptive installation allows managers of very large networks to bring new remote sites up quickly without costly truck rolls.

### **HIGH VALUE, LOW TCO**

Quintum solutions provide a complete set of essential functionality – including “any-to-any” connectivity, survivability, analog support, and PSTN connectivity – in a single, self-contained package. This single-device solution offers significantly greater value than alternative solutions, which typically require some combination of a switch, a gateway device, and/or a dedicated server. Such multi-device approaches increase both the initial cost of installation and ongoing management workloads. With Quintum, on the other hand, the cost of hardware, provisioning, and ongoing management are all substantially reduced.

Simply put, Quintum solutions do a better job of keeping “stones” out of VoIP implementers' “shoes” than anything else on the market. By uniquely fulfilling the technical and business requirements of companies undergoing continuous change in their IT environments, they enable more effective and cost-efficient VoIP implementation than any other set of devices available from any other single vendor.

## BENEFITS

The unmatched technical capabilities of Quintum's convergence infrastructure solutions deliver substantial business advantages to companies transitioning to the next phase of VoIP-enabled communications. These advantages include:

### **SIGNIFICANTLY REDUCED RISK**

Quintum solutions insulate companies from the full range of risks associated with technology migration – including the risk of service outages, the risk of unanticipated hardware and/or software incompatibilities, and the risk of device obsolescence.

### **SIGNIFICANTLY REDUCED COSTS**

Quintum solutions reduce the full range of costs associated with technology migration – including capital hardware costs, implementation/integration costs, and ongoing TCO. Because they require less time and effort to maintain as conditions on the network change, Quintum solutions also free limited IT staff resources for allocation to other strategic projects.

### **SIGNIFICANTLY ACCELERATED TIME-TO-BENEFIT**

By simplifying implementation and eliminating project snafus, Quintum solutions enable companies to more rapidly gain the business benefits they seek from VoIP. The “infrastructure transparency” Quintum solutions provide also empower IT organizations to move more aggressively in their adoption of future technologies in order to reap the further benefits those technologies offer.

### **IMPROVED RESPONSIVENESS TO BUSINESS NEEDS**

Quintum solutions give IT organizations the adaptability to more nimbly respond to all types of changes in business requirements – including mergers and acquisitions, implementation of new convergence-enabled applications, and the extension of operations to overseas locations.

Companies of all kinds need to continue moving forward with their convergence roadmaps in order to optimize their bottom-line performance and ensure their continued competitiveness. But no network manager has a crystal ball. And no IT organization has unlimited resources to devote to their convergence strategies. Given these resource constraints and the very real risks associated with change in an uncertain world, Quintum offers network planners the best available infrastructure solutions for implementing VoIP as part of a broader convergence strategy.

## ABOUT QUINTUM

Quintum Technologies, LLC, a wholly owned subsidiary of Network Equipment Technologies, Inc., is headquartered in Eatontown, NJ. Quintum delivers VoIP solutions that bring the reliability and voice clarity of public telephone networks to Internet telephony. Quintum's intelligent VoIP access solutions integrate easily into existing PBX and IP infrastructures, making them the ideal choice for service providers and enterprises alike.

Quintum was awarded the Frost & Sullivan 2007 Global Product Differentiation Innovation Award in recognition of its ability to grow and strengthen its position in the enterprise media gateway market through intensive in-house product development. Quintum is also a Microsoft Gold Certified Partner, a Nortel Developer Partner, and an Avaya DeveloperConnection Partner.

Quintum sells its switches worldwide through its direct sales force and a network of resellers and distributors. For more information, visit [www.quintum.com](http://www.quintum.com).

