This workshop focuses on the benefits of using Passport as an ATM-based enterprise network consolidator. Many Nortel customers are now receiving the cost and flexibility benefits of implementing Passport in their enterprise networks. The aim of the workshop is to broaden awareness within the Magellan customer community of how Passport can be used in this role. The workshop includes an overview of the networking issues involved and how Passport addresses them. Two case studies are used to show concretely how real customers are using Passport to consolidate their enterprise networks.

The objectives of the presentation are:

- to provide information about Passport's capabilities as a network consolidation platform; and
- to show real examples of customers using Passport in enterprise network applications.

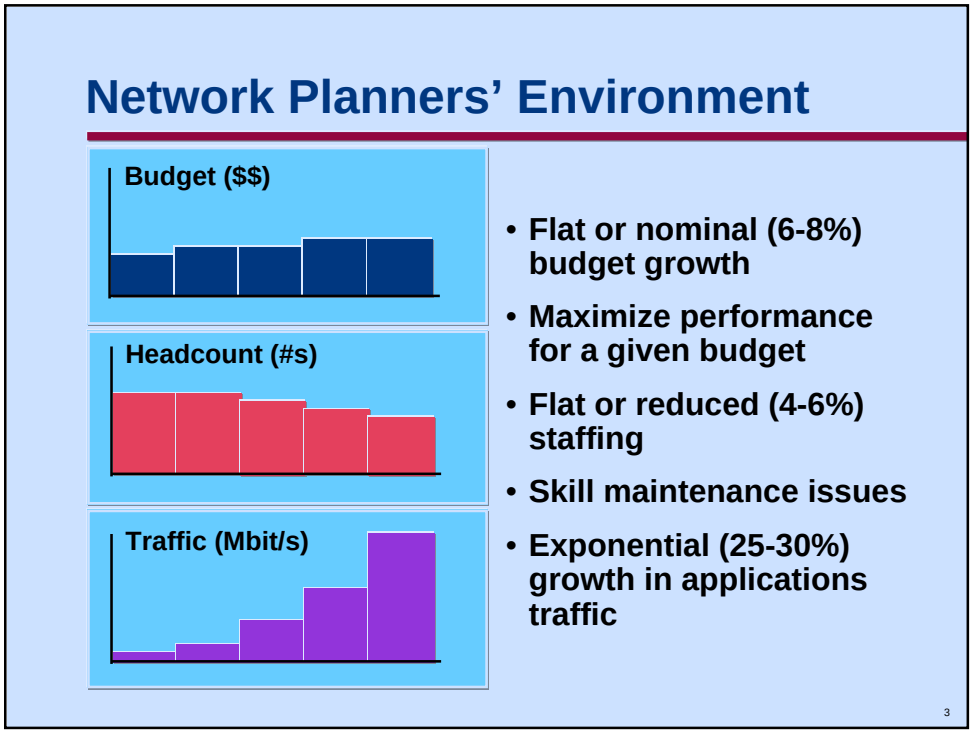
About the presenter:

Nick Vreugdenhil graduated from McMaster University with a Bachelors Degree in Computer Engineering and Management in 1988. He joined Nortel at that time and has held a variety of positions in product management and marketing since then. Along the way he acquired a Masters of Business Administration from the University of Ottawa, graduating in 1993. In 1994 he moved to Japan to take on his current role, where he is responsible for product marketing of the Magellan family in that country. This is Nick’s fifth presentation at an Inform event.

Today's enterprise networking environment includes many challenges and new ideas. By spending the first few minutes discussing some of them we can ensure a common understanding of the issues involved.

After this introduction, we will move on to a brief overview of Magellan Passport. There will be a special focus on its role in enterprise networks as a network consolidation platform. Although this is by no means a detailed discussion of the product, it should be enough to enable us to clearly understand what network consolidation is and why Passport is the ideal tool to achieve it.

The main purpose of the first two sections is to set a context for the case studies. In the final section, we will look at what two major Passport customers are doing with the product and how it is helping them to achieve their business objectives.



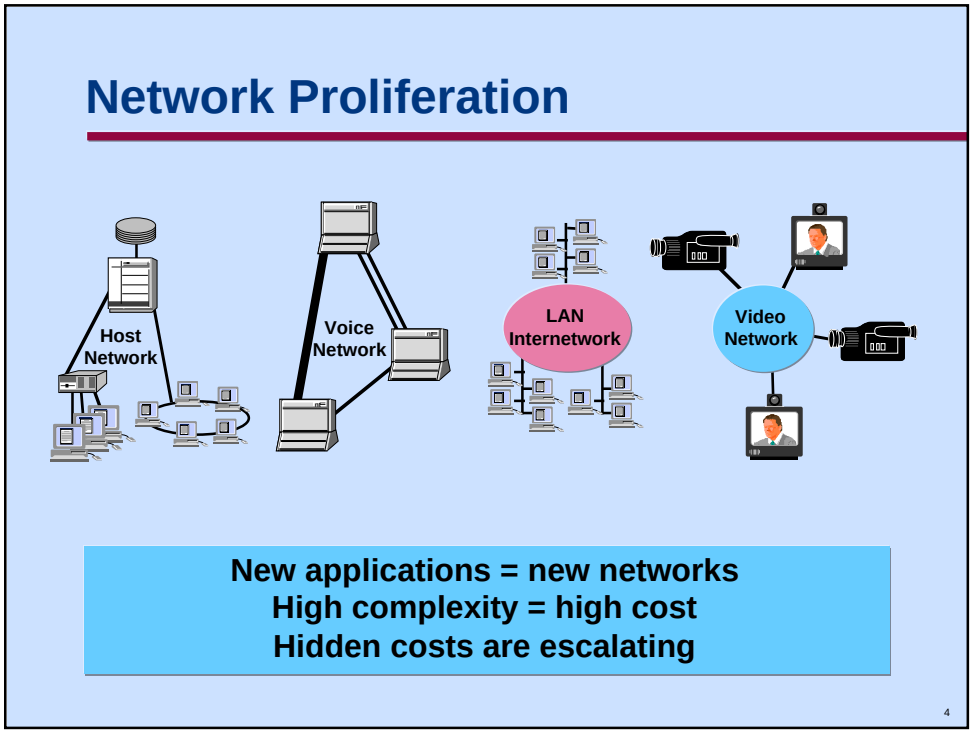
The next three pages summarize some of the key challenges enterprise network planners face today. Based primarily on discussions with customers, this overview is intended to provide a background for the rest of the presentation.

