This presentation provides an overview of market trends, opportunities, and challenges affecting service providers. As a leading supplier of products and services based on packet, frame relay and ATM technologies, Nortel will review its vision, directions, and business solutions for service providers.

About the presenter:

Rob Wood is Assistant Vice President, Magellan Broadband Switching, in Nortel's Magellan Networks group, located in Ottawa. He has worked in the telecommunications industry for 24 years. After graduating from the University of British Columbia and Imperial College in London, he joined Nortel Technology (formerly Bell-Northern Research). While at Nortel Technology, he worked as development manager in the switching division and played a major role in the creation of DMS, the first central office digital switch for telephone networks. Between 1987 and 1990 he led the development thrust for Nortel's SONET transmission products. He has held his current position with Nortel's Magellan Multimedia group since 1993.

Agenda

- **Market trends**
- **Nortel directions**
- **Service opportunities**
- **Cost reduction opportunities**

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This presentation first covers key market trends that Nortel is observing from its vantage point as a supplier to many of the world's major service providers. It then covers how Nortel is responding to these major trends. It explores Nortel's basic philosophy in assisting the service provider to take advantage of changes in the market by increasing service revenues and reducing operating costs. The final segment of the presentation addresses specific new services that are being introduced using our equipment and ways in which our equipment can reduce operation costs.
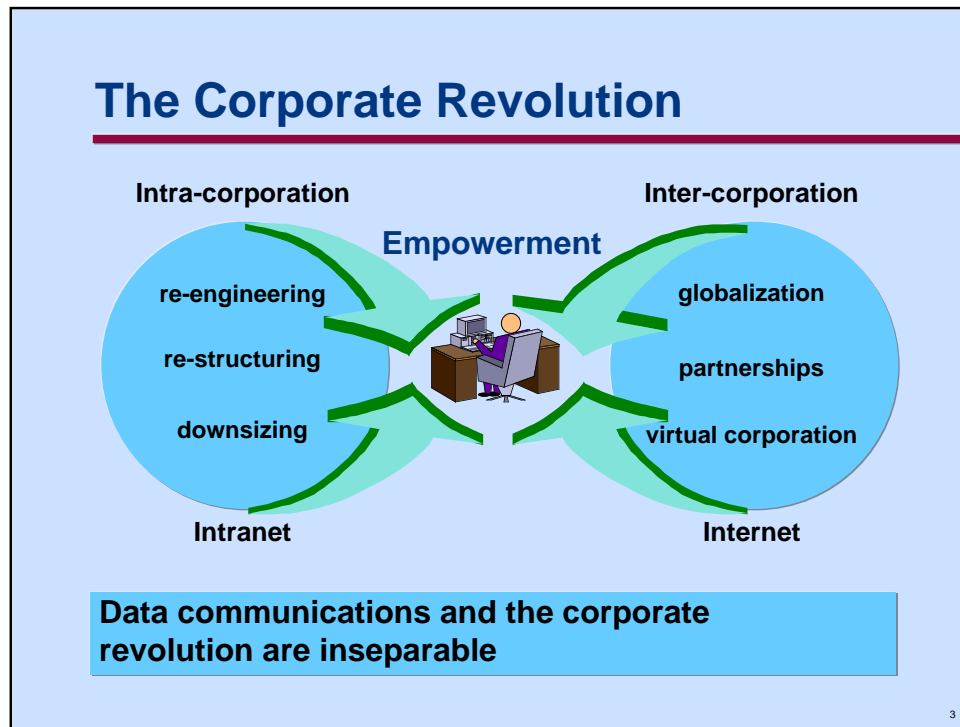
Everyone working within today's corporate world, and even most of those outside it, are aware of the revolution that is taking place. Corporations have downsized, organization structures are flatter, business processes have been re-engineered and people have been empowered. All of these thrusts translate into more work for the individual who is now assisted by sophisticated software applications utilizing more powerful computer and communication tools.

Alongside this revolution within the corporation, we have a parallel revolution taking place in inter-corporate relationships. Corporations are globalizing and creating regional linkages with suppliers and customers. Virtual corporations are being created out of multiple traditional companies—each with their own functional focus. Unprecedented partnerships are forming daily that require tight integration of functions across corporate boundaries. Again, the empowered individual worker with computer and communication tools, is the focal point of this intercorporate revolution.

Data communications and the corporate revolution are really inseparable, each challenging the other to empower the worker.
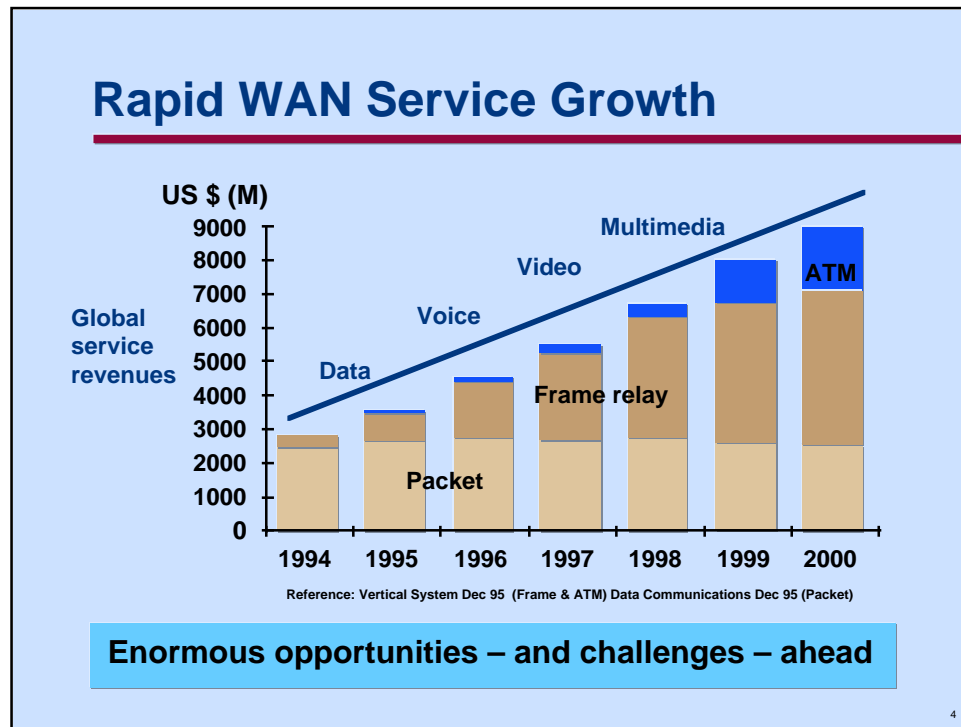
The very nature of the corporate revolution—geographically dispersed virtual workgroups —means that service providers play an indispensable role in its success. This chart illustrates the global service revenue projected for service providers providing wide area data communications. While data communications today is primarily intercomputer file transfers, the data classes are expanding to include voice, video, and eventually true multimedia services. As the chart shows, the opportunity is enormous. A market of close to $4.5 billion U.S. is expected to double to $9 U.S. billion by the turn of the century.

The chart also shows the trend in the underlying technologies needed to meet the evolving needs of data communication services. Packet technologies, first introduced two decades ago, remain at the core of the data communication services today. They are robust, proven, and have been continually enhanced in capacity and service diversity. However, the growth in the market is being picked up by the newer technologies—first frame relay, and secondly, ATM. These new services are attractive because they do offer the needed higher speeds and, in the case of ATM, the ability to carry a broad mix of traffic types. They, of course, do not have the service diversity and reach that packet data systems offer today.

While the opportunties are tremendous, the task we face as suppliers and service providers is tremendously challenging. Clearly, as organizations, we too need to be part of the corporate revolution.

The Service Provider's Challenge

- **Rapid delivery of new services**
- **Competitive price/performance**
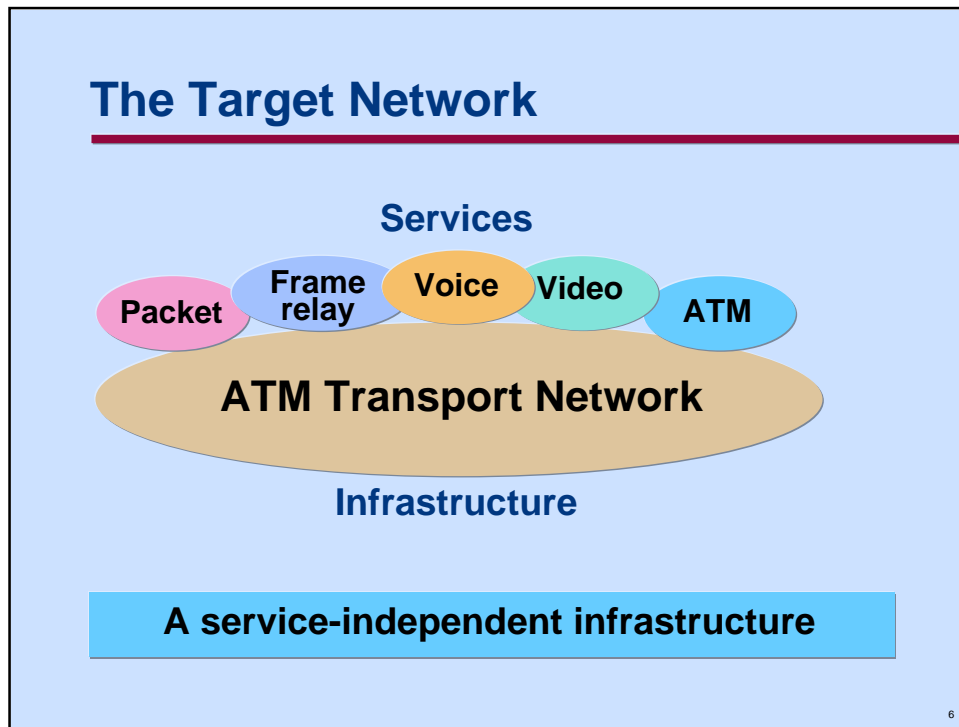- **Minimal investment risks**

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The first challenge for service providers is the rapid delivery of new services. New services are fueling the growth in this market and the service provider who is first to market and who is able to adapt his services to best meet his end users' requirements will be successful.

