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WHITE PAPER

IP Telephony: Reliability You Can Count On

Architecture Matters

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1. IP Delivers a Foundation for Reliability

For busy organizations everywhere, the phone service is a lot like air: you need it to survive, yet take it for granted until you don't have it. For more than a century, the makers of traditional voice switches have focused on developing systems that are available at least 99.999 percent of the time. Organizations naturally expect this level of high availability for their IP-based communications systems, which is why it is important to understand how IP telephony offers the crucial "five nines," and how to evaluate IP telephony systems for this mission-critical requirement.

One of the fundamental design goals of the Internet was to achieve an unprecedented level of communications network resilience. As a result, packet-switched networks fundamentally enable fault tolerance, adaptive routing, and disaster recovery, so it is quite possible—and can be quite cost-effective—to build IP-based communications systems that are more reliable than circuit-switched PBX platforms. The key is to start with the right foundation.

Today's IP-based telephony solutions fall into three basic categories:

- Systems evolved from traditional PBX platforms
- Systems evolved from traditional data-switch platforms
- Systems designed from the ground up for IP-based communications

All three of these architectures can be configured to deliver five-nines reliability, but with different degrees of complexity and cost. In this paper, we will examine the effects of these different architectures on the ability to deliver IP-based telephony systems that are both highly available and cost effective.

2. Compare Three Different Approaches to Delivering Five-Nines Availability

The manufacturers of legacy voice systems have a rich history of delivering extremely reliable voice switches, and are responsible for the 99.999 percent availability standard that modern IP-based telephony solutions must match or exceed. However, legacy PBX and key systems are hierarchical voice silos that operate independently at each location in a company. They cannot back each other up or be managed as a single voice network, and actually create a single point of failure at each site.

The majority of IP telephony solutions that have evolved from these legacy voice switches have inherited some of the inherent fragmentation of this centralized and hierarchical architecture.

3. The Centralized IP PBX

One approach is to put a centralized IP PBX at the main site and provision dial tone over an IP backbone to IP phones at the remote locations. If the wide area network (WAN) link goes down, so do the IP phones, however, availability assurance can be increased by installing a small standby IP PBX at each remote site. This device can either sense an outage and automatically take over as necessary, or require someone to flip a manual switch after employees start complaining that there is no dial tone, and then flip the switch back after the WAN link is restored.

The cost of the failover solution is generally inversely proportional to its level of automation. If a company has multiple sites that are fairly large, separate IP PBX equipment has to be installed at each location.

The result is a mass of switches that operate more like separate silos than elements of a single communications system. This fragmented architecture cripples one of the key benefits of IP-based telephony: the ability to create a single voice system that is distributed across multiple sites and can cover for individual switches that fail. It can also increase costs because each of the silos may still require outsourced management and maintenance, just like the circuit-switched predecessors. There may also be licensing issues to consider.

4. The Data-Centric Approach

Many vendors have entered the IP telephony market by turning voice into yet another network application, albeit a very important one. However, even the more established data-switch vendors lack an architectural edge due to some significant legacy baggage in the data world.

To begin with, while voice does not require much bandwidth, each conversation has to be maintained in a constant stream with strict latency thresholds for acceptable voice quality. Data traffic is very forgiving when it comes to latency, and data switches are designed to burst massive amounts of data through as quickly as possible.

Data-switch vendors approach IP telephony by taking these basic, data-optimized Ethernet switch platforms and embedding a new technology into them. As a result, call control is implemented in a separate centralized server, located in a data center. This centralized server is fundamental to all calls to, from, and between IP phones at all the company's different sites, so it creates a single point of failure. Multiple call-control servers can be purchased at additional expense and clustered together to provide fault tolerance, but this centralized architecture still assumes that the IP backbone connecting each office is always available.

This data-centric architecture requires IT to manage a web of marginally reliable disk drives that are responsible for providing mission-critical telephony functions, such as dial tone. Many products involve different management interfaces for different parts of the system, and these interfaces have to be repeated at each site. To ensure the entire system works properly across the enterprise, all information must be configured in a consistent fashion across each interface. A single error in just one management interface may cause communication features to fail, and take valuable man hours to troubleshoot and fix.

