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Raymond L. Strassburger
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NORTEL NETWORKS

EX PARTE OR LATE FILED

November 6, 1998

Ms. Magalie Roman Salas
Secretary
Federal Communications Commission
1919 M Street, N.W. - Room 222
Washington, D.C. 20544

EX PARTE NOTICE

Re: Ex Parte Presentation, *Deployment of Wireline Services Offering Advanced Telecommunications Capability*, CC Docket No. 98-147

Dear Ms. Salas:

Pursuant to Section 1.1206 of the Commission's rules, this letter constitutes notice that on November 5, 1998, representatives of Nortel Networks (Gary Bolton, Senior DSL Business Manager; Nabil Gebrael Senior Manager, Data Access Regulatory and Standards Strategies) and (the undersigned) met with FCC officials (Jonathan Askin, Esq., Policy & Program Planning Division; Charles Iseman, Esq., Chief, Spectrum Policy Branch; Evan Kwerel, Senior Economist, Office of Plans and Policy; Stagg Newman, Director, Technology Analysis, Office of Plans and Policy; Jason D. Oxman, Attorney/Advisor, Policy and Program Planning Division; Bob Pepper, Chief, Office of Plans and Policy; Daniel R. Shiman, Economist, Policy & Program Planning Division) concerning issues raised in the referenced proceeding. The basis of the discussion at the meeting was the written slide presentation, two copies of which are enclosed. The written presentation was distributed at the meeting and left with the participants.

During the meeting, Nortel Networks representatives emphasized the following points contained in the written presentation: 1) There should be no regulatory impediments to the deployment of switch integrated solutions; 2) Access to loops is critical to competition in general as well as the deployment of xDSL type services. Unconditioned loops (regardless of loop length) are readily identifiable and should be made available on request, at the lowest possible cost; 3) Under circumstances appropriately defined by the

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Commission, the FCC should grant waivers of Part 68 for xDSL type products.

Also enclosed for inclusion in the record of this proceeding is a recent white paper prepared by Bellcore, entitled *Solutions for Ubiquitous High Speed Data Network Access Services.*

If you have any questions, please communicate with the undersigned.

Sincerely,

Raymond L. Strassburger
Director, Government Relations, Telecommunications Policy

RLS/kc

Enclosures

cc: Jonathan Askin, Esq., Policy & Program Planning Division
Charles Iseman, Esq., Chief, Spectrum Policy Branch
Evan Kwerel, Senior Economist, Office of Plans and Policy
Stagg Newman, Director, Technology Analysis, Office of Plans and Policy
Jason D. Oxman, Attorney/Advisor, Policy and Program Planning Division
Bob Pepper, Chief, Office of Plans and Policy
Daniel R. Shiman, Economist, Policy & Program Planning Division

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Solutions for Ubiquitous High-speed Data Network Access Services

A Bellcore White Paper by Charles H. Woloszynski

"*...In 1989 Bellcore dreamed up a radical idea for using ordinary twisted-pair telephone lines to transmit information in video, image, and dense graphic formats...*" Kim Maxwell, Independent Editions, ADSL Forum

Executive Summary:

High-speed Internet access based on ADSL (Asymmetric Digital Subscriber Line) technology is transitioning from a vision into reality. The industry has developed two approaches for designing ADSL equipment: stand-alone DSLAMs (Digital Subscriber Line Access Multiplexers) and integrated line cards (ILCs). We examine the environmental and operations issues to determine the relative strengths and weaknesses of these approaches when supporting large-scale service deployments. By examining the detailed challenges of providing ubiquitous ADSL service deployment, we identify several fundamental advantages of the ILC approach over the DSLAM approach, especially when deploying service from remote sites. We also project the service provisioning aspects of the operational costs for equivalent service deployments of each approach and identify a **60% annual operations cost savings, or $38 per line per year, for the ILC approach**. This savings only captures the differences in the service provisioning process; we expect that additional savings can be quantified regarding other aspects of the operations costs of an ILC-based deployment over a DSLAM-based deployment.

Motivations for the Markets

The telecommunications industry is witnessing the creation of a mass market for computer-based applications and data services. The well publicized demand for Internet access is stimulating demand for high-performance mass-market data services. This growth in end-user demand is being sustained by underlying social and technological trends like the integration of work and home and the introduction of the PC into the residence. Today's consumers not only want high speed Internet access to networked services like web browsing, but are also exploring interactive and multimedia applications. Starting with the work-at-home segment, demand for data services will expand to include other segments of the consumer market. This will occur as the computer becomes a fixture in the home and the set of networked applications for consumers grows.

For established carriers, also referred to as Incumbent Local Exchange Carriers (ILECs), this growth in the demand for data services presents an opportunity to increase revenues and margin. It also presents a threat. Over the next several years as cable operators, direct broadcast satellite providers and other access providers enter this market with alternative access vehicles, ILECs will be facing direct competition in their home market for the first time — and for their most valued customers: the on-line and Internet service subscribers. These consumers have a monthly telephone bill that is 22% higher, have an income that is 42% higher, have more telephone lines and are more likely to have a cellular phone. For new carriers, also referred to as Competitive Local Exchange Carriers (CLECs), this market is the cream of the crop and will likely be their first targeted market.

ADSL deployment offers ILECs, CLECs, and ISPs a means to get to market quickly and cost effectively with a high-speed data services solution. ADSL uses existing copper lines, which total more than 140.7

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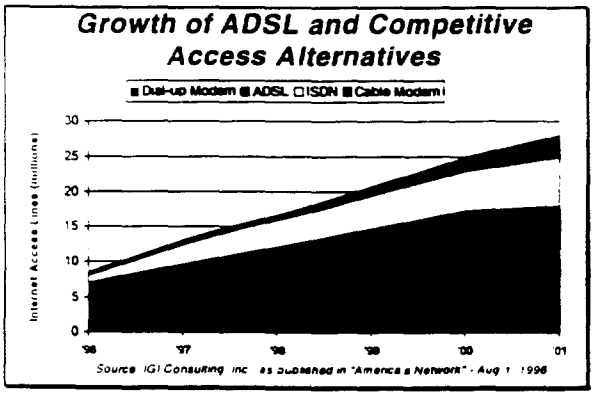
million loops in the U.S. ADSL converts existing twisted-pair copper telephone wires into access paths for multimedia and data communications.