A second challenge is providing the new services with competitive price and performance characteristics. End users will take on new services only if the price is right, and a keen competitive environment helps us get there sooner. The winds of deregulation are blowing strongly around the world. Every service provider is seeing entirely new competitors arise in their market regions, and many of these new entrants are employing the latest technology to create both service and price discontinuities. The service provider must be able to select the best technology for the service and control operational costs if they are to be successful.

They must also invest in technologies that provide flexibility to adapt to market shifts without equipment obsolescence. In other words, the service provider must minimize the risk in each purchase decision.
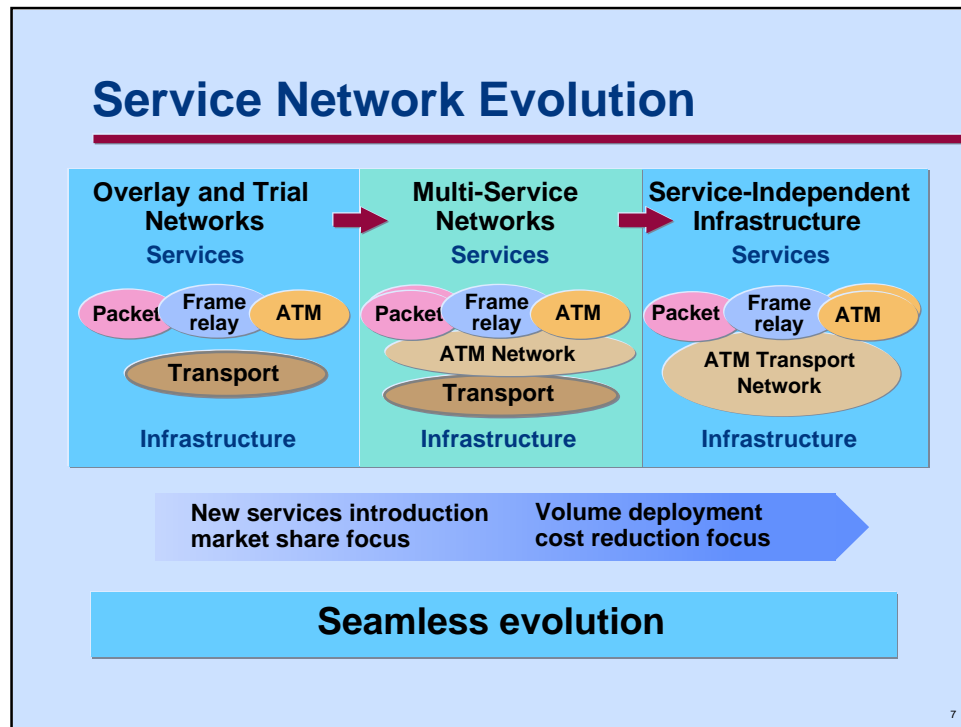
The critical question is what kind of network will meet these challenges?

The Target Network

Services

Packet · Frame relay · Voice · Video · ATM

ATM Transport Network

Infrastructure

A service-independent infrastructure

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It is Nortel's belief that the ultimate service provider's data network will consist of a services layer interfacing to users, and an underlying service-independent infrastructure.

The infrastructure will comprise of ATM and SONET/SDH technologies. On top of that will be the services layer which adapts end-user applications to the ATM infrastructure. Most of these end-user applications are variations of today's voice, packet, frame relay, and video services. In addition, native ATM will be offered to the end user as an alternative to private line.

If this is the vision of the ultimate network that will give service providers both the service diversity and flexibility they need, along with minimal capital and operational costs, the question remains: how will they get there from where they are today, when most data service providers are suffering from a growing number of service specific overlay networks with their own equipment requirements and their own unique operation and support requirements?

Service Network Evolution

Overlay and Trial Networks	Multi-Service Networks	Service-Independent Infrastructure
Services	**Services**	**Services**
Packet · Frame relay · ATM	Packet · Frame relay · ATM	Packet · Frame relay · ATM
Transport	ATM Network	ATM Transport Network
	Transport	
Infrastructure	**Infrastructure**	**Infrastructure**

New services introduction market share focus → Volume deployment cost reduction focus

Seamless evolution

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This chart illustrates how Nortel believes most data service providers' networks will evolve over the latter half of this decade. It is clear that the most deregulated markets are moving quickest toward the target network architecture, propelled by competitive forces driving the service provider to new services and lower costs at ever-increasing speeds.

The left side of the chart illustrates the reality of most networks today. Packet and frame relay services are built on top of a basic transmission structure that may or may not be shared with the public voice network. In some cases, ATM is being added to this portfolio of services.
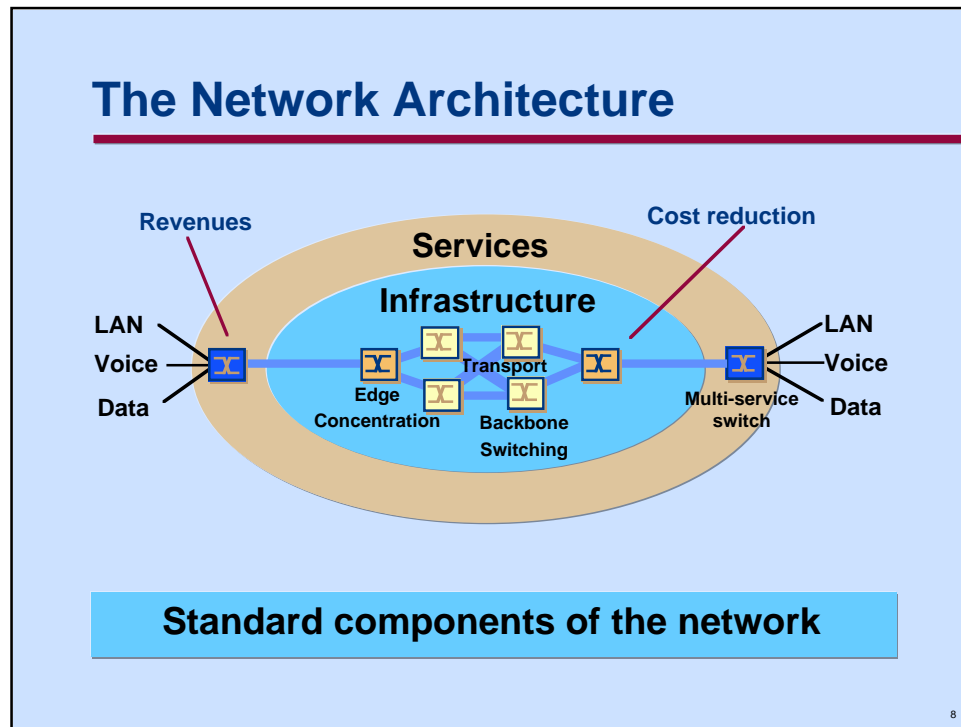
The next step is to use the ATM technology, not simply as another service, but as the service-independent transport layer beneath other services. Frame relay is the most significant driver of this transition. Service providers want to move frame relay services on top of an ATM network to avoid the cost of distinct ATM and frame relay tandem switches. The obvious extrapolation of this is to convey packet services over this same infrastructure.

Once this step is taken, ATM becomes a core infrastructure technology and integrating it with SONET/SDH equipment and managing them together is the obvious evolution step because it will reduce operational costs. This brings us to the ultimate service architecture introduced in the previous chart.

Some new entrants in the service provider market are already implementing the final network in an attempt to gain competitive advantage over their more traditional rivals.

For traditional service providers the challenge is making the transition smoothly.

Given this target architecture, the next key question is: what are the building blocks we need to construct this network?

The Network Architecture

Revenues   Cost reduction

Services

Infrastructure

LAN   LAN
Voice   Transport   Voice
Data   Data
        Edge   Backbone   Multi-service
    Concentration   Switching   switch

Standard components of the network

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First the construction of the network:

The services layer at the periphery of the network will be comprised of a wide variety of service-specific products that will perform the role of converting the service (e.g. native LAN) to ATM cells. The interior of the ATM network consists of small, concentrating edge switches that are located close to the end user, and large backbone or tandem ATM switches that efficiently interconnect the edge switches to ensure optimal use of the long distance SONET or SDH fiber transmission facilities.

Next, how does this network address the major challenges of the service provider?

It provides for rapid service delivery. New services can be readily added by deploying new service adaptation devices at the network periphery because the core infrastructure is service-independent and easily scalable in capacity. Most of the billing and management capabilities will already be in place. Cost is contained through the common shared infrastructure with common support systems. Finally, investment risk is minimized by the inherent flexibility of the service independent infrastructure.

However, to realize the vision of this network it must be inherently multi-vendor. It is essential that the equipment used to construct it be standards-compliant.

Service Migration Challenges

Challenges	Solutions
Packet	Proprietary
Frame Relay	RFC 1483/1490 ITU I.555
LANs	RFC 1483/1577 MPOA, LAN Emulation
Voice	VTOA
Video	MPEG-2

Standards progressing well

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Having stated that multi-vendor standards are pivotal in building the ultimate network, are they available or in the planning process?

A number of the key ATM standards related to a service-independent infrastructure is in place—access rates, signalling, traffic management and networking.

The question is: can we really surround a service-independent ATM infrastructure with a variety of service adaptation devices with assurances of service interoperability? The answer to this question is a qualified yes. Standards have not been put in place to allow X.25 to traverse an ATM network. A somewhat similar situation exists with voice. Nortel, having a very strong product portfolio in the pure voice world, is very active in the standardization of voice and telephony over ATM (VTOA). For other key services like LANs, video, and frame relay, all the necessary standards are complete and implemented by a number of vendors, including Nortel.

