Service Intelligent™ Circuit and Packet Convergence for Wireline Networks

Leverage existing infrastructure and add packet capabilities to networks – where and when it makes sense.

Lucent's unique vision for Service Intelligent Architecture™ helps service providers benefit from the quality and reliability of TDM and new service capabilities enabled by IP.

This White Paper Addresses:

- Factors at work in the marketplace
- An evaluation of network technologies
- Development of network plans to support business strategies and customer services
- Lucent's strategy for responding to Service Provider requirements.

Lucent Technologies
Bell Labs Innovations



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Abstract

Service providers have never faced more daunting or complex challenges as they explore the convergence of voice and data networks. The ongoing economic downturn continues to constrain capital budgets, which means any investment to achieve convergence must leverage carriers' existing networks and provide significant opportunities to maximize revenues, minimize operating expenses or both.

As a result, service providers are growing more aware of the benefits of deploying both circuit and packet technologies – circuit because it delivers the bulk of their current revenues and profits, and packet because customers are demanding new data services and data traffic continues to grow rapidly. An increasing number of service providers are choosing to manage both types of networks on parallel paths for some time, converging them only when and where it makes business sense.

This white paper discusses how a service provider can tailor an approach to convergence that will:

- optimize networks to boost profitability and surmount complex business challenges
- generate and protect revenue while reducing operating costs and complexity
- derive maximum revenue and value from its existing network
- take full advantage of the strengths of both circuit and packet networks
- create a unique network evolution plan tailored to its business.

Introduction

The earlier zeal to migrate to all-packet networks has waned considerably. At one time many in the telecommunications industry energetically discussed circuit to packet convergence, which predicted the gradual but eventual total replacement of circuit technology with packet technology.

However as the economy and market dynamics have changed and service providers have taken a closer look at their business challenges and opportunities, reality has set in. The anticipated near-term savings of packet technology often disappear in the execution, and the wholesale replacement of circuit with packet is a very difficult business case to prove in.

Industry analysts' reports highlight some of the key issues under discussion. For example, Stratecast Partners[1] in September 2002 noted that:

- Voice services represent approximately 70 percent of all communications subscription revenues.
- Even though IP is the strategic priority for the evolution of enhanced services, IP-based services currently represent 10% of overall revenue.
- The displacement of TDM systems by packet solutions in the global telephone infrastructure market will not occur until packet technology has matured to the point where it addresses mobile applications.

[1] Stratecast Partners, September 2002. "Packet Telephony Infrastructure Convergence and Product Strategies," Convergence Strategies & Network Architecture, Volume II, Number 12.

Further, Probe Research[2] in 2002 predicted that packet telephony will be a 20 year transition in the PSTN.

[2] Probe Research Inc., 2002, "Packet Telephony – Evolution of Public Voice Networks."

As service providers are aware, not only do voice services provide the great majority of revenues, but also they are the greatest contributors to profitability. If there ever was a desire by carriers to invest in new technology for its own sake, that day has passed.

More than ever, today's investment decisions are based on a service provider's carefully developed and unique business strategy. Rather than selecting technology for its own sake, carriers are choosing technology for their *business*' sake.

Central to technology decisions are the business questions of which sets of customers – enterprises and consumers – the service provider wishes to serve with what type of services. The emphasis is on optimizing business performance by retaining and attracting the most profitable customers, and enterprise customers, in particular, are creating significant opportunities for generating profitable, new revenues.

Because attracting and keeping the most desirable customers calls for providing a range of services that include the benefits of both circuit and packet technologies, most service providers are choosing to deploy both.

In this industry context, convergence can be defined in three ways:

- **Convergence of networks** – The layering of multiple applications onto a common network technology, such as collapsing or reducing the number of different networks.
- **Convergence of technology** – Sharing a specific technology across multiple applications in one part of the network.
- **Convergence of services** – Integration of two different services or applications.

