Telcordia Technologies

Performance from Experience

Telcordia Notes on the Networks

Telcordia Technologies Special Report
SR-2275
Issue 4
October 2000

Telcordia Notes on the Networks

SR-2275 replaces SR-2275, *Bellcore Notes on the Networks*, Issue 3, December 1997.

Related documents:

SR-NOTES-SERIES-01, *Telcordia Notes on the Synchronous Optical Network (SONET)*
SR-NOTES-SERIES-02, *Telcordia Notes on Dense Wavelength-Division Multiplexing (DWDM) and Optical Networking*
SR-NOTES-SERIES-03, *Telcordia Notes on Number Portability and Number Pooling*
SR-NOTES-SERIES-04, *Telcordia Notes on the Evolution of Enhanced Emergency Services.*

To obtain copies of this document, contact your company's document coordinator or your Telcordia account manager, or call +1 800.521.2673 (from the USA and Canada) or +1 732.699.5800 (all others), or visit our Web site at www.telcordia.com. Telcordia employees should call +1 732.699.5802.

Trademark Acknowledgments

18. IP Networking and Next Generation Networks

18.1 Introduction to Next Generation Networks

Telecommunications networks have traditionally focused on the support of voice traffic and voice services. As a result, the Public Switched Telephone Network (PSTN) has been optimized for voice traffic and services through a combination of circuit-switching, Time-Division Multiplexing (TDM), and Signaling System Number 7 (SS7). This voice infrastructure, developed and refined over the past century, has matured into a high-quality, reliable network. The network is ubiquitous and highly secure. Over the past decades, numerous voice services have been introduced in the PSTN.

With the growth of computing and networking, there has been a significant development of a data communications infrastructure. The data communications infrastructure was primarily developed to help corporations and other private networks (such as Universities) send information within a defined and closely managed group. The role of the public network infrastructure was to connect numerous private networks, using two distinct approaches:

1. Using either dedicated digital switched circuits or dedicated T1/E1 lines
2. Building and operating separate parallel networks to carry high-capacity data traffic.

The explosive growth of the Internet, with its accessibility to businesses and residences, has led to a new way of looking at the data communications infrastructure. The growth in the Internet has popularized the deployment of packet switching, and more and more public carriers have had to start considering using packet switching for the parallel data infrastructure. The Internet (and, in particular, use of the Internet Protocol) is providing a framework for sending and receiving voice, data, video, and multimedia over a common infrastructure. The Internet also provides a model for an infrastructure that can support a wide variety of applications, that could be rapidly introduced, often relying on intelligence being distributed at the “edges” of the network.

As technology has evolved, it is clear that Next Generation Networks (NGNs) are emerging. The goal of NGNs is to use the best from both the voice and data communications infrastructures. Thus, the vision of NGN is to provide a common infrastructure that supports a wide range of applications, including voice, data, video, and multimedia, while maintaining the high reliability, security, ubiquity, and controlled Quality of Service (QoS) offered by today's voice infrastructure. The NGN is intended to be able to support users with a wide range of Customer Premises Equipment (CPE), from the telephony phones in the PSTN to Internet appliances including PCs and PDAs, using a variety of wireline and wireless access technologies. NGN is intended to provide an infrastructure to rapidly offer new innovative applications and services and offer service providers the option of time or usage-sensitive billing.

18.1.1 Motivation for Next Generation Networks

Various industry experts have published numerous forecasts about the amount of voice and data traffic that will be transmitted over worldwide networks. Their published forecasts seem to support just about every point of view, from the wildly optimistic, to the rather conservative, with a variance of over 100 percent for the years 2002 and 2003. A composite of forecasts by these industry experts suggests that, while voice traffic is growing at 6 to 9 percent a year, data traffic is expected to grow at rates between 45 and 100 percent, leading to a dominance of data traffic over voice.

NGN would allow carriers to take advantage of savings as a result of the consolidation of voice and data networks. Today, many large carriers have independent networks for transporting voice and data. While the existing circuit-switched network is mainly used for voice calls, newer packet-based networks are being deployed to handle data transport. However, maintaining two independent networks is inherently expensive. One important component of NGN is Voice Over Packet (VOP). VOP transports voice calls on packet-based data networks. The NGN/VOP thus presents carriers with an opportunity to migrate all information transport, i.e., voice, data, fax, image, and video, onto a single medium. This would likely create significant cost reductions on transport, switching, on-site cabling and equipment, and administration and management, with the single network for both voice and data communications.