Standards are making the ultimate network feasible.

Agenda

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- **Nortel directions**
- **Service opportunities**
- **Cost reduction opportunities**

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Having covered what Nortel has discerned as the major trends, opportunities, and challenges that service providers face in the rapidly changing and growing data communications market, what is Nortel doing to assist the service provider? How is it going to ensure the success of the service provider and to address the challenges just described?
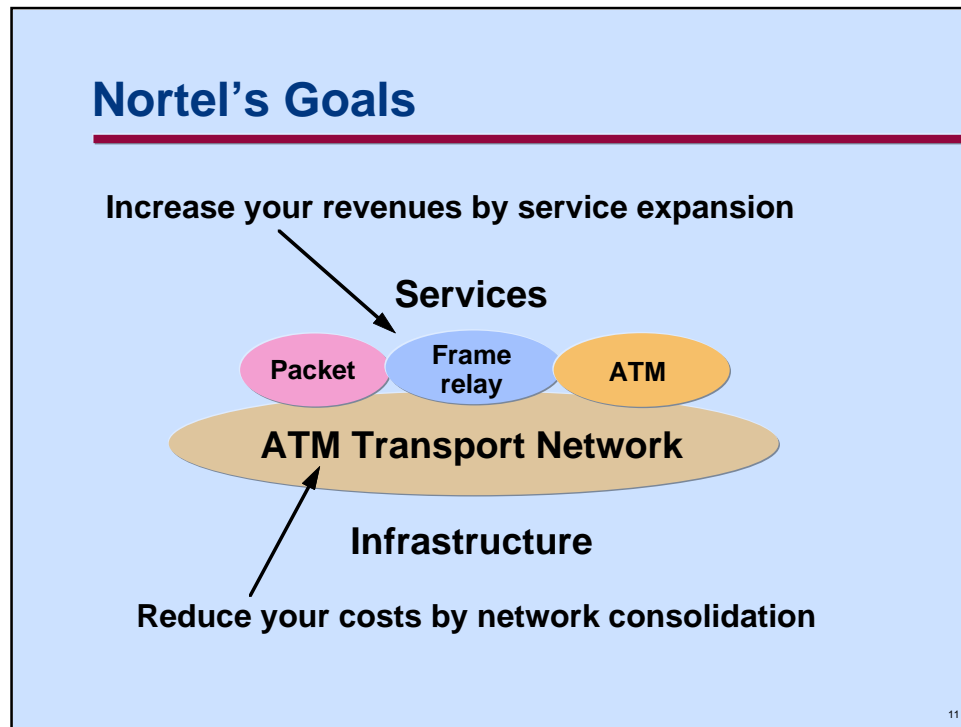
First, let's cover the plan that Nortel is pursuing as a supplier and partner to the service provider. With the ultimate network architecture as the goal, Nortel is continuing to invest in the evolution of its packet and frame services while it develops ATM-based services. A broad portfolio of services gives the service provider the flexibility of meeting all the needs of its customers who may be in different stages of the corporate revolution. A seamless evolution strategy gives both the end user and the service provider the best flexibility for benefiting from legacy services while taking advantage of the newer services.

In addition, Nortel is developing all the capabilities for an ATM and SONET/SDH service-independent infrastructure. A key component of this plan is the evolution of its packet and frame products to being the service components at the service layer of the network, all sharing the common ATM infrastructure.

This architecture will yield the benefits so necessary in today's environment—a rapidly expanding set of services that are quickly deployed because only the service interfaces need be developed, but none of the core infrastructure. Furthermore, the inherent scalability of ATM allows easy bandwidth provisioning as service demands grow. Equipment and operation costs are tightly controlled because the existing infrastructure is continually reused as new services are added. Only increments to operation systems and training will be required to deploy new services.

In summary, Nortel's evolution plan will improve your service diversity and your service velocity while reducing costs by consolidating multiple parallel networks into one.
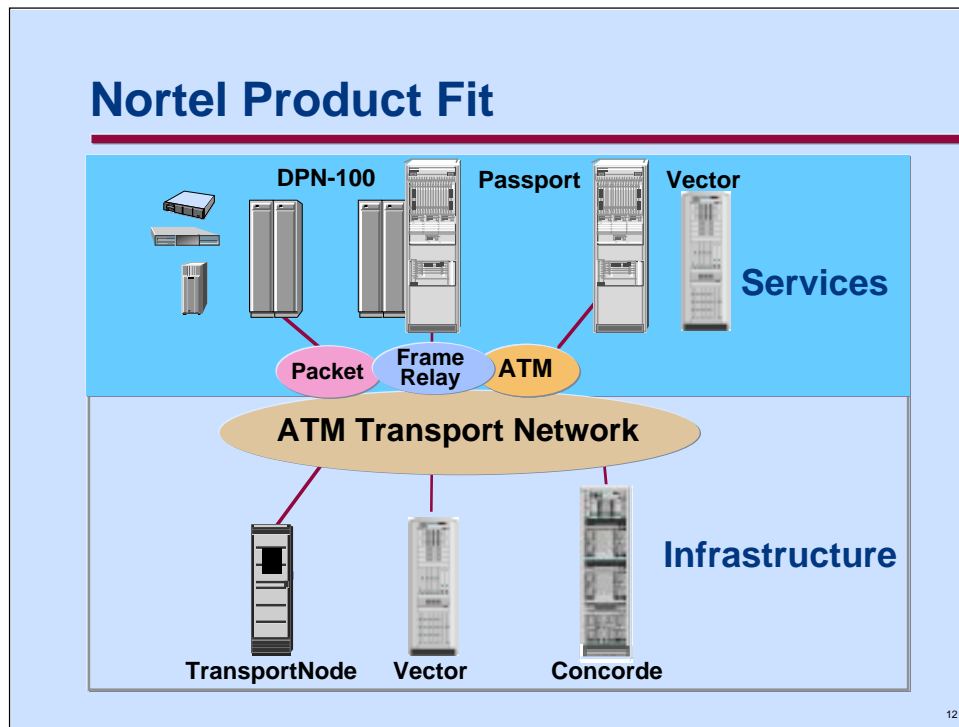
Nortel does have a complete portfolio of products to address both the services and infrastructure roles in the ultimate network, each with a strong evolution path toward that goal.

In the packet services domain we have the DPN-100 product line, with Passport as its high capacity backbone and key component of its migration plan towards more service variety and connectivity to an ATM infrastructure. Frame relay service is available on both products. In the ATM service domain, Passport and Vector can both offer native ATM service interfaces and ATM circuit emulation. In addition, Passport can interface native LANs (ethernet, token ring, and FDDI), frame relay and voice to ATM in its role as a multi-service ATM adaptation device.

Our infrastructure portfolio consists of Vector—an ATM edge switch, Concorde—an ATM backbone switch, and TransportNode—our family of SONET and SDH fiber transport products.

This chart introduces the major members of the Magellan product family.

The intent is not to describe the characteristics of the individual products but to indicate that Nortel is committed to being a leader in delivering products at the forefront of technology to ensure its service provider customers are able to deliver service capabilities ahead of their competition.

A considerable number of industry firsts are listed here ranging from token ring and SNA capabilities on DPN-100 through real ATM voice on Passport and ATM switched virtual circuits on Vector. The Concorde ATM backbone switch has broken new ground with full SONET implementation on its ports and a highly scalable, distributed control architecture.

Continued technology firsts will contribute to your competitive edge.

Expanding Nortel Services   Time to Market

Internet Access — **Rapport**

Residential Data — **Cornerstone**

Circuit Services — **TransportNode**

MPEG-2 Video — **NSAM**

New services - your competitive edge

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The Magellan group has formed a number of partnerships both within Nortel and with external companies to augment the Magellan portfolio with an ever-increasing set of service capabilities.

Within Nortel, Magellan has a close relationship with the Broadband group, best known for their SONET and SDH fiber transmission products. In addition, this group is building residential broadband distribution systems that bring ATM into the household and high quality ATM video systems using the Nortel Service Access Multiplexer or NSAM for short.

Outside of Nortel, alliances have been formed with leading vendors such as FORE Systems and Shiva to further enrich the service capabilities of the Magellan family. Products from these companies are being fully integrated into the Magellan family through the sharing of common software and hardware. We are marrying Magellan products to application devices to create service-ready offerings for the service provider.

The bottom line is that with our partnership program we can significantly broaden your service portfolio—and do it much faster in response to market needs.
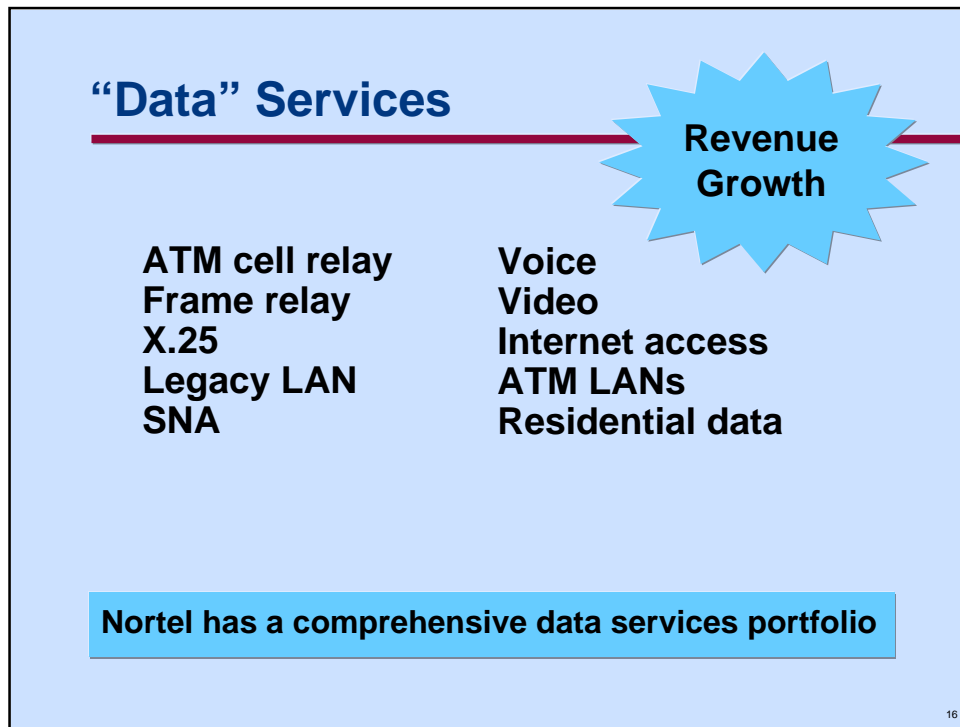
Agenda