When the WAN goes down, remote offices can fall back to a survival mode—if this optional feature was purchased and installed, and the IP phones were configured to use it in the event of a WAN outage. The approach is similar to that of the legacy voice vendors, who increase reliability by adding a standby PBX at the remote site. For legacy data vendors, improved availability takes the shape of a card that is installed in the remote site's data switch. This survival-mode feature is not always included in the original quoted price of the solution, and delivers a reduced level of voice service: in the event of an outage, users limp along with dial tone and just a few basic features.

When IP-based communications are based on a data-switch architecture, availability can be increased by building in a lot of redundancies. This over-provisioning approach tends to become very expensive very quickly, and it also makes systems more complex. In fact, the inherent complexity of retrofitting a data platform for voice adds reliability challenges at every level: design, implementation, day-to-day operations, and problem resolution. Implementing an IP telephony solution often involves sifting through hundreds of devices and options and trying to figure out which ones must be cobbled together to provide basic functionality with reasonable availability. Configuration of survival-mode features may require more than 20 command-line entries, with significant opportunity for human error.

5. IP-Based Communications by Design

IP networks are inherently distributed and resilient, and IP telephony architects starting with a blank sheet of paper can exploit this fundamental strength to create a self-healing voice platform. A truly UC system can be distributed across multiple sites by using a simple peer-to-peer architecture that has no single point of failure.