The topics that will be covered are:

- factors at work in the marketplace
- evaluating network technologies
  - – circuit technology
  - – packet technology
- developing network plans to support business strategies and customer services
  - – the role of Session Initiation Protocol (SIP)
- Lucent's response to service providers' requirements.

The Marketplace

While the market landscape is always evolving, changes over the past few years have been seismic and the aftershocks continue. Service providers are scrutinizing a number of complex and interrelated issues to fully understand their implications and to ferret out opportunities during a time of unprecedented industry contraction and escalating customer demands. These key factors include:

Participants

Service providers that have made longstanding and significant investments in circuit switches remain key players, and want to optimize revenues from and the performance of their installed base. Although many CLECs and new operators have left the market, a growing number of ISPs and ASPs globally have begun to offer residential services over broadband. In addition, the packet voice market is growing and currently dominated by nontraditional providers.

Economic and Business Factors

The severe economic downturn has significantly constricted capital spending, and any new investment must demonstrate the ability to both boost revenues from new services and cut operating expenses. Further, wireline erosion continues, resulting in fewer second lines and more excess circuit network capacity. In addition, a large embedded base of ISPs with excess RAS capacity wants to add voice services.

Today most service providers are discovering that generally it does not make sense to migrate existing circuit based networks to packet. At the same time, carriers are exploring way to leverage packet technology to retain existing and capture new customers and revenues.

Regulation

Today's U.S. regulatory environment encourages ILECs to deploy packet access technologies, while at the same time other policies maintain unbundling requirements that tend to discourage investment in general. The net effect is a slowing of overall voices services investment until these complex issues are resolved, which may take many years. During this period, investment will likely be directed toward new overlay VoIP network architectures built outside the existing regulatory domain.

Technology

Service provider priorities are changing from ATM to IP, and an emerging technology called SIP (Session Initiation Protocol) continues to gain momentum as an enabler for deploying converged and next generation services.

End-users

While today's end-users are growing more diverse and demanding, both consumers and enterprises alike are seeking many of the same characteristics or benefits from their communications. These include:

- high quality and reliability
- more bandwidth, speed and control
- more customization
- more multi-media services
- more mobility.

Enterprises in particular may offer service providers the greatest opportunities to increase revenues and profitability. Given the stresses of today's economy, enterprises are more interested in focusing on their own businesses and outsourcing telecommunications to the experts. In addition, enterprises want customized services to help them deliver unique and superior service to their best customers. Also, today's mobile professionals – so-called "road warriors" – want access to high-speed data services that boost their productivity no matter where they happen to be.

Enterprises that receive better than commodity-like services from their service provider are more likely to consider it a "service partner," leading to deeper, long-term and more profitable relationships.

Evaluating Network Technologies

Faced with this unique mix of marketplace and customer dynamics, service providers are carefully evaluating any potential new capital investments. This applies whether they are starting with a largely circuit network or largely packet one.

Evolving Circuit Networks

Service providers with significant investments in circuit networks are analyzing how best to:

- leverage investments in existing infrastructure
- reduce total cost of ownership
- address high margin revenue streams for both retention and growth, including new revenues not subject to unbundling regulations
- manage multiple networks most efficiently.

Evolving Packet Networks

Planners of packet networks are eager to improve profitability by adding voice applications, helping them:

- better use excess capacity or leverage their embedded base of RAS to offer voice over IP services
- add next generation services
- provide enterprises with turnkey solutions
- better address QoS issues
- interwork with existing CPE and with a wide variety of applications servers.

In short, in deciding whether, when and how to add VoIP or packet capabilities to their current networks, service providers are weighing the advantages of each and determining what balance and evolution of technologies are ideal for them.