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In summary, it is Nortel's intention to migrate the Magellan product portfolio toward a network architecture that consists of a service-independent ATM infrastructure surrounded by a peripheral service layer consisting of existing Magellan product platforms which will provide a continual flow of new service capabilities along with a set of products and services developed in association with partners who are recognized leaders in particular service domains. It is our goal to boost our customers' revenues through the continual addition of new services, while at the same time controlling their costs by transitioning to a common infrastructure with consistent network and service management.
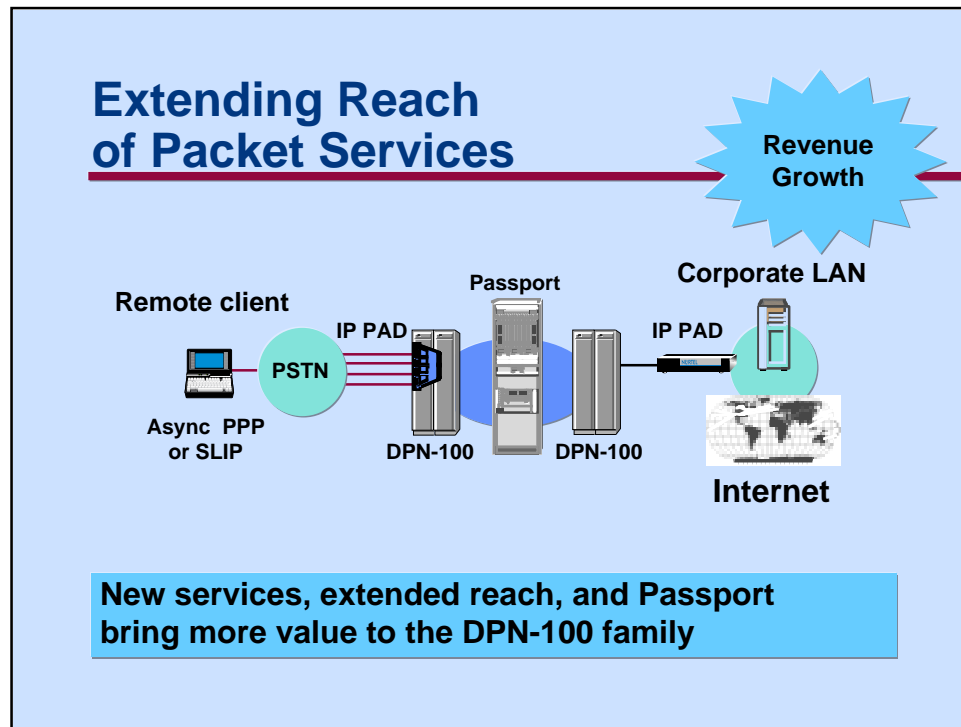
Given Nortel's objective, what opportunities are available now or are soon to be available that will increase service revenues and control costs? The next sequence of charts addresses this.

"Data" Services

Revenue Growth

ATM cell relay	Voice
Frame relay	Video
X.25	Internet access
Legacy LAN	ATM LANs
SNA	Residential data

Nortel has a comprehensive data services portfolio

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To grow service provider revenues, Nortel has, or is, introducing a growing diversity of data services. In fact, the term data is too narrow. We have broadened the definition of data to include video, enterprise voice, and even public network voice.
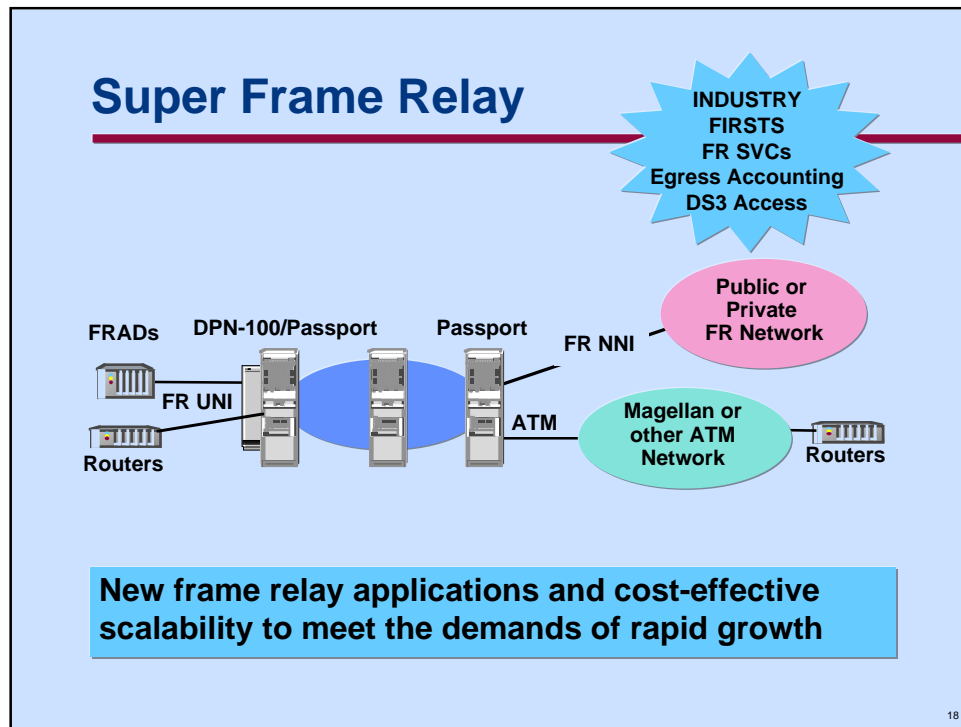
This chart lists the major data services that we are now delivering, or are close to delivering to service provider customers. These include services that have been available for some time such as X.25, SNA, and frame relay and a host of exciting new services including voice over frame relay and ATM, legacy LANs over ATM at wire speeds including delivery to the residence, and high quality video-over-ATM.

Extending Reach of Packet Services

Revenue Growth

Remote client — PSTN — IP PAD — Passport — IP PAD — Corporate LAN

Async PPP or SLIP

DPN-100   DPN-100

Internet

New services, extended reach, and Passport bring more value to the DPN-100 family

Although ATM has attracted the spotlight in our industry, the workhorse of service provider networks remains packet services. They are proven, robust, and extremely rich in the variety of data services they carry. We are committed to continuing to add value to DPN-100. Depicted here are two of the most recent—an IP pad with dialup access integrated into DPN-100, and a remote pad to extend the reach of the product. This will allow remote users to access their corporate LANs or Internet.

Passport—with its intrinsic frame and ATM capabilities—can also extend the service capabilities of a DPN-100 network. As a backbone, Passport expands the scalability of DPN-100 networks. As a service vehicle, Passport extends the performance range of DPN-100 services such as frame relay and SNA and significantly extends service diversity. As an ATM switch, Passport provides DPN-100 with a gateway into the service provider's ATM infrastructure.

Super Frame Relay

INDUSTRY
FIRSTS
FR SVCs
Egress Accounting
DS3 Access

Public or
Private
FR Network

FRADs   DPN-100/Passport   Passport   FR NNI

FR UNI

ATM   Magellan or
other ATM
Network   Routers

Routers

New frame relay applications and cost-effective scalability to meet the demands of rapid growth

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Nortel is rapidly adding to the capabilities of frame relay networks. Flexibility in billing, and full egress accounting, give the service provider the ability to uniquely define its service offering.

The rapid growth of frame relay has sent management costs spiraling and slowed responsiveness to customer service provisioning. With the introduction of frame relay SVCs, the service provider gets dynamic provisioning capability. This is a true win-win situation. The service provider is relieved of the burden of provisioning circuits while the customer get circuits on demand. The newer multimedia FRADs will also rely on SVCs on setting up voice calls. SVCs also enhance scalability, compared to the limits of fully-meshed PVC networks.

The scalability of a Passport frame relay network can be further enhanced with the use of Vector serving as an ATM infrastructure.

High fan-in is another improvement being added to Nortel's frame relay offering. The number of T1/E1 ports per shelf is being doubled—to further increase capacity access up to 50 Mbit/s is possible. This will reduce network costs and speed up service provisioning.

By the introduction of frame relay traffic classes, new forms of traffic—such as voice—can be carried within a frame relay network

Automatic UNI and NNI backup via alternate facilities, either dedicated or dialup, are being added to improve network reliability.