Given the much higher growth in data traffic, carriers are being forced to make investments to upgrade their packet networks. VOP would allow the carrier to use the same packet network to handle the growth in its voice traffic. For newer carriers who do not have their own infrastructure, the economics are even more compelling. Given the faster growth in data traffic, the carrier is likely to deploy a packet network to handle its data traffic. NGN/VOP would allow the carrier to use the same network for voice. Another motivation is that NGN/VOP provides the opportunity for additional revenues for service providers that have data network with spare capacity, which can be used for voice calls. Many service providers, such as ICs, CLECs, and alternate access providers, have already deployed high-capacity digital networks to key enterprise sites. The same scenario is true in many other countries, where INCs have bypassed the incumbent's PSTN to selected large business sites. These same high-speed networks, which were originally used for data, can be utilized using VOP for long-distance and international voice calls.

Another key motivation for service providers is that NGN can provide the necessary infrastructure for offering bundled services to its key customers. There are industry studies that indicate that a residential customer is much more likely to change service providers if the customer obtains only a single service from a provider. An example, is the high "churn" among long-distance customers of major ICs. However, if a customer is offered multiple services such as wireless, local phone, long-distance phone, and Internet access bundled together as a single offering by a service provider, then the customer is much less likely to switch to another carrier.

Over the longer term, arguably the most significant motivation is that NGN provides carriers with the potential for new service offerings. Such newer services, most of which are still in the conceptual stage, could take advantage of both voice and data offerings. In addition, packet networks offer a more “open” environment with greater flexibility for service creation and customization than the relatively “closed” telephony environment. NGN could allow the option of supporting Application Programming Interfaces (APIs) that are open and available to any developer or in-house development group, to create custom services for each enterprise. Large businesses, such as banks, government, transportation companies, hi-tech, and health care concerns, who are likely to be a carrier's key customers, would be able to create and deploy custom telecommunications services to meet their unique requirements. This is in contrast to traditional telephony networks where there are few open APIs. For example, a traveling employee can connect a notebook computer to the public Internet or a corporate Intranet to obtain information, access databases, and send/receive e-mail. However, on the same call, the user can also use the speaker and microphone built into the notebook PC to check voice mail, and make voice calls through an office PBX.

In addition, there are studies that suggest cost advantages of NGN. Analyses show that NGN offers cost advantages for both switching and transport. Some studies have suggested that the combined infrastructure and operations cost savings could be as much as 30 to 50 percent. However, such analyses depend on the specific assumptions used, and are often based on market forecasts and assumptions that may or may not be applicable to a particular situation. The cost-savings potential of NGN is realistic, but needs to be quantified on a case-by-case basis to develop a sound business case for migration to NGN.

Another consideration for NGN is that, despite the much faster growth of data traffic, most revenues and profits for service providers today are obtained by supporting voice and voice services. As a result, support for voice and voice services over a packet infrastructure can be considered a critical component of NGN deployment. As such, VOP, which provides a carrier class solution for supporting voice, should be viewed as the first step toward NGN.

The technology that enables VOP is not new. Technologies such as voice packetization, data detection, and silence suppression have been used for many years as a means of improving the trunking efficiencies for international submarine cable systems and other transport systems, with a relatively high cost of bandwidth and low flexibility in system bandwidth upgrade. What is new is this:

1. Signal processing technology has advanced enough to allow these systems to be implemented on single chip digital signal processors and personal computers
2. Protocols have been developed which standardize the means for packetized voice to be transmitted and controlled over ordinary data networks, based on the Internet Protocol stack.

Many of the initial NGN/VOP solutions are based on the H.323 family of standards, which is published by the ITU-T. However, existing standards do not address all the needs of a carrier wanting to deploy VOP. For example, H.323 does not address

DOCKET ALARM

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts

Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research

With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips

Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.

WHAT WILL YOU BUILD? | sales@docketalarm.com | 1-866-77-FASTCASE

fastcase® Smarter legal research.