Copper-based carriers are being threatened by new, competitive high-speed data services. At the same time ADSL is being rolled out, cable companies, direct broadcast vendors, and wireless industry players are trialing competitive alternatives with technologies such as cable modems, satellite downloads, and Multichannel Multipoint Distribution System. To meet these competitive threats — and protect their customer base — these carriers must get ADSL out quickly.



Despite the existence of credible drivers for the consumer data services wave, future demand is difficult to predict. Established service providers can minimize the risk of serving this market by deploying ADSL. It leverages existing investment in access facilities, hence reducing capital costs. Furthermore, since ADSL is an incrementally deployed technology, carriers can roll out service on a case by case basis as each new subscriber asks for it.

Infrastructure Challenges

ADSL service providers face a substantial set of challenges, deploying a new technology into the current environment. The past 50 years of telecommunication planning have left a substantial legacy of assumptions and constraints that have a direct impact on the successful deployment of ADSL services. Currently, there are approximately 10,000 central offices and 16,500 switching systems in the United States serving 140,700,000 access lines. Of these access lines, 19% are being served by DLC systems. The rate at which new customers are served by DLC is currently very high, with the industry surveys reporting a range between 30% and 50% of new lines served by DLC systems. These DLC systems are deployed in several different configurations: controlled-environment vaults (CEVs), uncontrolled-environment buildings known as huts, and smaller uncontrolled-environment enclosures known as cabinets. These different serving arrangements place very different constraints on ADSL equipment.

The diversity in the outside plant serving arrangements for customers was developed to minimize operations costs for existing services. To this end, this diversity has been a success. However, this diversity has created new challenges for the introduction of new services such as ADSL. When these new serving arrangements were developed, they were designed to be transparent to the customer. This allowed the ILEC to use any serving arrangement that was economical for a specific set of customers. The customer is generally unaware of their serving arrangement. However, as the ILEC plans to deploy a new service, it faces a dilemma. The ILEC can either deploy the new service where it is technically most convenient first, which is generally out of central offices, or it can deploy the new service to an entire geographic area, which makes marketing the service simpler. If an ILEC pursues the former option, they need to develop a strong marketing campaign that targets only those who can get the service and avoids disappointing the consumers who are not yet served. If an ILEC pursues the latter option, they need to develop a business case that can support the larger capital investment. In any case, the long-term success of ADSL will require ubiquitous service.

Therefore, a successful ADSL deployment must be capable of providing coverage for all of these serving arrangements to reach a vast majority of the customers. Central offices are generally equipped to provide ample space, electrical power and cooling capacity. The main distributing frame provides a solid infrastructure for managing any re-arrangements needed to support ADSL access.

In contrast, remote sites are a relatively recent phenomenon. These sites require substantial investment by the carriers, both in terms of invested capital to construct the site and in terms of labor to locate sites and negotiate acceptable terms for these sites. In order to obtain the rights to establish these sites, carriers have designed them to be generally small and unobtrusive. At the same time, these sites have seen unprecedented growth in the number of served customers. The advent of the fax machine, home offices,

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consumer access to the Internet, and teen lines have all created tremendous growth in the demand for POTS lines. This growth has pushed many remote sites to their design limits and beyond. Equipment manufacturers have worked to meet this growth by developing higher density systems that can be retrofitted into previously deployed systems.

These newer, higher density systems have challenged outside plant engineers to balance the deployment of new capacity with the needs to maintain adequate battery backup. Although the newer systems are generally more efficient in power usage, they tend to draw more power, in total, than the systems they replace. Many remote sites are currently equipped at or above their designed power backup consumption and have no substantial additional power backup to support new systems for new services like ADSL.

All remote sites are engineered with some cooling capacity. In many cases, there is sufficient passive cooling available that this is not a limiting issue for new service deployment. However, in the case of CEVs, the passive cooling capacity is limited and instead active cooling is provided. In these cases, the same trends that have pushed the power backup capacity to its limits have also pushed the active cooling capacity to its limits.

Either copper facilities or fiber facilities may serve remote sites. Since ADSL-based services are bandwidth-intensive, remote sites that are fed by copper facilities may not have sufficient bandwidth available to easily support new ADSL services. Remote sites that are fed by fiber facilities are more likely to have spare transport capacity back to the central office. If not, it is possible to upgrade fiber facilities to higher data rates to provide relief without requiring additional outside plant construction. Upgrading from a SONET OC-3 to a SONET OC-12 or OC-48 is now a common practice.

In addition to the space, powering, cooling, and transport challenges faced when trying to deploy new services at remote sites, the simple task of gaining access to the copper facilities at the remote site poses special challenges. Original engineering guidelines known as the serving area concept placed the remote sites central to several distribution areas. Each distribution area (DA) is designed with a serving area interface (SAI) to support convenient rearrangements of the feeder capacity to meet the varying needs of the customers served by the distribution plant. This SAI is generally not co-located with the remote site. In addition, the feeder plant between the remote site and the SAI is generally sized to meet the expected line card capacity of the digital loop carrier system and then hardwired to the DLC system. No point of rearrangement is generally available in the remote site. This is especially true in the case of CEVs. Thus, there is generally no spare capacity between the SAI and the remote site.

Equipment Choices

What equipment characteristics are likely to impact the product acceptance for ADSL? One characteristic is the targeted approach for integrating the equipment into the current environment. There are two of these approaches. The earlier ADSL equipment designs were based on the DSLAM model. This model assumes that all the functionality needed to support ADSL services is placed in new equipment with minimal impact on the existing infrastructure. A later ADSL equipment design, which has recently received a lot of press coverage, is based on an integrated line card (ILC) model. This model assumes that the current infrastructure can be enhanced to support ADSL service more cost-effectively than building a new infrastructure.