Finally, to facilitate the transition to an ATM infrastructure, the Passport frame relay product has frame relay trunking over an ATM network. Frame relay to ATM service interoperability will allow frame relay routers and ATM routers to interwork.
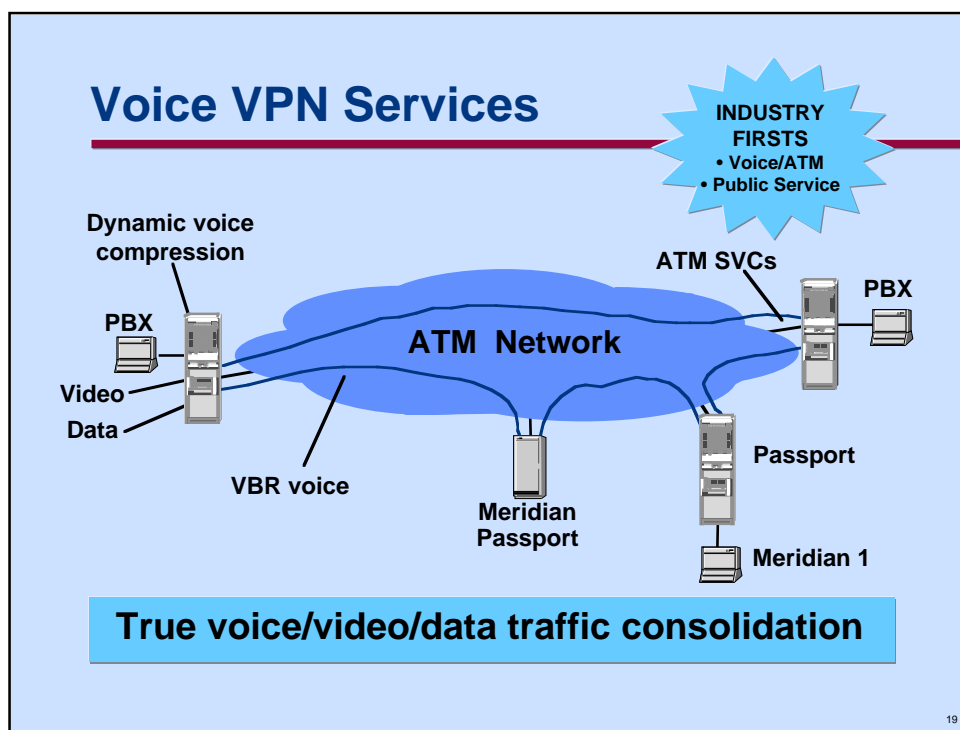
One of the most exciting developments that Nortel has undertaken is the addition of voice to its data service portfolio. Although originally intended for corporate networks, carriers have extended its use to public networks. One of these is MFS Datanet. They are rapidly moving toward the ultimate network architecture described earlier with a service independent infrastructure and service specific products at the periphery. They were able to add a voice service quickly and inexpensively by placing Passports at the periphery of their existing ATM network. Clearly this opens a whole new service opportunity to the traditional data carrier, where regulations permit.

Demonstrating its commitment to both the ultimate network model and to voice-over-ATM, Nortel's internal corporate network has been built on this model. Operational today is a Vector-based ATM infrastructure with Passports at the periphery translating both our LAN and voice traffic to ATM.

Currently, the voice capabilities of Passport are being extended through the addition of network signalling, which will permit calls to be tandemed through sites without involvement of a PBX. This will also permit the creation of voice virtual private networks allowing the carrier to offer secure service to multiple corporations on a single network. Furthermore, our Meridian PBX partners have joined forces with us to integrate the functions of Meridian and Passport.
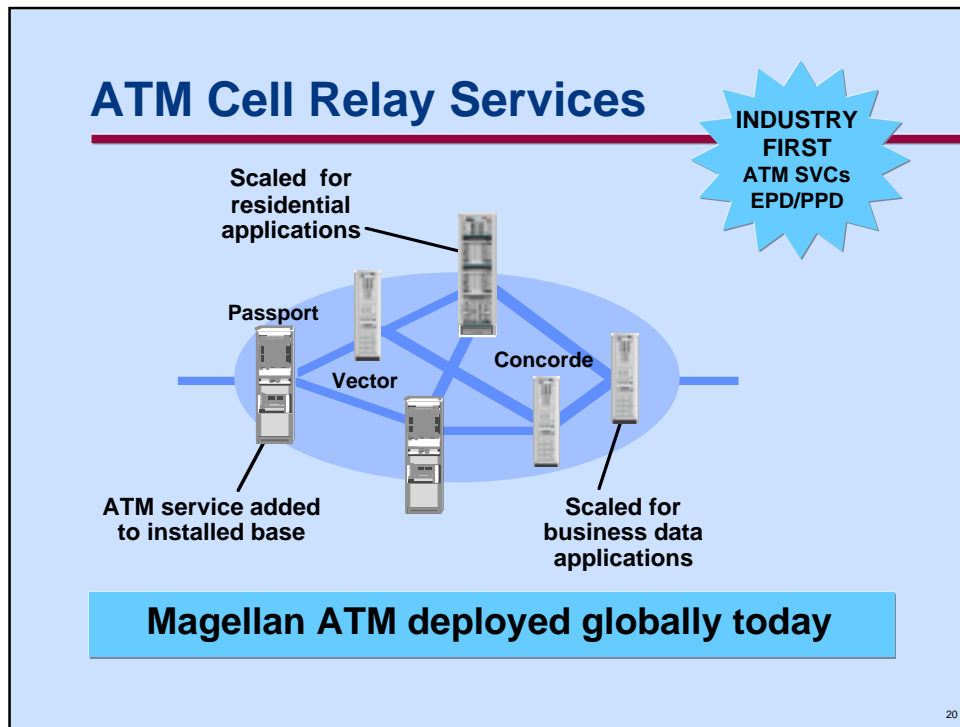
ATM cell relay is another service being implemented on Magellan equipment by carriers.

ATM cell relay is the natural extension of the highly successful frame relay service. It appears to be following the same evolutionary path, but lags behind frame relay by about three years. The recent standardization of low speed ATM access—the T1/E1 UNI and the frame UNI (FUNI)—has overcome the limitation of ATM to high speed, high cost access. These standards appear to be the trigger which will drive wide scale deployment of ATM.

The underlying end-user need is coming from the insatiable demand for more wide area bandwidth driven by the corporate revolution. The rapid migration to groupware, such as Lotus Notes, is a good example of what is driving this need. At the same time, costs must be controlled—making a multimedia technology like ATM, which allows maximum bandwidth utilization, very appealing.

All the major frame relay carriers in the U.S. will be starting serious volume deployment of ATM cell relay services this year. Magellan will be a major supplier of the equipment.
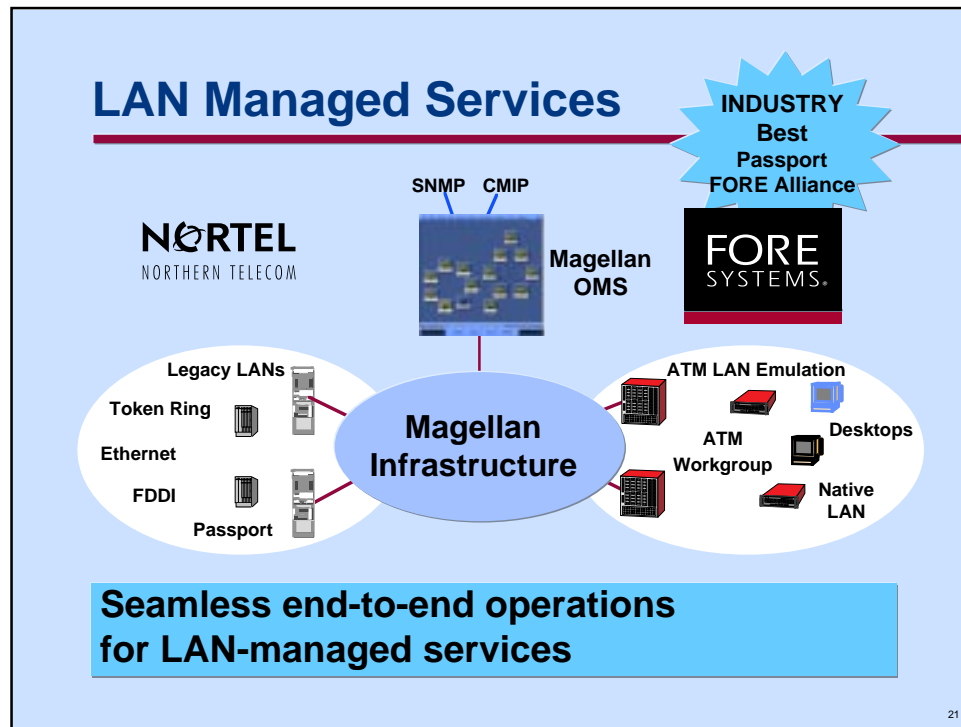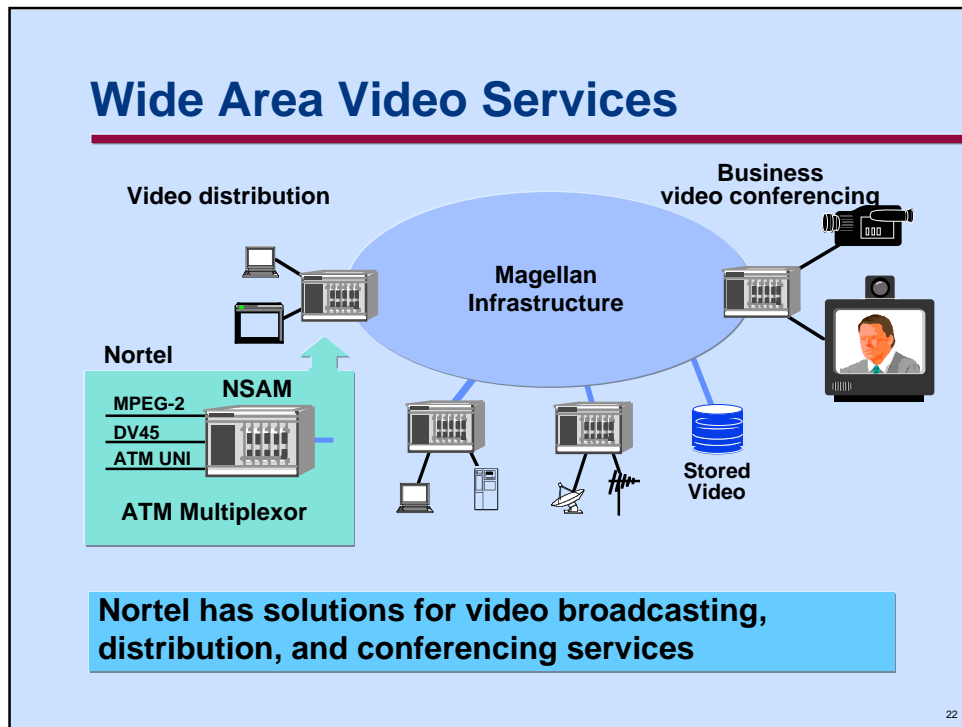
A cell relay service is the most obvious service that can be sold off ATM switching equipment. Many corporations want the benefits of ATM but prefer to focus resources on their core business rather than coming to grips with new technology.