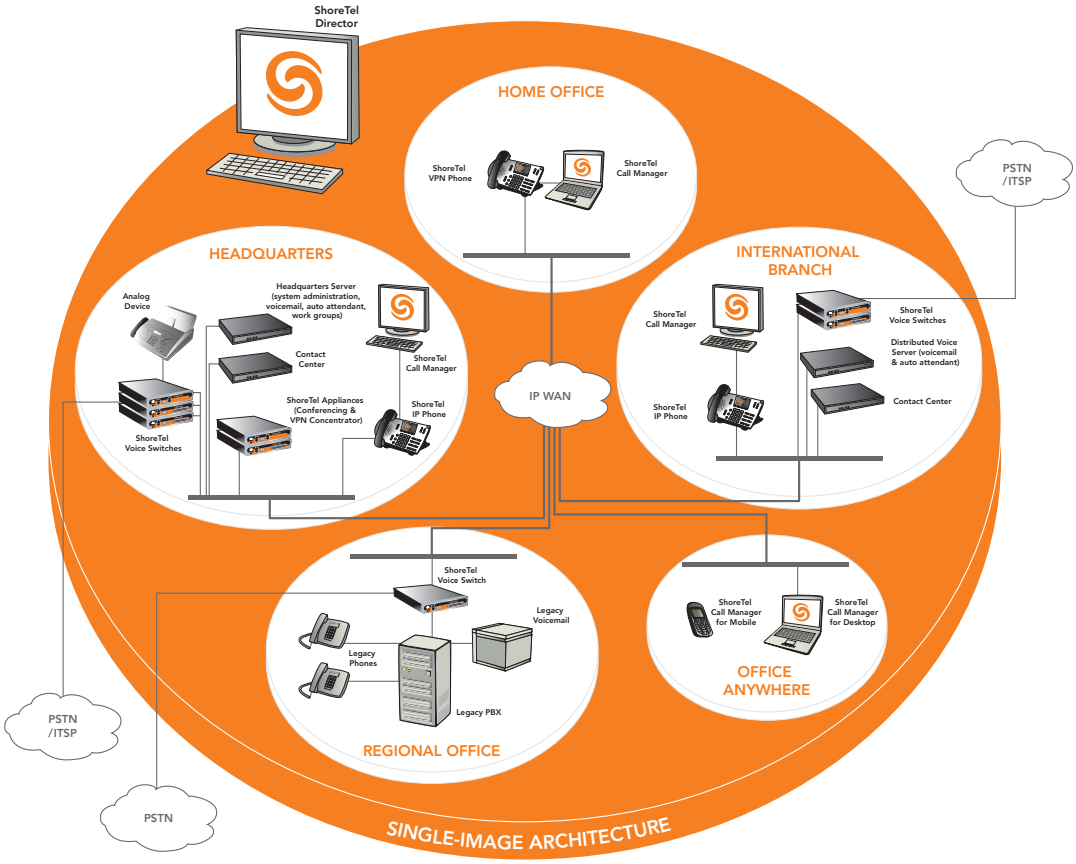

Figure 1: ShoreTel's distributed architecture provides a single-image system for business sites spanning any geography. It's the foundation of our brilliantly simple solution: easy to use and maintain, and a catalyst for productivity gains.

6. ShoreTel Reliability: Simple to Deploy, Easy to Manage

ShoreTel has designed IP voice switches specifically for voice, with switches incorporating a complete call processor—even small models aimed at remote offices requiring eight ports or less. Since these switches have fewer moving parts than typical disk drives and run on a real-time operating system, they are inherently reliable, with most models demonstrating a mean time between failure (MTBF) in excess of 500,000 hours.

Each ShoreTel Voice Switch is a peer with a full complement of routing information safely held in local flash memory, and can operate as a standalone PBX if its site is cut off from the IP backbone. It can make best effort calls on its own, using a failover PSTN trunk if necessary. When switches are added or restored to the network, they and the existing switches at all the sites automatically discover each other and start working together.

ShoreTel voicemail switch models offer integrated voice messaging and automated attendant capabilities. This means that organizations can deploy voicemail at remote sites without the need for a distributed voicemail server. As with voice calls, ShoreTel's distributed architecture ensures that access to voicemail is not interrupted in the event of a WAN failure.

If a switch providing PSTN access to one site fails, its peer switches elsewhere in the WAN provide alternate PSTN access to the users at that site. They continue to have a full set of voice features available, rather than a survival-mode subset. As long as the data backbone stays up, this type of distributed voice network does not suffer an outage unless all the switches go down simultaneously.

Reliability is built in with this approach, and the five-nines availability requirement for voice is easily met. In fact, it can be increased beyond five-nines by installing a redundant switch with PSTN access at each site. A native IP-based UC architecture is therefore inherently autonomous and survivable, which means that delivering a reliable and highly available system doesn't have to involve additional cost or complexity.

7. Conclusion

When innovative technologies start to emerge, established vendors always look at the new landscape through the lens of the world they currently dominate. The architectures they design tend to be limited or even crippled by this legacy. However, there is no longer any question that highly available IP telephony systems can be delivered on any of the three basic architectures discussed in this paper.

Today, the question is how such reliability is achieved, not whether it can be achieved. For IP-based communications solutions built on a legacy voice or legacy data foundation, each additional nine in the availability rating comes at the expense of more complexity and resources. But with a UC system that is IP by design—mimicking the resilience of IP networks with a peer-to-peer communications architecture, and with autonomous call management built into each voice switch—it comes very naturally.

For more information on how ShoreTel can help you achieve five-nines reliability in a cost-effective way, contact a local ShoreTel Partner or call 1-877-807-4673 to schedule a demonstration.

ABOUT SHORETEL

ShoreTel is the provider of brilliantly simple Unified Communication (UC) solutions based on its award-winning IP business phone system. We offer organizations of all sizes integrated, voice, video, data, and mobile communications on an open, distributed IP architecture that helps significantly reduce the complexity and costs typically associated with other solutions. The feature-rich ShoreTel UC system offers the lowest total cost of ownership (TCO) and the highest customer satisfaction in the industry, in part because it is easy to deploy, manage, scale and use. Increasingly, companies around the world are finding a competitive edge by replacing business-as-usual with new thinking, and choosing ShoreTel to handle their integrated business communication. ShoreTel is based in Sunnyvale, California, and has regional offices and partners worldwide. For more information, visit www.shoretel.com.

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