DSLAM Approach

The DSLAM approach emphasizes the carrier's need to quickly deploy the equipment, regardless of the existing infrastructure. By making very few assumptions about the deployment environment, the DSLAM approach allows any carrier to quickly install the DSLAM equipment into any office and begin offering service. The DSLAM becomes a pre-switch adjunct that the class 5 switch can essentially ignore. The only interaction between the new equipment and the existing equipment occurs when the serving loop is rearranged at the MDF to first connect to the signal splitter. The low-frequency portion of the signal is then rewired to the class 5 switch and the high-frequency portion of the signal is then wired to the DSLAM itself. The ease in which a DSLAM can be deployed is very attractive for early service offerings. Aggressive companies that are working to gain market share and retain current customers can easily benefit from this approach.

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Equipment Issues for the DSLAM

The DSLAM approach deploys well in the central office environment. DSLAMs require additional space, power, cooling, and transport capacity. Central offices will generally have sufficient space, power, cooling, and transport capacity to support a number of DSLAMs. Connection to the customer's loop is accomplished with multiple passes across the MDF.

However, deploying a DSLAM into a remote site is not as simple. Remote sites generally do not have spare space, power, cooling, or transport capacity. The deployment of a DSLAM at a remote site may require additional equipment reconfigurations to create this capacity. The DLC system may need to be upgraded to a newer, lower power set of line cards, or a higher density design to free up power and space. If the site is in a CEV and cannot support both new equipment and additional power backup capacity, a new power management process may need to be developed. When the CEV loses commercial power, this process may require the DSLAM systems to shut down to allow the CEV to continue to provide lifeline services without adding additional power capacity.

The space, power, cooling, and transport issues will add cost to the deployment of ADSL services in a remote site and they may require some new construction. This construction may be needed to provide additional transport capacity and additional space in areas where the site was already near capacity. These factors may slow the deployment rate of services to the affected sites and may, depending on the cost of these additional activities, make service in some areas prohibitively expensive.

The final equipment issue for DSLAM service at remote sites centers on access to the copper facilities themselves. In many areas in the US, the copper plant at the remote site is pre-wired between the backplane of the DLC system and the SAI. If the DSLAM is to be deployed in the remote site, the DSLAM needs to have access to the copper facilities. To do this, it is conceivable to run new copper facilities to the SAI and re-partition the SAI to allow some posts to support access to the DSLAM. The signal would then travel back to the DSLAM and its signal splitter. Once the signal is split, it would then be rerouted back to the SAI on a second pair and then terminated onto a new pair that would travel back to the DLC system. Many SAI boxes are currently deployed with a planned capacity that was derived from the planned capacity of the remote site. In these cases, this relief plan will not work and more extreme engineering would be needed to provide ADSL service from such sites.

The cost of this work-around is likely to be very high. Add to this the other costs of supporting ADSL services from a DSLAM at a remote site and the installed-first costs for a DSLAM approach in this environment may be too high to ever consider offering ADSL services from a remote site.

Operational Issues for the DSLAM

The simplicity of the DSLAM deployment, which makes the DSLAM approach attractive for early deployments, may be its primary weakness from an operations perspective. When deploying DSLAMs throughout a region, the collection of deployed DSLAMs becomes effectively a new overlay network. The service order flows through the legacy OS environment, and these systems manage the portions of the service that are already reused when supporting ADSL services. For example, the cable pair assignment and the port assignment are handled in the legacy systems. Since the DSLAM's element management system (EMS) is not integrated into the current service order process flows, the service order drops out of the system when it needs to provision the DSLAM. The service order then requires manual intervention before the ADSL service order can complete. The remainder of the service order processing is performed manually with the EMS and any additional systems needed to complete the provisioning beyond the DSLAM. The bulk of the manual effort involves the provisioning and assignment of a Permanent Virtual Connection (PVC) between the customer and the service provider.

In addition to the provisioning costs, the overall operations costs are also affected by the efficiency of the service assurance processes. The following is an example of the reasoning used in determining the efficiency of this process.

Any service assurance call begins with simple fault isolation mechanisms. One of the first tools generally used after interviewing the customer is a metallic loop test (MLT). However, the DSLAM does not support any MLT activities. Instead, the craft personnel could use the class 5 switch, which does support MLT testing. This would require access to the customer's telephone number. Depending on the service record approach taken, the customer's telephone number may

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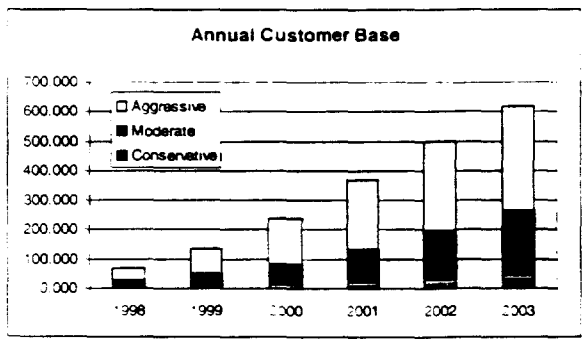
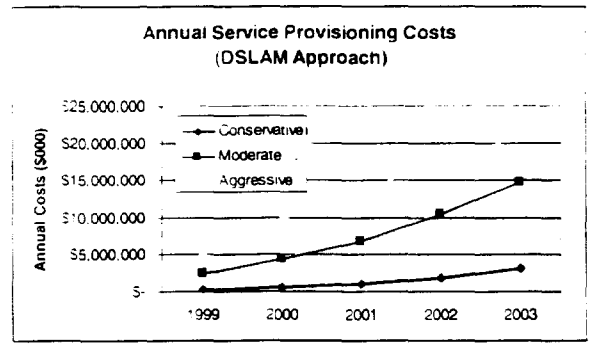
not be easily determined once a work order has been issued. Even if the telephone number was available, the MLT system could test the low-frequency connectivity. If this fails, then the craft can proceed with their normal process. However, if there is connectivity for low-frequency service, MLT cannot provide any definitive feedback on the ability of the loop to support ADSL. It cannot detect if the customer has been re-arranged onto a facility with a load coil or if a T1 circuit was recently routed in the same binder group --two situations that make it impossible to support ADSL service on the current loop.

In order to compute the operations costs of a DSLAM deployment, Bellcore has developed a hypothetical market with three different market growth rates, as depicted in the following figure. These market numbers are used to drive costs of operating a network based on DSLAM or ILC technology.