Many enterprise network planners now find themselves caught in a painful squeeze between users and management. Senior management are looking for stable budgets and personnel levels. At the same time, user departments (sometimes in response to similar pressures) are aggressively pushing for new applications and more network capacity.

The symptoms of this squeeze are as follows:

- Flat or low-growth budget: money allocated by senior management can satisfy only the most critical of needs
- Maximize performance for a given budget: the need to operate by "satisfying" within restrictive limits
- Flat or reduced staffing: results in extreme challenges supporting new technologies
- Skill maintenence issues: resources are overwhelmed with day-to-day concerns and never get a chance to upgrade knowledge and skills
- Exponential growth in applications traffic: new users, new applications, more reliance on communications to reduce headcount and maintain competitiveness

This uncomfortable situation can result in a desparate need to find solutions that simultaneously deliver cost reductions and new capabilities—a difficult challenge.

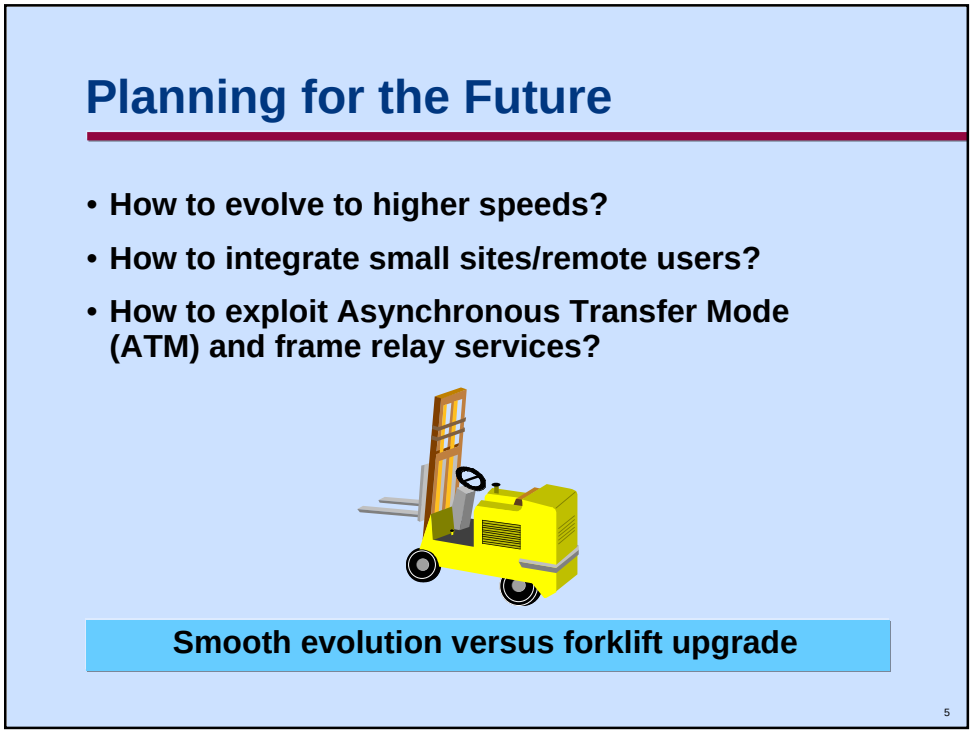


As if this difficult business environment isn't enough of a challenge, the technical environment is also becoming more complex for many network planners. The rapid increase in total volume of network traffic tells only part of the story. What has been happening is that each new application required by users has driven the deployment of a new network infrastructure. Almost every corporation now has numerous corporate-wide networks deployed (typically a minumum of five, with some companies having 20 or more).

This proliferation phenomenon has caused increasing complexity and rising costs. Even attempts to consolidate networks (for example, adding TDM multiplexers) have just added yet another networking technology to manage. Costs of bandwidth, skilled human resources, and equipment are threatening to get out of control.

But even these costs are only a fraction of the total. With proliferation has come a trend toward decentralization and grass roots control. The amount of time that local users spend implementing, administering and maintaining networks is seldom included in official estimates. And even those costs probably pale beside the business impacts of down-time and consumption of skilled resource time consumption.

With the advent of yet more new applications in areas like multimedia, video-on-demand, and client-server databases, this trend clearly cannot be sustained for long.