Benefits of Circuit Technology

Circuit switching is unsurpassed for delivering real-time, interactive voice and it remains the mainstay of telecommunications today for good reason. It offers a range of features that enterprises and consumers alike have come to demand, and advantages on which many service providers have built their businesses:

- **QoS** – Voice customers have enjoyed the very highest levels of quality and now expect it in all types of communications.
- **Reliability** – Networks providing up to "six 9s"– 99.9999 percent – reliability have provided very dependable service for today's end-users.
- **Security** – The importance that customers place on security and privacy of communications, while always high, has grown even higher recently.
- **Rich Features** – Today's telecom switches provide between 500 and 3,000 features, and anywhere from 30 to 300 of those can be considered critical. Most of the 3,000 features provide carriers with network services that deliver the reliability and OAM&P capabilities to support end-user services across large embedded base circuit networks.
- **Established OAM&P** – The current processes and procedures at the heart of today's high quality, high-functioning circuit networks are efficient and cost-effective.
- **End-users' Expectations for Ubiquity** – Today's enterprises and consumers feel entitled to "any time, anywhere, any device" communications.

Still, despite these clear benefits of circuit technology, the promise of packet technology is compelling. Though its evolution will take longer than originally expected, clear market opportunities do exist today, and packet is a viable alternative, when and where it makes business sense.

Benefits of Packet Technology

Packet technology also has unique advantages, many of which can be delivered today and others that will provide greater benefits in the future:

- **Next Generation Services** – Packet is ideally suited for providing next generation services for which both consumers and enterprises are eager, translating into growing revenue opportunities. Such services include multi-media offerings, mobile high-speed data, and outsourcing for enterprises.
- **Converged Services** – Packet technology enables the integration of legacy telephony features and services and the intranet/Internet. The convergence of voice and data allows powerful new revenue generating service to be delivered to traditional and next generation endpoints. Examples of converged services include click to dial, find me/follow me and web provisioning.
- **Interconnectivity** – From a design perspective, packet technology helps support highly dynamic networks that can adapt quickly and easily to changing customer demands and technological growth.

Developing Network Plans to Support Business Strategies and Customer Services

Optimizing the Benefits of Both Circuit and Packet Technologies

Only after essential, strategic business decisions have been made can network planners develop ideal approaches directly linked to supporting the business strategy and proposed services for enterprises and consumers.

Today's savvy business and network strategists are applying voice and data convergence to select areas of their networks where it makes clear *business* sense. This approach helps them:

- minimize the risk inherent in adopting new technologies and entering new markets
- augment existing embedded base of circuit infrastructure with IP capabilities
- add VoIP services to existing data networks
- retain lucrative voice revenues and add enhanced services and network efficiencies with IP
- maintain reliability and QoS for critical applications
- support both traditional and new endpoints
- preserve current, efficient and cost-effective operations systems management policies and procedures.

The Role of Session Initiation Protocol (SIP)

The recent emergence of SIP – a new paradigm and technology enabler – may well serve as a remarkable boon to the practicality and ease of adopting circuit and packet convergence. Even more importantly, SIP promises to dramatically enhance opportunities for new and more profitable revenues.

SIP is a powerful and flexible internet-style protocol that provides interfaces from the PSTN with only an incremental investment. It allows telephony and data/internet services to be combined and leveraged in innovative new ways, including enabling PSTN calls to be carried over the IP network, the beginnings of true network convergence.

SIP offers numerous benefits, including:

- simplifying access, interfaces, and applications that allow powerful new service combinations for traditional and new IP endpoints, across both wireline and wireless networks
- dramatically enabling and accelerating converged services ubiquitously across the network
- allowing customers to re-use existing infrastructure, resulting is lower capital and operational expenses
- providing an excellent service mediation platform, thereby facilitating vendor independent and third party services.

Momentum for SIP is growing rapidly, with key information and communication technology vendors adopting it, and various standards bodies and customers incorporating it into their plans.

Lucent's Response to Service Providers' Requirements

Lucent's View of Convergence

As referenced earlier in the introduction section of this white paper, convergence can be defined in three different ways – convergence of networks, convergence of technology and convergence of services.

Lucent designs and delivers network products and software for the world's leading service providers. As a result, Lucent has deep and long-standing relationships with the largest and most successful carriers. Lucent is focused on supporting the convergence of a service provider's services and technologies until such time as the carrier is ready to converge its network.