Using historical costs for current operations activities, Bellcore has developed a set of operations costs for a subset of the activities needed to support a network based on DSLAMs. This includes work efforts based on the annual growth in the customer base, churn in the customer base, and change orders for existing customers. It includes the operations costs for service provisioning of the copper plant, the DSLAM, and the transport network. This does not include costs for outside plant activities, such as installation of the POTS splitter at the customer's premises. Combining these costs with various rates for these operations activities and the overall number of customers leads to an expected operations cost for service provisioning of this network. These costs are shown in the following figure and reflect a single-vendor solution. We expect multi-vendor solutions to have somewhat higher operations costs, but that the difference in costs will be equivalent for both the DSLAM approach and the ILC approach.



Integrated Line Card (ILC) Approach

The integrated line card approach emphasizes the efficiency of a solution that can be installed in existing equipment and provisioned using existing processes. It leverages the notion that the existing infrastructure can be modified to support ADSL line cards. For example, Nortel has announced a product called a *1 Meg modem* that can provide both voice and data services from a single line card. This requires an upgraded backplane with circuit pack in the supporting shelf to aggregate the traffic between the various line cards and the interface to the transport network, but the rest of the infrastructure remains essentially unchanged. Integrated line cards are also planned for the Nortel AccessNode. Both Lucent and DSC have also announced similar plans, with Lucent announcing integrated line cards and backplane upgrades for their 5ESS and SLC series products and DSC announcing integrated line cards and backplane upgrades for their Litespan product.

In developing an operations solution for integrated line cards, one of the goals is to re-use current process flows. The ADSL service on integrated line card equipment can be modeled as a new Custom Calling Feature (also known as a CLASS service). CLASS services are provided on top of existing voice service interfaces (e.g., POTS) and the flows to support this type of service are robust. Normal service ordering, disconnect, and change orders are all current process flows. The service flow for CLASS features already supports the notion that a specific CLASS feature may need feature-specific data to complete an order. Thus, the process flows for these features support the handling of feature-specific data from the service order processor, through the OS systems, to the switch that will provide the service. This will allow the service provider to write service orders using existing process that can contain any information needed (e.g. sub-

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scribed data rate) to flow through the existing infrastructure and processes and be delivered, ultimately, to the ILC management system. This allows an ILC approach to be deployed and immediately have a relatively robust operations infrastructure in place.

Equipment Issues for the ILC

Deployment of the ILC approach is limited by the availability of the hosting equipment. The targeted offices need to have appropriate equipment. Most carriers have one or two preferred vendors. If an approved ILC system is available from these vendors, the deployment of ADSL from these systems should be very easy. A shelf of the system is cleared of customers by transferring their service to another shelf. Once the shelf is clear, it is upgraded to support the ILCs. The shelf is then populated with ILCs. The provisioning systems are updated to reflect the new features of these line cards and service orders will then begin to assign these cards as needed.

If these offices are not equipped with a system that has an approved ILC system, it is possible to deploy a new system from an approved ILC vendor to support the new services. In a central office environment, it is most feasible to deploy a DLC system into the office and provide ADSL service and POTS service from that platform. Since space, power, and transport capacity is generally available, this is a feasible approach. The cost effectiveness of this needs to be studied. At remote sites that are served by a DLC system that does not have an approved ILC system, the ILC approach does not have substantial advantages over the DSLAM approach.

A major advantage of the ILC approach is its convenient access to the copper plant. With an integrated card, a service order to provide ADSL service is translated into a request to change the wiring of a customer to serve them from a switch port capable of supporting the ADSL service. Once the customer's port is rearranged, the service order is translated into a request to move the customer's POTS service configuration from the old switch port to the new switch port. At the central office, the customer's line has a single appearance on the MDF and is connected to one piece of equipment in the central office. Although this is superior to the DSLAM approach, which requires two passes on the MDF, the resulting congestion at the MDF is not likely to substantially impact the viability of the ADSL service. However, unlike the DSLAM approach, the impact of the ILC at a remote site is minimal. As previously discussed, the outside plant design plans do not generally co-locate the SAI and the remote equipment. This separation of equipment makes wiring a DSLAM into the circuit between the SAI and the DLC system very difficult. The ILC approach does not suffer from this. Since the line card provides both POTS service and ADSL service, a single change at the SAI allows the customer to be conveniently moved from a POTS line card to an integrated line card and provided ADSL services.

The ILC approach does have its limits. The line cards to support ADSL services draw more power and support fewer customers than a POTS-only line card could support in the same space. Consequently, any system that has ILCs deployed will lose effective POTS capacity to gain ADSL capacity. In offices and remote sites that are nearing capacity, this may become an issue as the market penetration of ADSL increases. Remote sites that are reaching capacity will probably incur an upgrade cost in the near future anyway.

Operational Issues for the ILC

The ILC approach requires an existing infrastructure to be in place before service can be offered. In most cases, this infrastructure is already available. In areas where it is not available, new equipment can be deployed or these offices can be scheduled for future phases of a service launch. This need for infrastructure, which can delay initial deployments, bears tremendous benefits in the operating cost of this network.

Early operations costs are driven primarily by the cost of learning new processes and systems. Errors in executing the new business process are translated into additional operating costs generated by additional service calls. In addition, these errors can adversely affect the market perception of the carrier's brand and lead to lost potential revenues for this service and other related services. The ILC approach minimizes the risk of these types of errors. It leverages the current processes and systems and allows the craft personnel to learn a minimum of new activities needed to enable ADSL services. The learning curves for an enhancement to an existing product are much less dramatic and translate into immediate savings in the operations costs of the new service.

The ILC approach immediately supports a strong level

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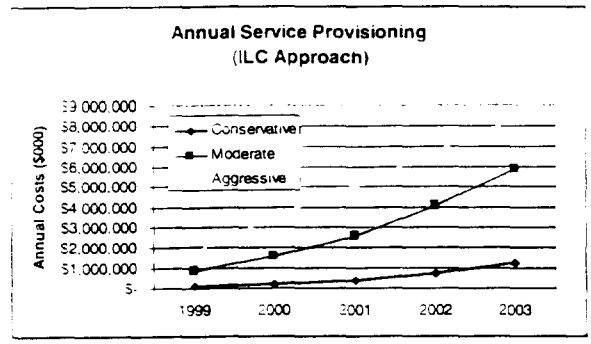
of flow-through provisioning. Bellcore operations support systems can provide flow-through of the integrated line card provisioning with minor system enhancements and without the need to develop entire new systems. This translates into faster time-to-market and lower support systems cost when compared to the DSLAM approach. The new service flows through the same process but requires new line cards. The service provisioning process has no processes that the craft personnel need to learn. In effect, the ILC is a new line card for the existing services and one new service.