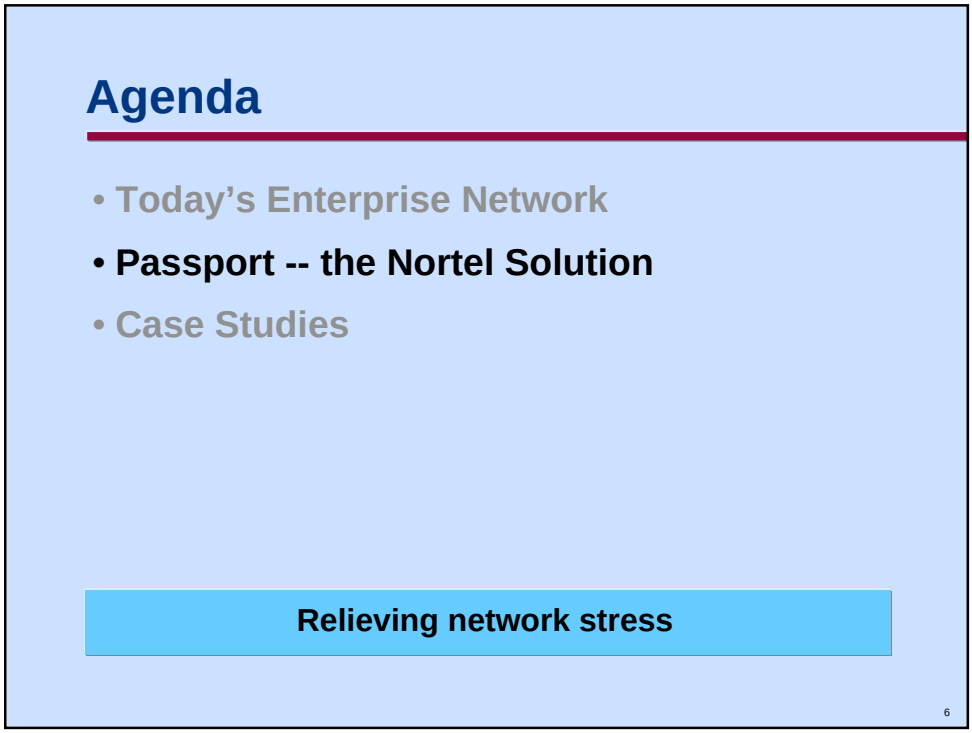


Finally, networking technology itself has not been standing still. New services, networking devices, and standards are constantly becoming available. No network planner can afford to invest in new networks and then find him- or herself unable to upgrade to the next generation. Yet this is exactly the situation that can arise if bad luck or bad planning leads to wrong choices.

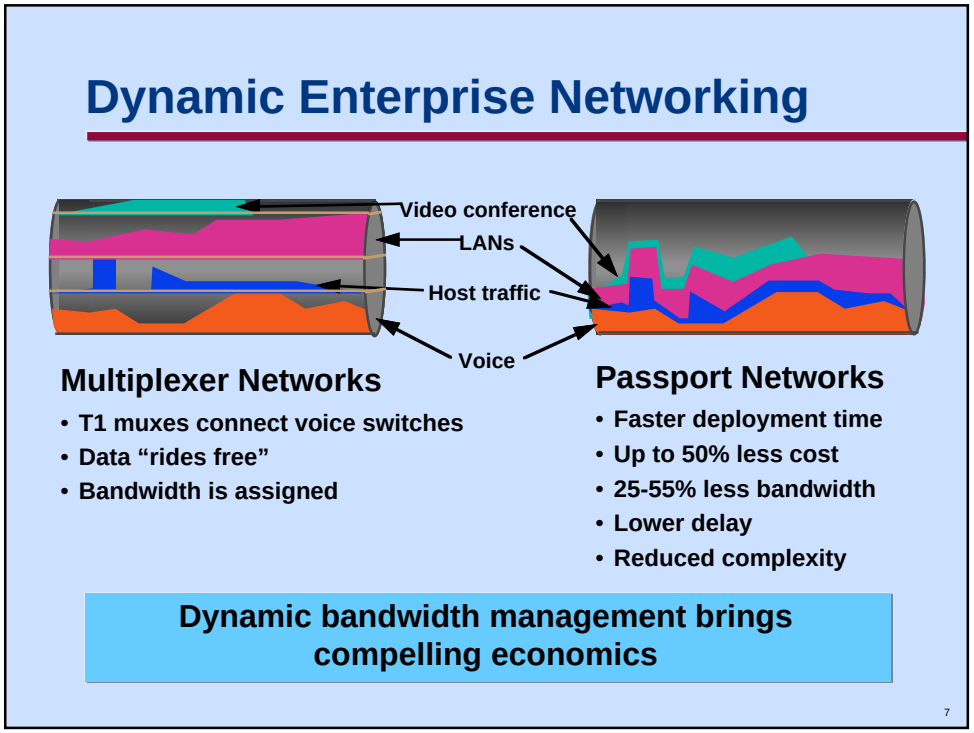
Utilizing higher speeds, reaching a wider range of sites and users, and introducing frame relay and ATM technologies are some of the key questions facing network planners today. But once these are handled, more questions will arise. Churn and change have become a way of life in enterprise networking.

Investing in network solutions that have built-in flexibility and evolvability may be more expensive in the short term. But it is a vital precaution to avoid much greater costs of throwing away equipment ("forklift" upgrade) prematurely one or two years later.

Today's enterprise networking environment is certainly a challenging one. But it is also an exciting one. The overall objective is to find a way to make sure that new networking challenges can be seen as opportunities, rather than just the source of more problems for network planners.



Now that we have discussed the enterprise network environment, let's move on to take a brief look at Magellan Passport and how it can help to deal with some of the issues ...