Service providers are responding by moving up the value chain by converting the cell stream to a legacy service and thereby offering a managed service. There are a number of instances where service providers are already offering turnkey LAN and video services running over private line, packet, router, frame relay or ATM infrastructures. It is our firm belief that these managed services will migrate to an ATM infrastructure, hence we have been building our portfolio with that vision in mind.
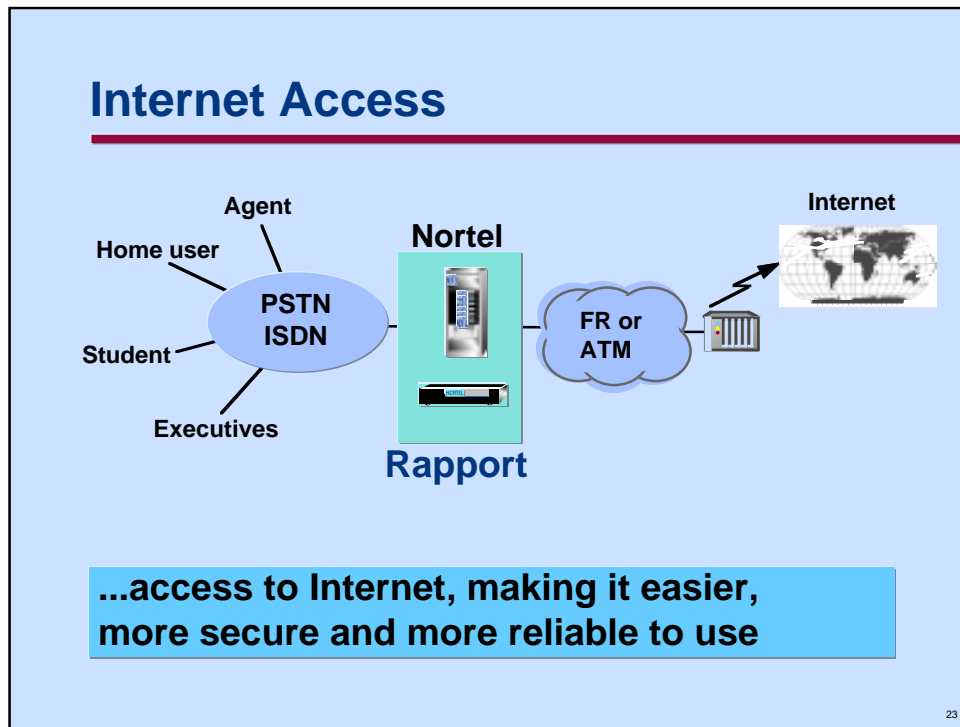
We also recognize that the vast flexibility of ATM makes it impossible for us to provide all the answers, so we have entered into strategic partnerships to enable carriers to build these services using the equipment from Magellan and our partners. For this reason, we have formed an alliance with FORE Systems, the world's leading supplier of ATM customer premise equipment. By sharing key elements of networking and network management software between FORE and Magellan we are able to seamlessly interoperate their equipment with ours.

With Passport's support of ethernet, token ring and FDDI over ATM, we have the capability to deliver managed LAN services—both legacy and ATM—to the customer premise.

Wide Area Video Services

Video distribution

Business video conferencing

Magellan Infrastructure

Nortel

NSAM

MPEG-2
DV45
ATM UNI

ATM Multiplexor

Stored Video

**Nortel has solutions for video broadcasting, distribution, and conferencing services**

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Wide area video services is another opportunity for offering managed service.

The broadband networks group at Nortel is a major supplier of video codecs to the broadcast industry—they have developed ATM interfaces for their video codec and have also integrated an MPEG-2 codec. The resulting product is an ATM video multiplexer known as the Nortel service access multiplexer. This product, in association with our Vector ATM switch, is currently being evaluated by a carrier to provide nationwide high quality video throughout the U.S.

Internet Access

Agent

Home user

Nortel

Internet

**PSTN
ISDN**

**FR or
ATM**

Student

Executives

Rapport

**...access to Internet, making it easier,
more secure and more reliable to use**

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The explosive growth of the Internet is a well-known story. Nortel's Rapport product line is directly targeted to this opportunity.

We have formed an alliance with one of the early leaders in the Internet access business —Shiva Corporation—and are jointly developing products which carriers can use to provide dial-up access via modems or ISDN to the internet. These can be used to extend the reach of our packet, frame, and ATM networks to the individual residence, providing internet access.
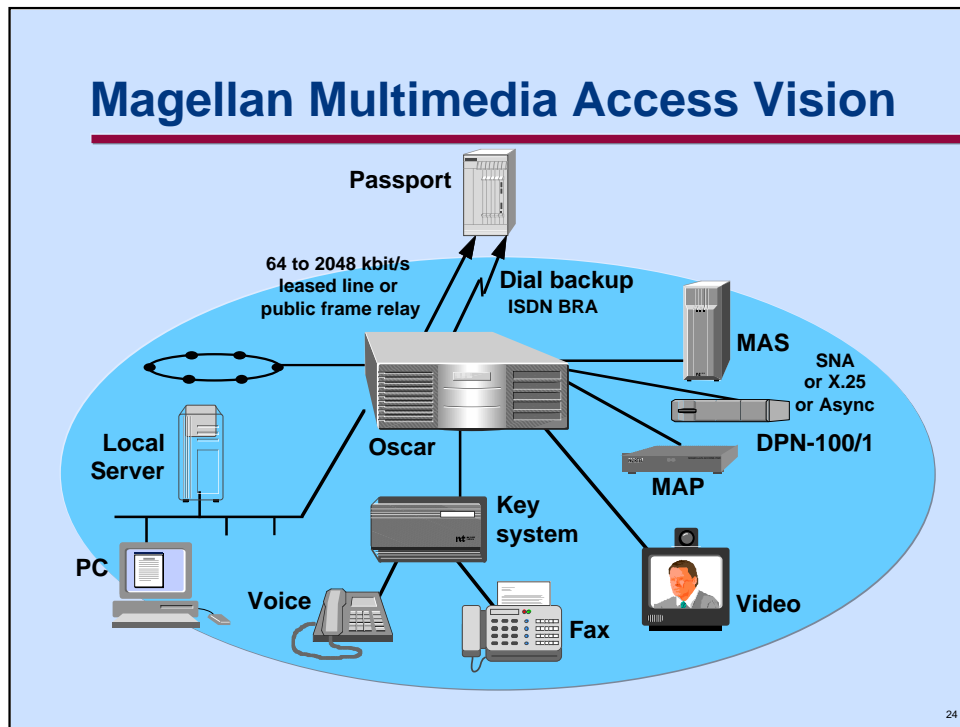
Nortel is working to deliver a multimedia access solution which will provide the ability to cost-effectively integrate applications at the branch level and enable new, emerging services to provide you and your customers with a competitive advantage.

To accomplish this, we are currently developing, a multimedia access device (project name "Oscar") to extend the values and benefits of Passport to the access layer of the network. Oscar has been designed with lead customer input, specifically to complement Passport network solutions.