The service assurance processes are also very familiar to the craft personnel. The placement of the line card into existing equipment that supports mechanized loop testing (MLT) allows the craft to leverage their current process for fault isolation. The process begins with an interview of the customer and service identification. Since the ILC uses the telephone number for the service record identifier, the customer simply needs to know their telephone number to begin the process. During the interview process, an MLT test can be performed. This can quickly identify if the problem is with the continuity of the cable plant. Of course, these tests are not currently sophisticated enough to identify all troubles with ADSL services, but they do provide a strong infrastructure to build the needed additional expertise required to make ADSL service assurance cost effective.

Bellcore has estimated the operating costs for an integrated line card approach. Using the same model of costs developed for the DSLAM approach, Bellcore has developed a set of operations costs for the activities needed to support a network based on ILCs from a single vendor. This includes the operations costs for the same activities that were modeled for the DSLAM approach. Combining these costs with various rates for these operations activities and projected customer base leads to an expected operations cost for this network, shown in the following figure.



In order to compare the cost differences between the DSLAM approach and the ILC approach, we assumed that the market penetration for these two deployment approaches is identical. This assumption may need to be challenged. The DSLAM approach can be deployed in more locations without concern for the available serving equipment. This may allow it to reach more customers more quickly. At the same time, the ability to deploy the ILC approach into areas where the customers are served by DLC systems may allow for a wider deployment of ADSL services. The perception of a ubiquitous service as a strong influence on a customer's willingness to pursue a new service. In addition, the perception of ubiquity will also create additional incentive for ISPs to launch ADSL-based access to their services.

Without attempting to project the impact these issues may have on the ADSL market penetration, a straight comparison of these approaches shows an operational savings for the ILC approach of approximately $38 per line. These savings are generally insensitive to the market penetration.

Implications on Market Velocity

As the previous discussions indicate, the ADSL market is diverging in many areas. There are many approaches to deploying ADSL, ranging from ISPs deploying ADSL modems on "dry copper" to ILECs developing a new major service offering. Each deployment of ADSL has brought a new service model to the market. The service models affect all aspects of the ADSL market, including the end-users, manufacturers, and service providers.

There are two approaches that appear to have sustainable business advantages that meet the end-user service needs: a regulated data service and an unregulated data service. The regulated data service currently has

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the advantage with better access to information on the infrastructure. The unregulated data service may offer a more compelling investment opportunity if the challenges of integrating information from the regulated carrier and the unregulated carrier can be solved competitively.

The advent of the integrated line card approach to supporting ADSL services has added new options into the market. The idea of an integrated line card solves many of the outside plant issues that are delaying ADSL service from being deployed in remote sites. At the same time, the carrier is dependent on the embedded vendor to develop a cost-effective ILC solution. This approach may provide additional economical advantages for carriers deploying a regulated data service. An unregulated carrier deploying an ADSL-based data service will rely on DSLAM technology. Given the challenges of deploying DSLAMs in remote sites and the current regulatory rulings regarding co-location of equipment at remote sites, it appears that there are still challenges that need to be solved before this approach can successfully compete with a regulated data service approach. Until that time, the industry will likely see the current small-scale trials of DSLAM-based ADSL service shift to ILC approaches to economically support large-scale, ubiquitous ADSL service deployments.

Acknowledgments

The main objective of this paper was to stimulate industry debate and discussion on the solutions for the successful deployment of ADSL-based services and to articulate key operations and cost of ownership differences between two emerging technologies – DSLAMs and ILCs. The authors gratefully acknowledge discussion with many industry members including members of the ITESF, and the following Bellcore subject matter experts: Jeff Goldthorp, Chad Herbert, Ed Pinnes, Grant Lenahan, John Wojewoda, Jerry Farro, Mary Lau, and Art Daughtry.

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Mr. Charles Woloszynski is the Director of ADSL Solutions, working in Bellcore's Broadband Access Design and Engineering Practice. His group performs research into service architectures and deployment challenges for high-speed data network access, including ADSL technology. They provide system engineering, economic modeling, deployment planning, and equipment testing for carriers. In addition, his group also supports strategic planning, systems engineering, and equipment testing for equipment manufacturers.

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NORTEL NETWORKS

FCC Ex-parte Meeting

Deployment of Wireline Services Offering Advanced Telecommunications Capability
CC Docket No. 98-147

November 05, 1998

Nortel's Objectives

NORTEL NETWORKS

- **The FCC should not permit or establish regulatory impediments to the deployment of efficient cost effective switch integrated solutions.**
  - Affiliate Asset Separation
  - Collocated Switching Equipment
- **Loop Access is critical to enabling competition and volume deployment of xDSL services.**
- **The FCC should grant waivers of part 68 for xDSL type products which are network friendly.**

NORTEL NETWORKS

- **Nortel is concerned that some areas of the current policy direction may limit technology innovation and force Service Providers to resort to costly, inefficient network architectures resulting in higher subscriber prices, slowed deployment, and reduced availability of advanced services.**