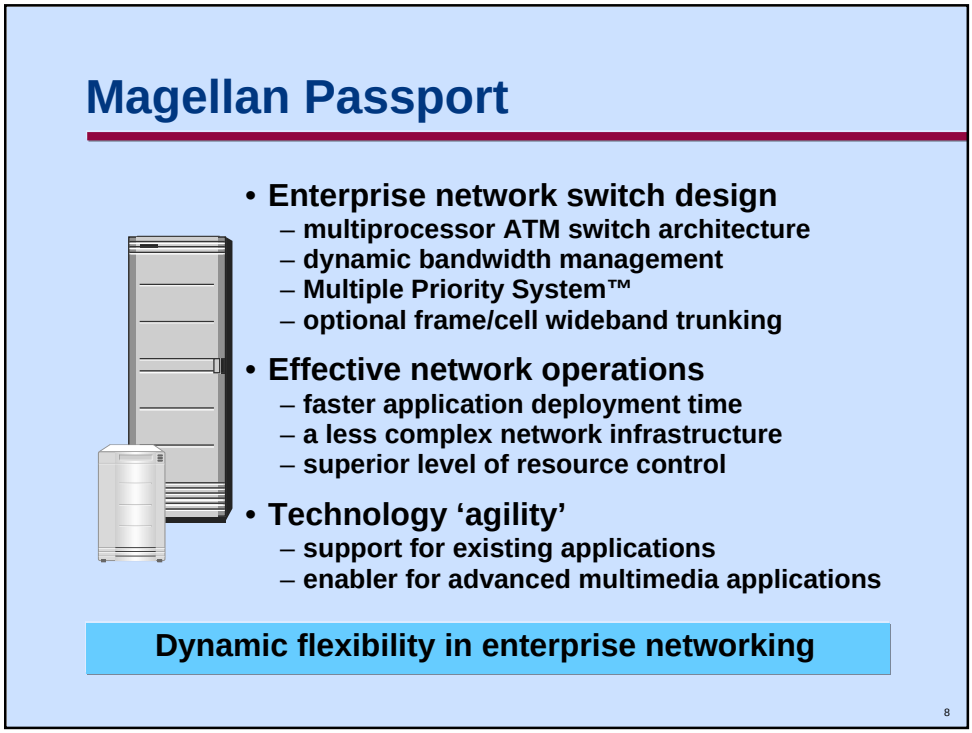
Traditional bandwidth consolidation, using Time Division Multiplexing (TDM) gear and fixed time slot allocation is giving way to new architecture—unified, consolidated, enterprise networks.

Magellan Passport delivers many **logical connections** over a single **physical network,** preserving the unique attributes of each application: voice, video, SNA, LAN internetworking and more ...

This approach gives users the benefit of having ALL of the bandwidth, when it's needed, rather than just SOME of the bandwidth all of the time. Dynamic allocation is the central argument behind the global move towards ATM and frame relay technologies. The effects of dynamic allocation are pervasive:

- Greater flexibility to deploy new applications
- Major reductions in human resources, bandwidth, and people costs
- Faster networks, leading to faster application response times
- Simplified network architecture

Looking at these advantages, especially in the context of the challenges laid out in the first section of the workshop, it is easy to see just how compelling the economics behind Passport are.



Magellan Passport is Nortel's vehicle for network consolidation. The attributes that make Passport an unparalleled solution for next-generation enterprise networks are:

1. Enterprise network switch design

- Multiprocessor architecture with a RISC CPU per card on a dual ATM backplane
- Bandwidth-effective transport including ATM, frame relay, voice and LAN
- Magellan Multiple Priority System™: multiple Classes of Service, priorities implemented in hardware, deep buffers, and traffic management
- Optional frame/cell wideband trunking to support highly efficient networking

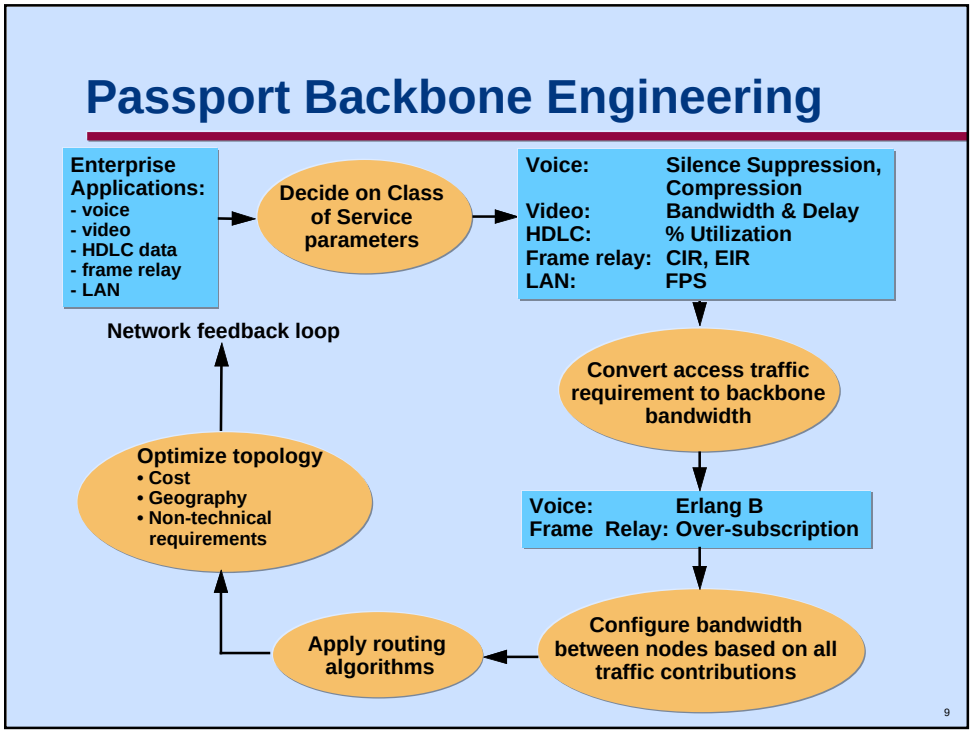
2. Effective network operations

- Faster application deployment time: network is no longer the bottleneck
- A less complex network infrastructure: integrated backbone for all traffic types
- Superior level of resource control: performance optimized, full capacity available