Residential Data Services
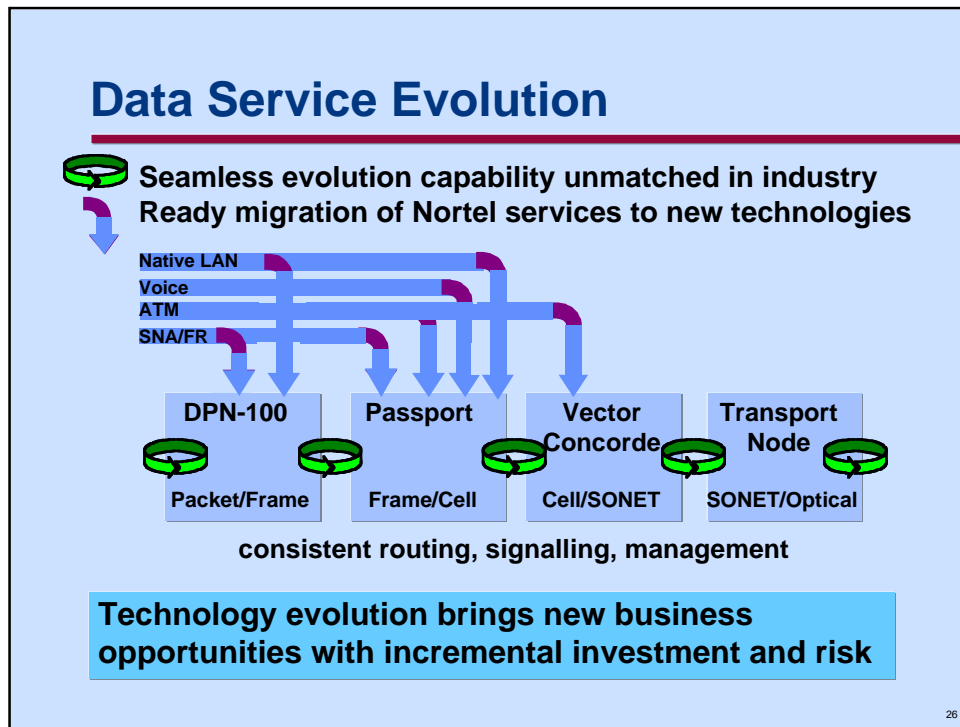
work@home.your living room.at 10 Mbit/s
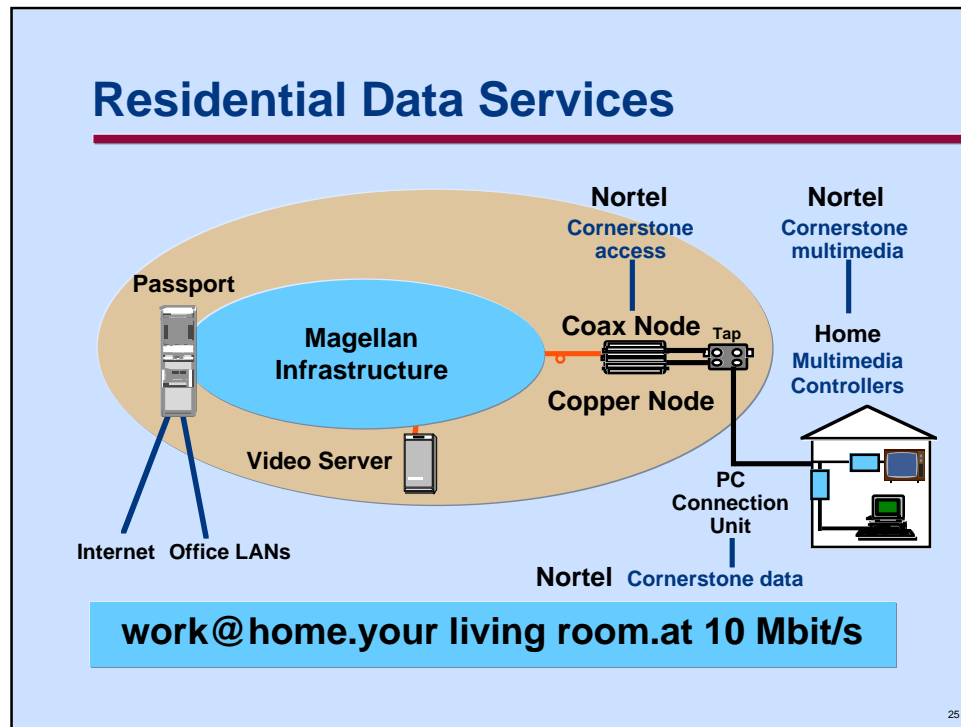
Perhaps the most exciting service opportunities come from delivering broadband to the home.

The Magellan group, in association with Nortel's broadband group, has developed a portfolio of products that will deliver ATM to the residence. In the backbone, Concorde provides the ATM switching between the residence and a variety of services and destinations. Currently, trials related to switched video services to the home continue. On the other hand, interest in high speed data has grown significantly for internet access and for work at home.

Architectures and products have been developed to allow the final leg to the residence to be carried by conventional twisted pair—using the Copper Node, and a higher capacity coax connection—using the Coax Node.

Nortel already has a number of its knowledge workers working from home but their productivity is limited by the low speed of the ISDN connections they are currently using. Nortel's broadband products deliver high speeds to the house via ATM with a PC termination unit allowing 10 Mbit/s ethernet connectivity from the home to the office, an exciting new step in the corporate revolution.

Data Service Evolution

Seamless evolution capability unmatched in industry
Ready migration of Nortel services to new technologies

Native LAN
Voice
ATM
SNA/FR

DPN-100	Passport	Vector Concorde	Transport Node
Packet/Frame	Frame/Cell	Cell/SONET	SONET/Optical

consistent routing, signalling, management

Technology evolution brings new business opportunities with incremental investment and risk

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It is interesting to discuss the service opportunities open to carriers once they install the ultimate ATM infrastructure—but few carriers have made that step.

It is therefore imperative that the Magellan customer be provided with the capabilities to extend services on their existing equipment and gracefully migrate these services forward as the underlying equipment evolves towards the ultimate infrastructure.

Depicted on this chart is the Magellan commitment to preserve service implementations and avoid equipment obsolescence as new services are added to the network. Fundamental to this seamless migration is the Passport product which forms the bridge between the packet, frame, and ATM worlds. This will enable the DPN-100 customer to carry his traffic over a future ATM infrastructure, while offering incrementally new services unique to Passport, such as voice.

This chart concludes the section on service opportunities for carriers.
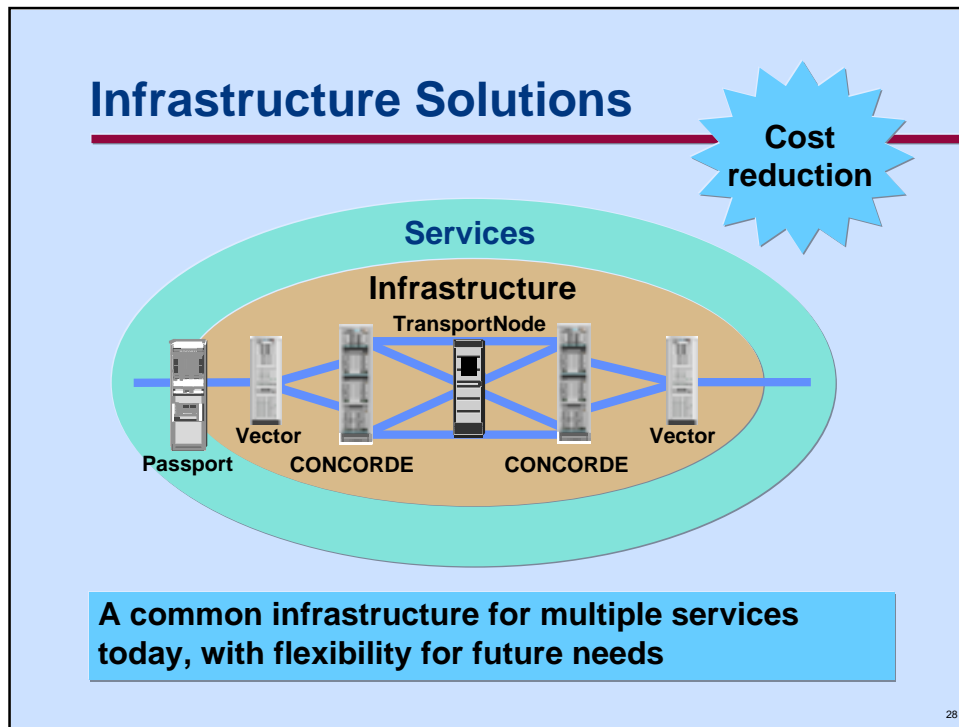
Agenda

- **Market trends**
- **Nortel directions**
- **Service opportunities**
- **Cost reduction opportunities**

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The next and final segment of this presentation addresses the opportunities for a carrier to control his equipment and management costs by adopting the right infrastructure.

As stated at the outset of this presentation, Nortel believes that the ultimate network infrastructure will be constructed from a marriage of ATM and SONET/SDH. The benefits of this multi-service network are:

1. Maximum use is made of the equipment because all services share it. Network bandwidth utilization is optimized because it is not dedicated to a particular service.

2. New services can be provided quickly and economically because they can be added at the periphery of the existing infrastructure. They need only adapt the service to ATM switching and transport is already in place.

3. One of the most important attributes of ATM is its inherent scalability. The same cell structure is used whether an access link be 1.5 Mbit/s or 2.5 Gbit/s. This allows a carrier to easily offer a broad range of access speeds and to increase capacity as required without wholesale equipment changeout.

4. Another key component of both cost control and service velocity is network management. By using a common open management system throughout the network, personnel costs for network operations are reduced and the changes required to produce new services are minimized.

5. Finally, an ATM infrastructure is one built on multi-vendor standards which will permit new services to be added from any vendor having a new service to offer. The carrier is not locked into a single vendor.
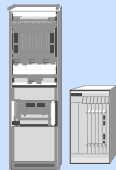
Scalability and Robustness

Oscar

DPN-100/MAS **Passport** **Vector** **Concorde**

Fully Scalable
- Capacity range up to 80 Gbit/s
- Very high fan-in
- Intelligent buffer management
- Distributed architecture
- Client-server management architecture

Unmatched Robustness
- No single point of failure
- Real time re-routing
- Hot swappable cards
- Billing redundancy
- NEBS and ETSI compliance

- **A few ports to hundreds of thousands of ports**
- **Up to 99.998% availability**

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Because Nortel products are designed to the standards of network infrastructure equipment, they are well-suited to meet the demands of both scalability and robustness required in a service provider's network.

The portfolio offers nodal capacities of up to 80 Gbit/s switching. The number of nodes in a network can run into the thousands. Our experience with signalling and routing in very large DPN-100 networks helps us in our implementations on Passport and Vector, which we are jointly developing with FORE Systems. In Concorde, we have gone the extra step of separating the switching function from the signalling and routing functions, to allow independent scaling of the two functions.

In addition, system and network uptime has been a priority design goal. Each successive new product improves our ability to withstand faults without service interruption. Concorde represents the ultimate in reliability, with complete redundancy of all components and the implementation of 50 ms switching per the SONET and SDH standards on port switching.