Areas of NPRM Concerns

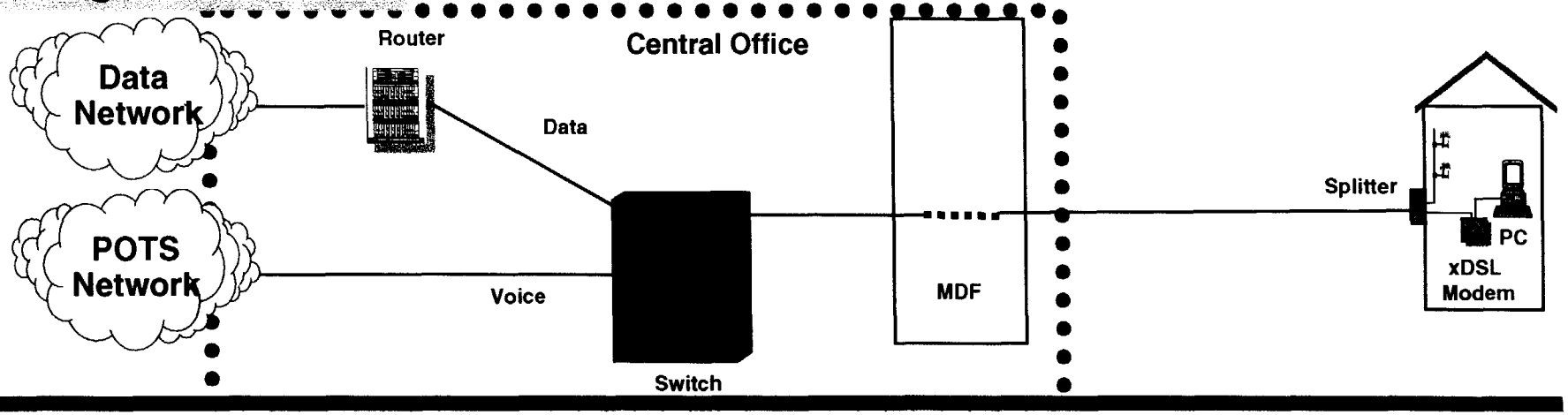
- In crafting its rules on full separation of affiliate assets , the Commission should be careful not to preclude the use of integrated switch solutions by either ILECs or CLECs. ILECs should not be forced to physically separate the assets.
- The Commission should not force carriers to disable the switching capabilities of the collocated equipment.
- Nortel recommends that the Commission adopt the "unconditioned" loops and "qualified" loops categorization to ensure that the lowest cost and functional loop be available to those carriers deploying xDSL on unbundled loops.
- Nortel urges the Commission to grant waivers of part 68 for network friendly products.

Integrated Switching Solutions

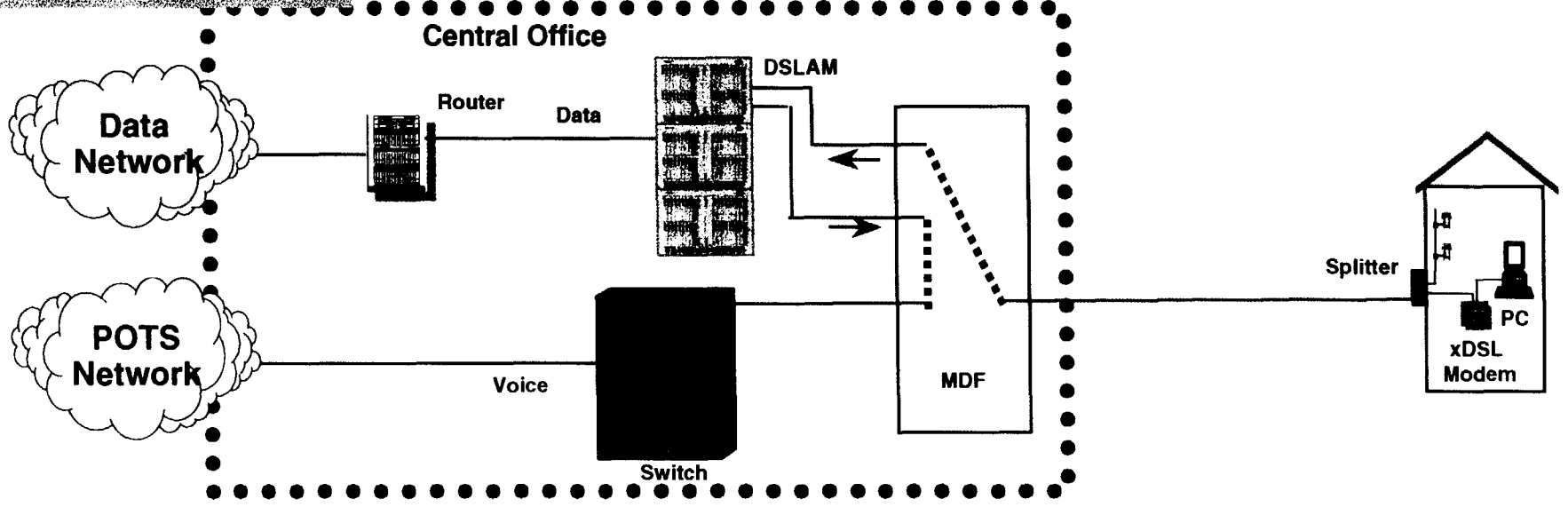
Integrated vs. Discrete Networks

NORTEL NETWORKS

Integrated Network



Discrete Network



Integrated Switch Solution Drivers

NORTEL NETWORKS

- **Speeds Deployment**
- **Eliminates need for Duplicated Common Equipment**
- **Minimizes Floor Space / Power consumption**
- **Avoids Duplicated Test Facilities**
- **Fits into existing Operations, Maintenance and Provisioning systems**
- **MDF Space, Re-wiring & Re-grooming**
- **Digital Loop Carriers / Remotes** (space and right of way constraints)