3. Techology 'agility'

Magellan Passport allows business users to selectively deploy ATM broadband networking while providing consolidation for today's voice/data/video networks.

For more information about Magellan Passport, please refer to the *Passport Update* workshop and/or various workshops in the Network Consolidation, Frame Relay and ATM tracks.



You might think that these benefits of dynamic networking come at a cost in terms of reduced ability to plan and manage the enterprise network. However, in reality this new networking paradigm allows planners to fully control their network as long as they clearly understand how it operates.

The process of engineering a consolidated network backbone is understandable and manageable. The above diagram is taken from the Passport engineering guidelines. In summary, network engineering for a consolidated enterprise network is based on an understanding of the traffic types on the network and their requirements. By following a simple step-by-step approach, these requirements can be converted into a network design that meets users needs while achieving the full benefits of dynamic allocation.

Some key points of the process include:

- During the first implementation, application cut-over to the network should be phased and carefully assessed to ensure no impact to users
- Traffic levels and characteristics should be carefully analyzed up-front
- The network design should be based on a good understanding of how Passport works (key topics include QoS features, trunk bandwidth allocation, and routing mechanisms)
- The design should be continually analyzed and updated to ensure continuous achievement of the benefits

Continued on next page ....

For more information about engineering, planning, and managing Passport networks, please check out the following Inform '96 sessions:

- Engineering Whiteboard Clinics
- Planning and Analysis Tools hands-on session
- Closing the Loop with Planning and Analysis workshop

The last three pages have given a brief overview of Magellan Passport as a solution to some of the problems introduced in the first section.

Glossary of terms use in Passport Backbone Engineering slide:

- CIR, EIR: Committed Information Rate, Excess Information Rate
- Erlang B: Commonly used Statistical table
- FPS: Frames per Second
- HDLC: High-level Data Link Control (common layer 2 protocol)
- LAN: Local Area Network

The final section of this presentation comprises two case studies of real corporations using Passport to consolidate their enterprise networks and position them for the future. The two companies are:

- The Fuji Bank Ltd.
- Sanyo Electric Software Inc.

Although both of these corporations are based in Japan, the issues they face and the solutions they are utilizing are applicable globally.

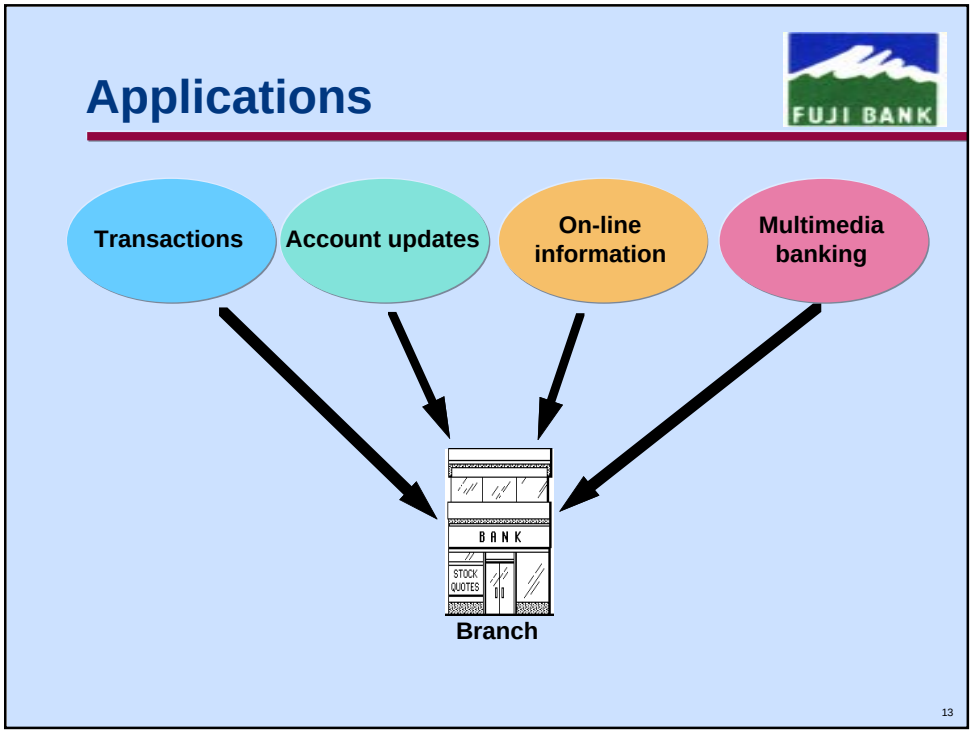
The Fuji Bank is one of the world's most well-known banks. In operation since 1923, it has long been a major bank in Japan. In recent decades it has expanded overseas, achieving a significant global presence. Measured by assets, Fuji was the world's largest bank in 1995. Fuji Bank currently has 16,000 employees and operates 366 branches.