Further, in Lucent's view, network convergence is not imminent. Rather, Lucent believes that circuit and packet networks will continue to co-exist and that each will provide significant and unique value for the foreseeable future.

Based on real-world customer challenges and networking requirements, Lucent has developed a comprehensive and flexible approach to circuit and packet solutions that allows service providers to select and tailor products, software and services to meet their evolving needs.

Lucent's Circuit and Packet approach incorporates three key elements:

- a new common services architecture that enables converged services as well as next generation services for new IP endpoints that service providers can get from Lucent, third parties, or that they can write themselves. Unlike some other vendors, Lucent will support third party applications via open interfaces.
- packet interfaces added to the embedded PSTN that support internetworking with packet elements for both service control and enabling new, converged services
- next generation endpoints to support new multimedia or other capabilities.

Lucent can integrate these major components into solutions to meet service providers' needs – whether they want to leverage their embedded base of 5ESS® switches, provide new voice services on their packet infrastructure, or provide any combination of services possible with today's full spectrum of circuit and packet possibilities.

Lucent and SIP

Lucent is working diligently to deliver the full capabilities of SIP to service providers. Lucent has extensive experience and networking know-how in multi-vendor, multi-technology and multi-service networks, and in wireline and wireless environments. Also, the Bell Labs research and development community possesses the expertise to fully exploit SIP's potential for enabling profitable new services, optimizing network efficiencies and holding down costs.

Lucent has adopted SIP as an integral part of its product planning and has developed a common, synergistic approach to incorporating SIP across its broad portfolio. Lucent's SIP-enabled product portfolio allows service providers to leverage their existing network investments, control costs and offer attractive new personalized SIP-based services to business and residential customers. These products cover the application, service control and transport layers of the network. Lucent supports open, standard interfaces with products designed to be compatible with legacy systems, and to operate in a multivendor environment.

Services Enabled by Lucent's Circuit and Packet Solutions

Because of its extensive industry experience and long-standing relationships with the world's largest and most successful service providers, Lucent understands the new services that enterprises and consumers value, and that help deliver higher profitability to service providers' businesses. While each carrier will select and tailor the services that match its business plan, these revenue-generating services may include:

- **IP Centrex** – leverage existing circuit technology, facilitate evolution to IP, create pull-through opportunities for other services, and help enterprises reduce equipment costs and boost productivity
- **Managed Contact Centers** – facilitate provisioning and growth locally or into new markets, permit upgrades and enhancements independent of switch software, while reducing enterprises' contact center costs up to 50%
- **Web Portal Services** – minimize capital and operating expenses and leverage service infrastructure in the next generation network, while giving end users more control and integrated telephony and PC-based features

- **Terminating Routing Services** – boost mobile professionals' productivity by giving them robust routing capabilities
- **Voice Mail/Unified Messaging** – provide unified voice mail, e-mail, etc., all controlled by end user
- **PrePaid** – offer pre-paid arrangements in and IP environment and give users more control.
- **Voice VPN** – deploy a network-based voice VPN solution to target medium and large enterprises with multiple branch locations; includes key features such as multiple access and call types, private numbering plan and multi-tier web-based management.

Lucent's Circuit and Packet Portfolio

Lucent's Circuit and Packet Portfolio, and all of Lucent's solutions, are based on Lucent's *Service Intelligent*™ Architecture. This is the company's vision for a fully integrated, service-rich, highly profitable network that service providers can start building toward today. Put another way, it combines the service reliability of circuit voice networks with the service richness of IP networks.

The vision includes open, programmable service creation platforms; service intelligence in each network layer and element; open interfaces between layers; unified network management for provisioning, monitoring and fault recovery; and full lifecycle professional services from planning to operations.