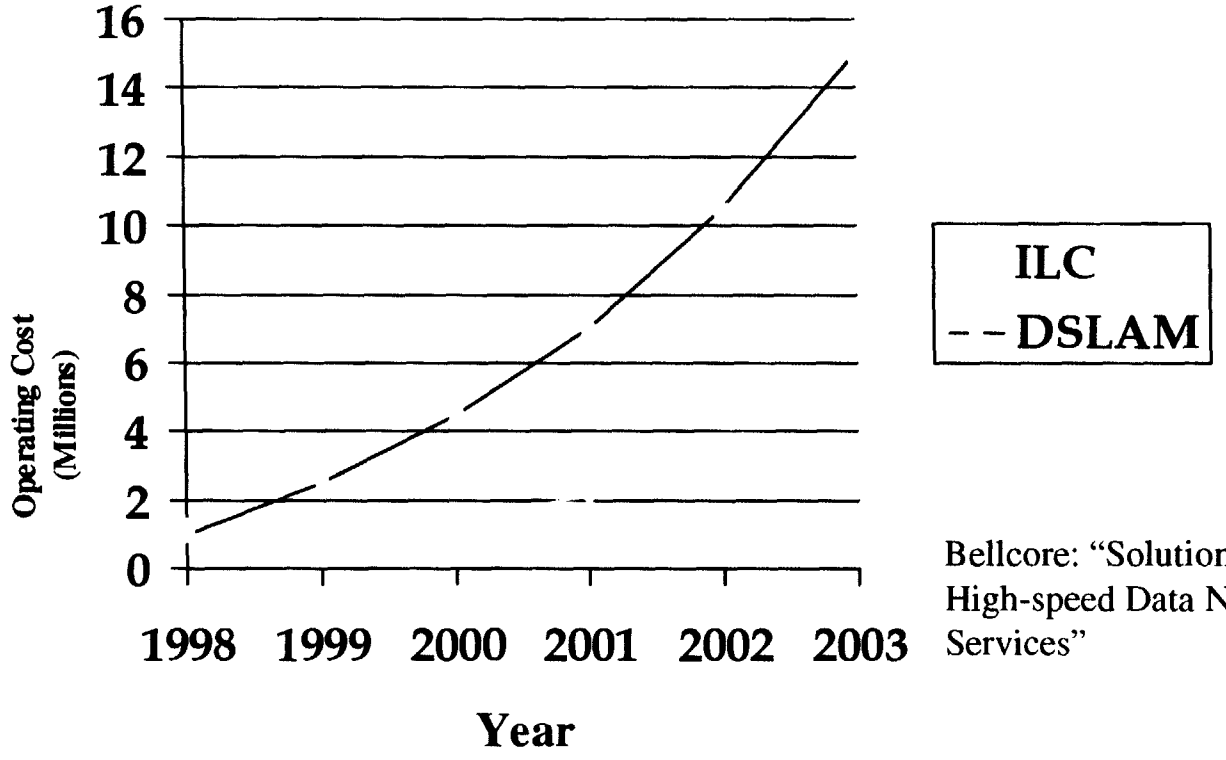
Cost Effective Solutions enable Advanced Services to be more affordable and available to all Americans

Provisioning Options

Integrated Line Card vs. DSLAM

NORTEL NETWORKS

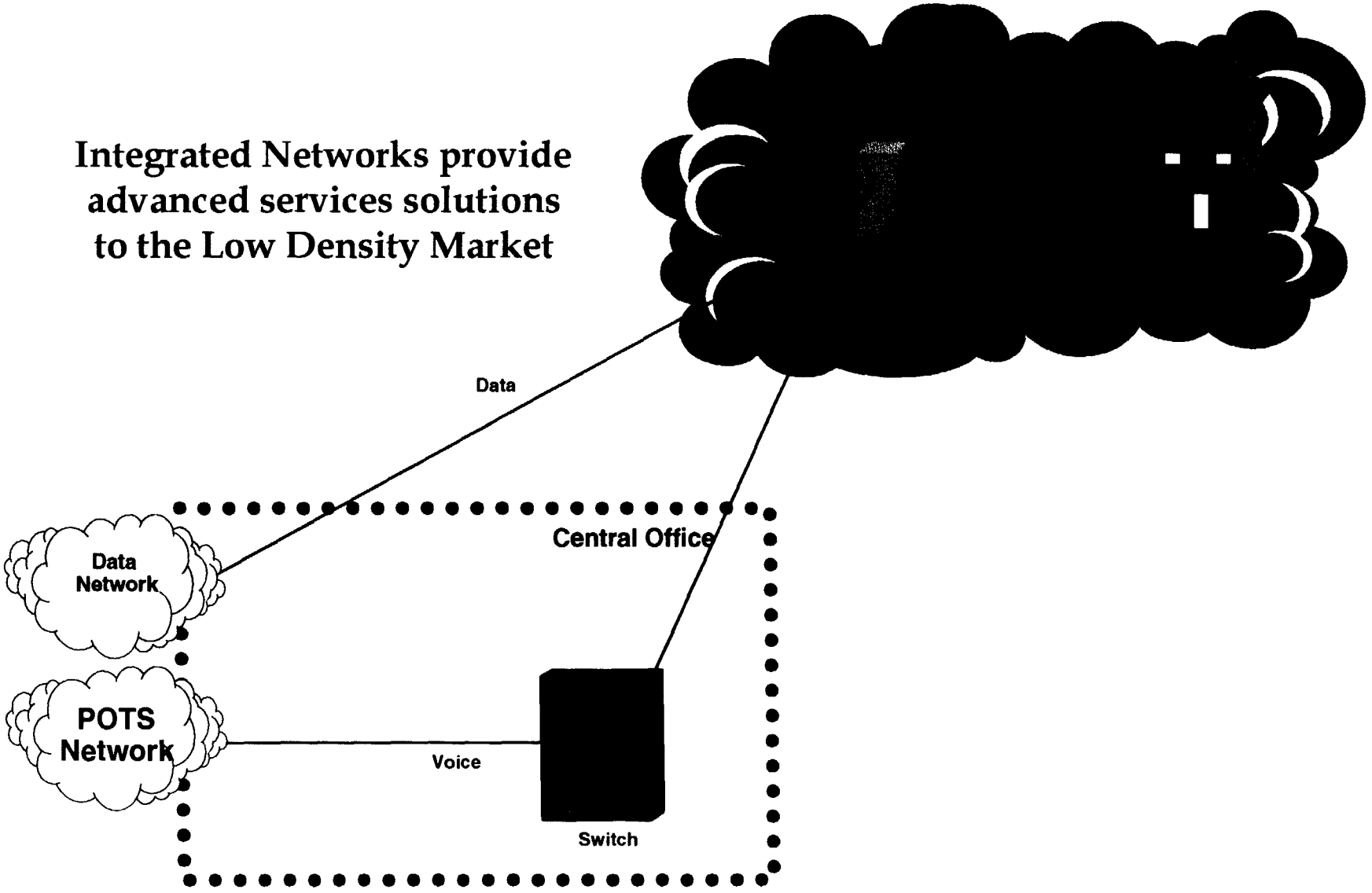
Using anticipated growth and churn rates, Bellcore estimated provisioning requirements for copper plant, DSLAM and transport facilities and identified a 60% annual operations cost savings for an integrated line card approach - like the Nortel ILC - versus a DSLAM deployment model.