Fuji Bank has consistently pushed the limits of customer service innovation. In 1991, executives at the bank made an important decision—to focus on "multimedia" as the next major step in banking. They focused on this technology as a key opportunity to continue differentiating Fuji Bank from other banks and to maintain competitiveness.

Early on, the multimedia team realized that a new enterprise network backbone would be a key element of this thrust. They selected the following as its objectives:

- Cost reduction: improve cost-effectiveness of bandwidth
- Improve performance: a quantum leap in usability for current users/applications
- Any-to-any communication: break away from hierarchical communications paths
- Increase reliability: always a key concern for any bank
- Multi-vendor environment: use standards to avoid single-vendor lock-in
- Multimedia infra-structure: network must be fully ready for multimedia

The pictures above show various aspects of a futuristic "multimedia banking" branch in a railway station in suburban Tokyo. At this unmanned site, customers can do virtually any banking transaction using scanner, image, video, and touch-screen technologies. The branch is linked to headquarters over ATM.



The consolidated backbone and a separate pilot network for multimedia applications are now installed. They carry the following application types.

Applications carried over the main Fuji Bank Passport network:

Transaction and Account Systems (SNA and OSI traffic):

- Teller transactions and account transfers
- Automatic Banking Machine traffic
- Inter-bank traffic (BANKS, NCIS)
- Credit card authorizations
- Stock/bond transactions

Information Systems (TCP/IP traffic):

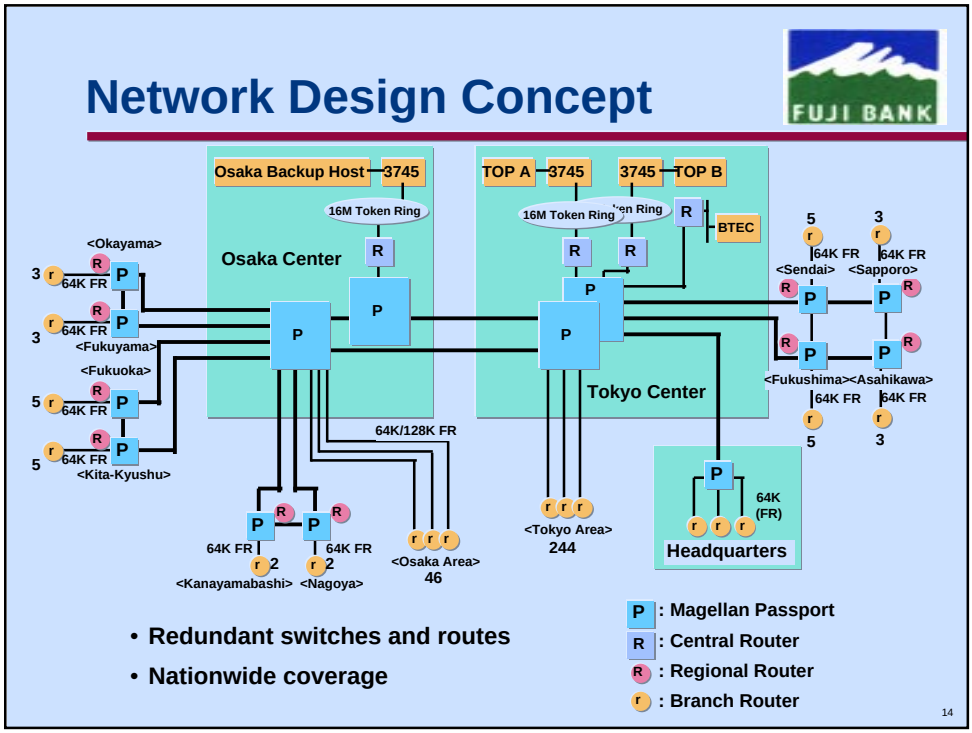
- Inter-bank information services (Zengin, JCA, ANSWER)
- Internal traffic (reporting, e-mail, authorizations)

Applications carried over the pilot Fuji Bank Passport multimedia network:

Remote Consulting (loan applications, etc.)

Information Data Base (video-on-demand application)

Multimedia applications envisioned by Fuji Bank include: employee training, image-based auto-clearing, on-line consulting, internal approvals process, and more.