Service and Network Management

Applications

- **Billing**
- **Performance data**
- **Network display and alerts**
- **End-to-end provisioning**
- **Service monitor**
- **VPN/CNM...**

Benefits

✓ **reduces network operating costs**
✓ **provides access via standard i/f**
✓ **uses open platforms**
✓ **integrates Nortel and alliance products**
✓ **is scalable for very large networks**
✓ **provides migration to INA & TMN**

NMS   MAS   DPN-100   Oscar   Passport

OMS   Oscar   Passport Rapport Vector Concorde

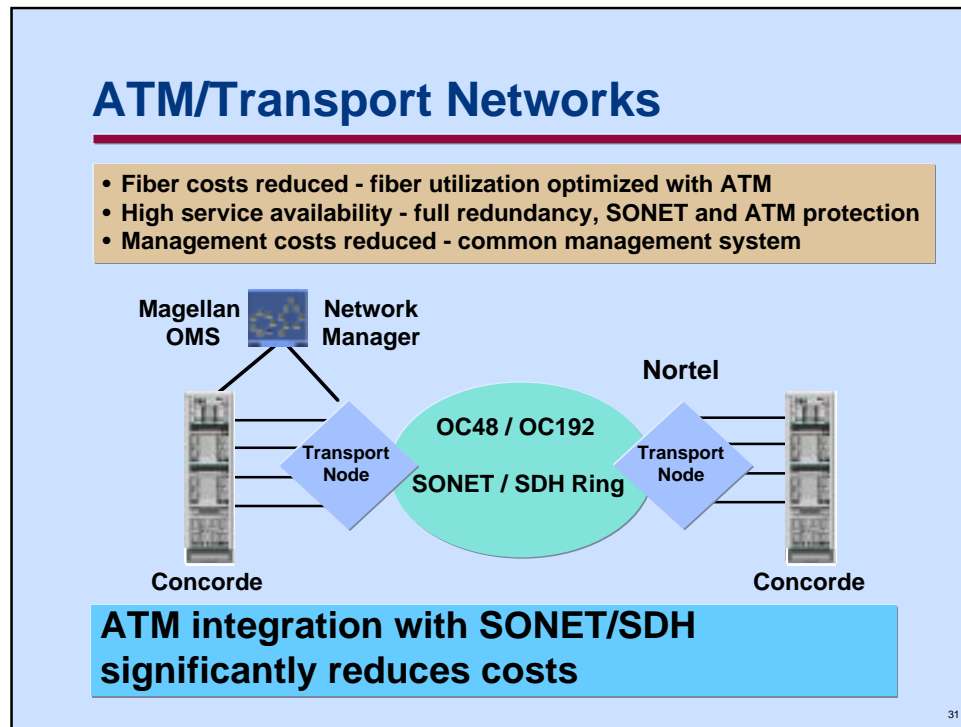### Service velocity and reduced costs

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Pivotal in building a multi-service infrastructure is service and network management that permits end-to-end management across the multiple products in the network. Nortel has a lengthy history of providing capable service and network management systems—networks management system (NMS) for its DPN-100 product line is a good example.

The trend in service provider networks is now toward open management systems, with platforms and software provided by such vendors as HP, Sun, IBM, and Cabletron. In recognition of this, we are developing our recent products to be managed by these open platforms, and are structuring our management around the layered TMN model. For this reason, the smaller products—Oscar, Passport, and Vector—are being managed by the Magellan Open Management System (OMS) using an SNMP interface and CMIP in the case of Concorde.   In addition, a set of fault management, billing and provisioning functions are being developed to bind the product line together. For the customer who uses only a single member of the portfolio, complete nodal management capabilities are available via open interfaces.

Key benefits of using common open management system include cost containment, service velocity and end-to-end management.

ATM/Transport Networks

- Fiber costs reduced - fiber utilization optimized with ATM
- High service availability - full redundancy, SONET and ATM protection
- Management costs reduced - common management system

Magellan OMS   Network Manager

Nortel

OC48 / OC192

Transport Node

SONET / SDH Ring

Transport Node

Concorde   Concorde

ATM integration with SONET/SDH significantly reduces costs

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The goal is the creation of a seamless ATM and SONET/SDH infrastructure. Toward this end, we are working with Nortel's Broadband products group to ensure that Concorde can perform as a fully compliant SONET/SDH line termination point—supporting full maintenance and line switching when interfaced to a distant fiber multiplexer. Furthermore, work has been initiated to incorporate applications from the Magellan Open Management System into the Transmission INM open management system. Work has also begun to incorporate the same level of SONET and SDH compliance into the Vector product.

Nortel has strong tradition in providing infrastructure products—which helps us in developing ATM products that are also infrastructure-ready. A seamless evolution toward the target network helps reduce costs while containing risks within an acceptable level.
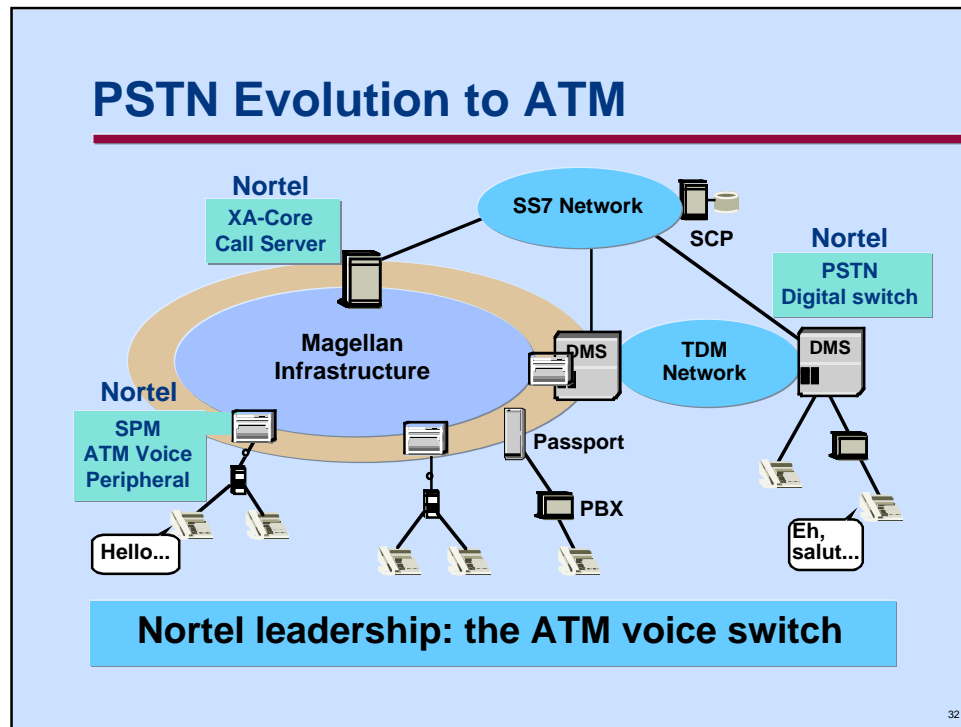
Nortel believes that ATM and SONET/SDH will form the infrastructure—not only for data networks, but also the existing voice network.

Prototyping activities have begun this year to demonstrate a full service voice switch using the Concorde switch, a new DMS ATM switch peripheral (called SPM), and the new call processing server (XA-Core) developed for DMS (Nortel's CO-based digital switch). This is not simply the carriage of voice traffic over ATM but the application of full call processing functionality to voice being carried in cells. Nortel does not yet have specific product plans to deliver this capability, but it is our goal to make ATM the core technology of the service-independent infrastructure and build all service intelligence on the periphery.

This peripheral service capability will include the full suite of narrowband call processing features. Because the new DMS processing is entirely message driven, the call processing intelligence can control the service adaptation points and their legacy signalling from anywhere in a broadband network.

Nortel is helping create the network of the future—by exploring the solutions today.
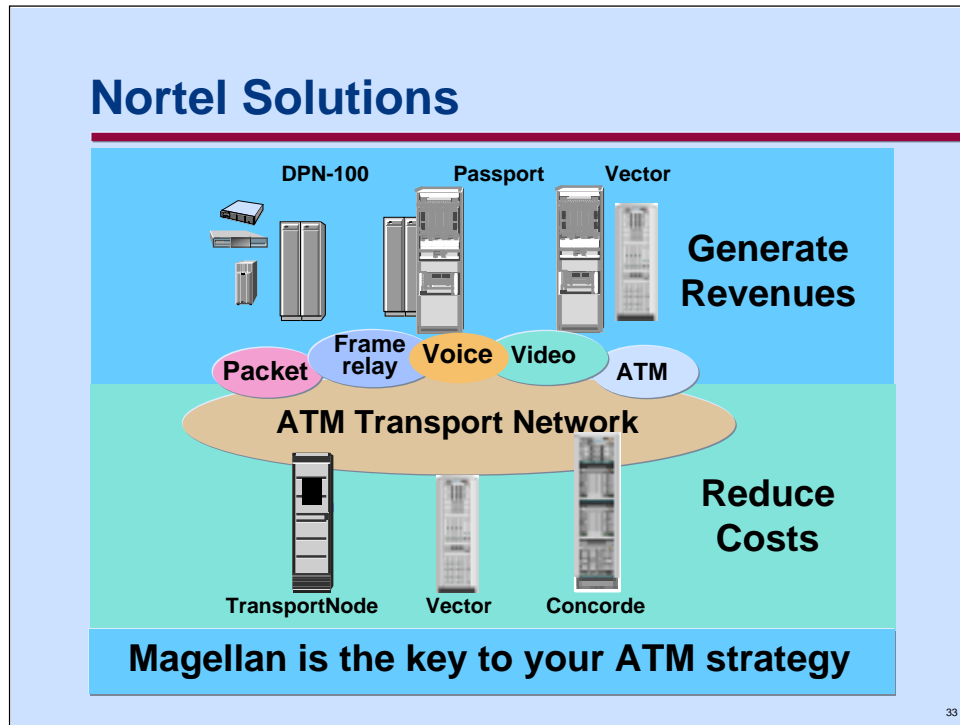
Nortel's primary goal is to help our service providers generate new revenues and reduce costs, and to do this while seamlessly evolving the business and the technology towards the target network.

We believe that Nortel's Magellan product line and Nortel experience with service providers is a key element in helping you achieve your vision for the future.

Nortel Commitment

Nortel believes that ATM will be the basis of a ubiquitous broadband multimedia network

Nortel will evolve its data, voice and video products to transition gracefully to the ultimate vision

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Nortel believes that ATM will ultimately be the basis of a ubiquitous broadband multimedia network that will absorb today's private line, data service, and voice networks.

Nortel will evolve its data, voice, and video products gracefully toward that ultimate vision, adding new services and reducing costs throughout the transition process.