Lucent had as its goal providing the most complete, vendor agnostic solution for circuit and packet networks. It developed its circuit and packet portfolio to incorporate the attributes service providers most desired:

- enabling them to leverage current investment, increase their revenue generating ability, and reduce operating expenses
- giving them the ability to quickly add or expand to new markets with new services
- based on standard interfaces and protocols to allow them to rapidly and flexibly deploy new network elements, applications and services
- built on an open, programmable application development platform, and backed by a robust vendor partnering program
- based on the world's most reliable call control and high-speed transport platforms
- providing scalable, media-independent gateways for access and connection services
- providing integrated network management for creating customized operations, maintenance and provisioning capabilities.

Lucent's Circuit and Packet portfolio is a suite of fully integrated and tested solutions designed to extend the profitable life of existing networks as service providers evolve to IP data. Lucent will continue to evolve this portfolio, and will augment it through partnerships to provide customers with end-to-end solutions.

In addition, service providers benefit in other ways from Lucent's extensive networking experience:

- **Bell Labs** – With nearly 10,000 employees around the world, Bell Labs is the largest and broadest research and development organization focused on the needs of large service providers. It designs products and services that are at the forefront of communications technology, and conducts fundamental research in fields important to communications. For two years in a row MIT *Technology Review* named Lucent as having the strongest technological base of any telecommunications company.
- **Lucent Worldwide Services (LWS)** – LWS is the world's largest and most experienced telecommunications services team. It includes more than 12,000 skilled technicians, engineers, network design consultants and installers who serve customers, including all 50 of Lucent's top customers on five continents. Today, about a third of LWS' work involves servicing multi-vendor networks, and the demand increases as service providers' networks grow more complex.

Conclusion

In these challenging times, service providers are developing unique business strategies focused on optimizing profitability while minimizing capital and operational expenditures. To retain and attract the most profitable customers they are developing portfolios that include traditional, new and next generation services designed specifically for the customer sets they wish to serve.

Only after central decisions about business strategy and customer services have been made can technology decisions follow. In many if not most cases today, service providers increasingly are selecting approaches that employ both circuit and packet technologies. Each has its strengths, and most service providers will need both technologies to address marketplace issues and customer requirements. Further, converging circuit and packet is appropriate only when, where and how it makes business sense.

An emerging new paradigm, Session Initiation Protocol (SIP) promises to significantly improve revenue-generating opportunities by easing and speeding the adoption of circuit and packet convergence to deliver new and next generation services.

Partnering with a networking vendor with extensive experience, broad and deep technology and services skills, and proven results can help service providers select an approach for circuit and packet convergence that will better ensure they:

- optimize profitability
- protect and generate revenues, including those from converged and next generation services
- minimize capital and operating expenses
- get the maximum benefit from their network – today and into the future.

Flagship products of Lucent's circuit and packet portfolio

5E-XC™ Switch: the latest generation of the Lucent market-leading 5ESS® switch significantly expands capacity and adds the ability to interface to IP and SIP networks

iGen™ Compact Switch: a cost-effective, next-generation Class 5 small switch for local and host applications designed to support IP networking and services with optional software and hardware

Lucent Softswitch: an IP based programmable, next generation call control platform for advanced wireless and wireline services and applications

iMerge® Centrex Feature Gateway: provides access to class 5 feature set (e.g. centrex) for the IP enterprise

Enhanced Business Services (EBS): a web portal for delivering next generation and advanced services to both traditional and next generation endpoints

APX® 8000 and APX® 8100 Universal Gateways: IP access services, including dial access and VoIP trunking for IP and circuit network integration

AnyPath® Messaging System: supports applications from basic call answering and voice messaging to advanced multimedia, real-time access to information and services, call management and speech-enabled services—all on a reliable, carrier-grade platform

Stinger® DSL Access Concentrator: a complete line of DSLAMs to allow cost effective deployments in any location, whether indoor or outdoor, large or small. It offers segment-leading port densities and support for video, ATM & IP

AnyMedia® Access System: provides converged next generation DLC/DSLAM in a single chassis, segment-leading port densities, and a robust packet-based evolution plan.

To learn more about Service Intelligent™ Circuit and Packet Solutions, please contact your sales representative, or call 1-888-426-2252. You can also visit our web site at www.lucent.com/solutions/circuit_packet.

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