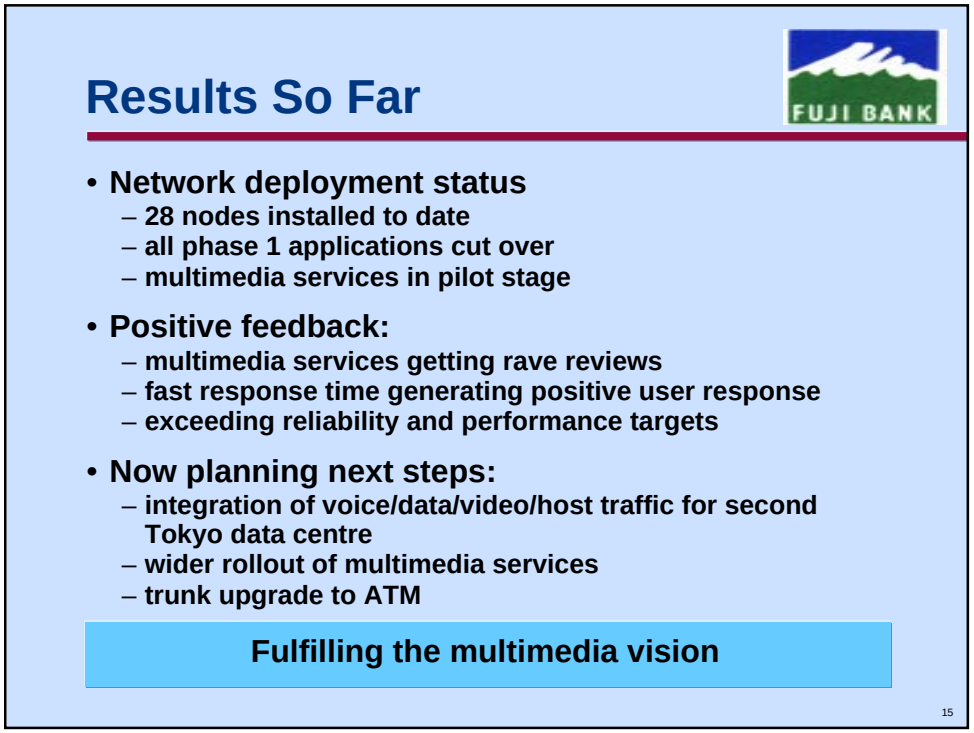


As mentioned earlier, planning and engineering the network is key to achieving the advantages of network consolidation. Fuji Bank paid careful attention to the design of its network.

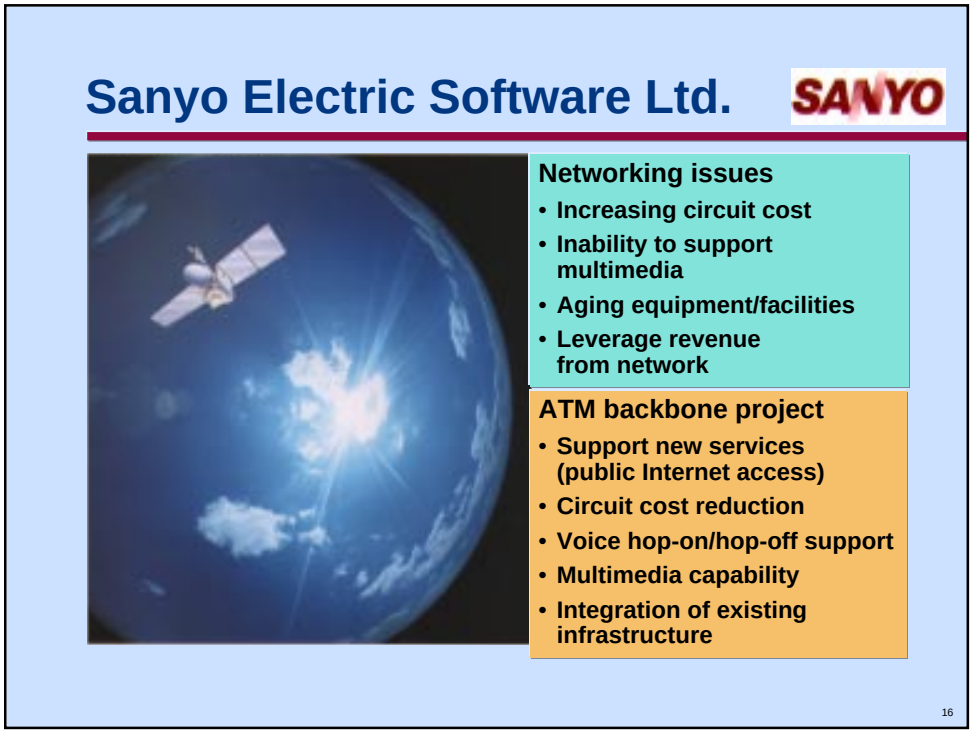
The following were identified as the key criteria for the design:

- Availability: no single point of failure, 7X24 operation
- Performance: higher throughput and lower response time versus current networks
- Redundancy: switches, routes, facilities
- Expandability: allow at least 3X expansion
- Economy: all resources dynamically assigned
- Disaster response: enable smooth switch-over
- Interfaces: based on international standards
- Management: integrated tracking and management of the entire network

This diagram does not include the four-node multimedia pilot network, which is currently implemented separately. It links headquarters, Tokyo Data Centre, the Chiba Dial-Centre and four pilot branches over a public ATM service. The two networks will eventually be merged as the main backbone is upgraded to become fully ATM-based.



As the above results show, Fuji Bank is well on its way to achieving the multimedia vision it set for itself. By going through this fundamental restructuring of their networking environment they have escaped the budget squeeze trap highlighted in the first section and are well-positioned to maintain competitiveness and cost-effectiveness into the next century.