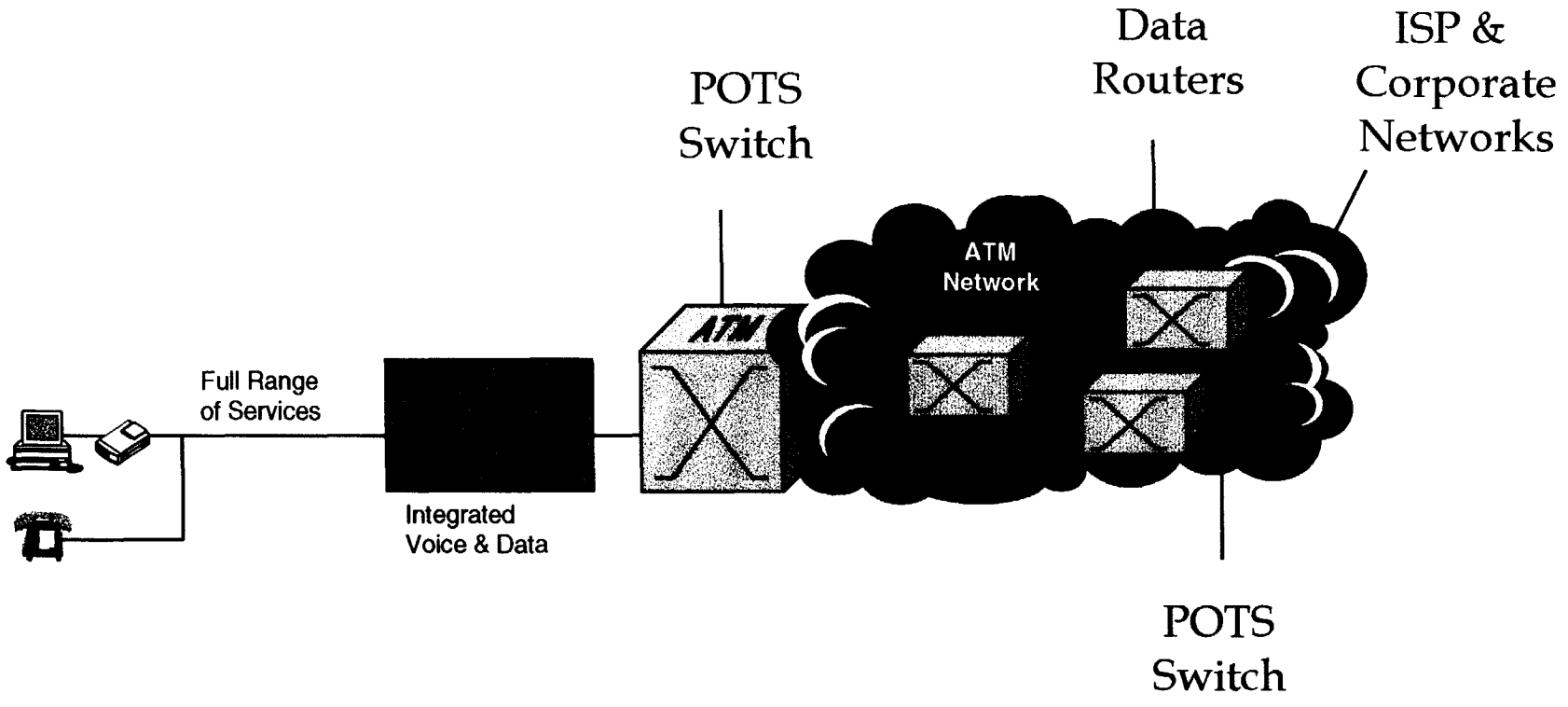
Bellcore: "Solutions for Ubiquitous High-speed Data Network Access Services"

NORTEL NETWORKS

Integrated Networks provide advanced services solutions to the Low Density Market



NORTEL NETWORKS



Voice and Data become Blurred in Future ATM Networks

Loop Access

Loop Access Barriers

NORTEL NETWORKS

- Nortel has sold nearly a 1 Million xDSL (1-Meg Modem) Lines
- Deployment is very slow
  - No cooperation on loop plant engineering.
  - Excessive loop conditioning slows availability and drives up cost.

Deployment of Advanced Services are constrained

Loop Categorization

NORTEL NETWORKS

Nortel categorizes copper loops as follows:

"unconditioned" loops	Are loops which have no capacitive or inductive devices (such as loading coils) on them, regardless of loop length. These are readily identifiable
"qualified" loops	Are loops which require special conditioning or engineering to meet more stringent requirements.

[redacted]

1-Meg Modem Sample Field Results

NORTEL NETWORKS

All consumers realized a significant increase in data rates over today's modems

13.2	960	120	1 (~1607 ft)	Damaged Outside Plant
14.6	960	120	0	None
14.0	320	40	0	Load Coil
14.5	320	120	1 (~947 ft)	ISDN Interferer
16.2	640	120	0	AM Transmitter
16.7	640	120	0	HDSL Interferer
[illegible]	[illegible]	[illegible]	[illegible]	None
[illegible]	[illegible]	[illegible]	[illegible]	None
[illegible]	[illegible]	[illegible]	[illegible]	None

1-Meg Modem can be deployed on Unconditioned Loops

Part 68 Waiver

NORTEL NETWORKS

The FCC should grant Part 68 waivers for xDSL type products

- Part 68 waivers will speed deployment of network compatible equipment
- Nortel has 100 years experience in deployment of loop access equipment and understands the importance of spectral compatibility
- Nortel's products are designed to be "Network Friendly"
- Nortel is filing waiver requests for its xDSL type products

NORTEL NETWORKS

- **Nortel**
  - Developing cost effective switching integrated solutions and consumer friendly, easy to deploy products, such as the 1-Meg Modem.
  - Developing technologies which are network friendly.
  - Making innovative products available to consumers now.

- **Recommendation to FCC to realize advance service deployment**
  - The Commission should be careful not to preclude the use of integrated switching solutions by ILECs or CLECs.
  - The Commission should adopt the "unconditioned" loops and "qualified" loops categorization.
  - Grant waivers of part 68 when the manufacturer can demonstrate that its product will avoid harm to the network.