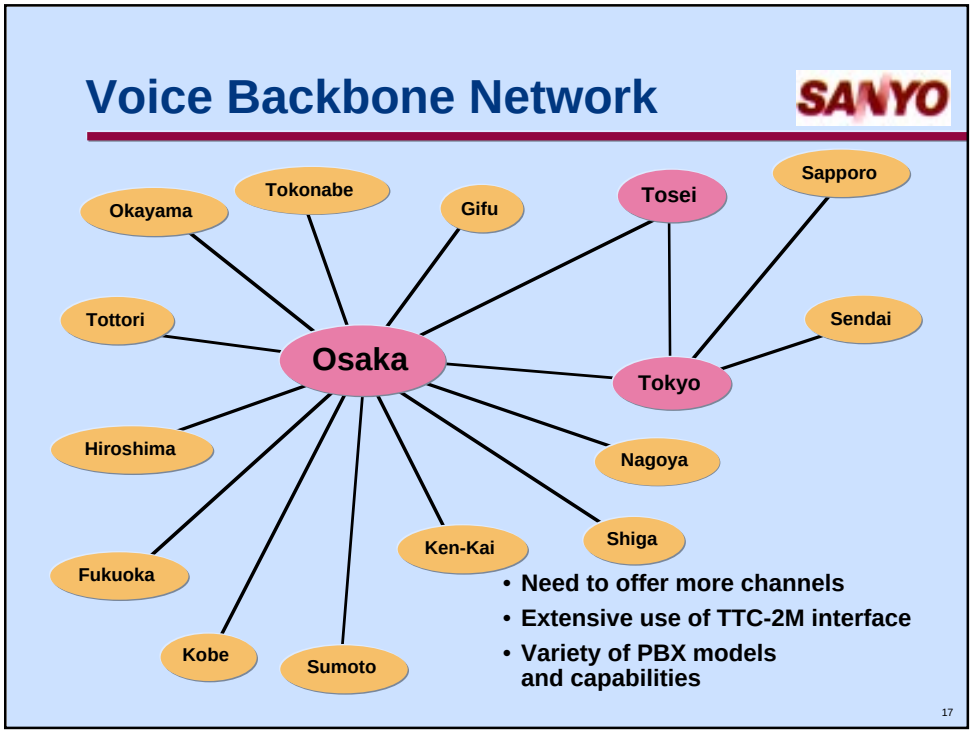
Sanyo Electric is a household word. From electronics to appliances to outer space, Sanyo offers a wide range of products. With 1995 revenues of ¥1,075 billion (US$11 billion) and Japan revenues of ¥753 billion (US$7.5 billion) Sanyo is a major corporation.

Sanyo Electric Software is the Information Systems subsidiary of Sanyo. It was spun off as a subsidiary in 1992. Its traditional mission is to offer communications and computing services to its parent company. But increasingly it is under pressure to improve the return on Sanyo's IS investment by generating revenues through external service offerings. Accordingly Sanyo Electric Software was recently certified as a Type II "Special" carrier in Japan, licenced to offer value-added network services. It has 400 employees.

To be successful in both its internal and external mandates, Sanyo Electric Software executive identified cost control, multimedia support, re-use of aging equipment and external revenues as their highest-priority issues. To make progress on these issues they kicked off the "New ATM Backbone Project" with the following objectives:

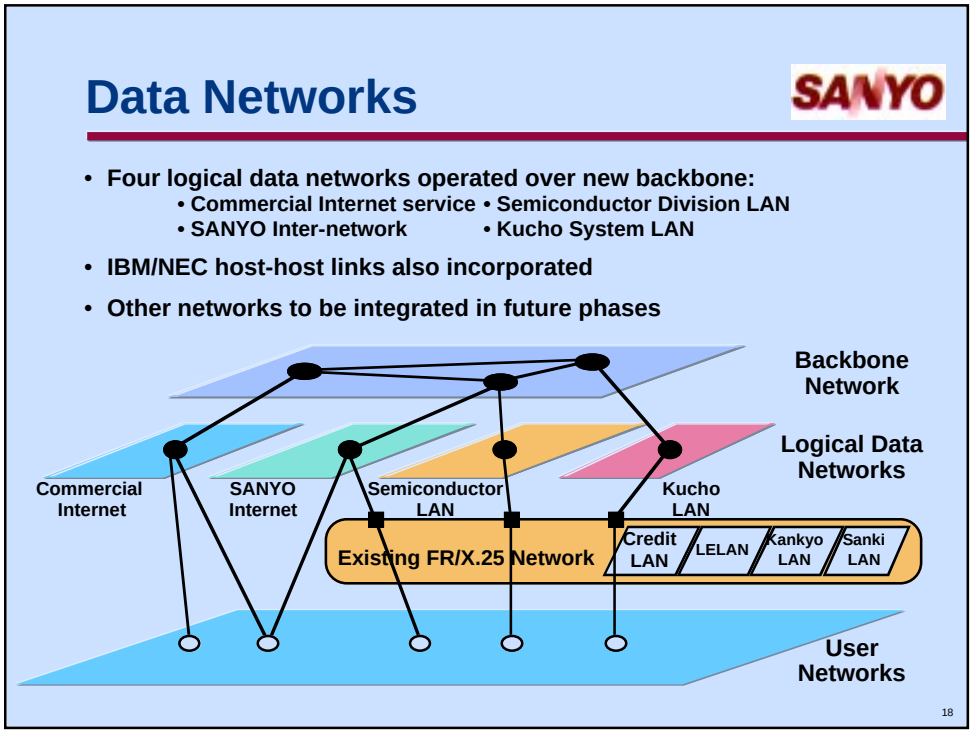
- Support new services: public Internet access service as a first step
- Cost reduction: more cost-effective use of bandwidth
- Voice hop-on/hop-off* support: cope with the expected dramatic increase in private network voice traffic once such configurations are deregulated this year
- Multimedia capability: be ready for new multimedia applications expected soon
- Integration of infrastructure: consolidate multiple proliferated networks

*Note: hop-on/hop-off refers to the ability to carry voice calls over a private network for part of their route, even if they originate and/or terminate on the public telephone network.



Operating the Sanyo voice network is one of Sanyo Electric Software's most strategic day-to-day activities. It includes more than 200 Sanyo sites throughout Japan. However, the existing TDM network could not offer sufficient voice channels over the existing leased lines. As a result, a significant amount of voice traffic was overflowing onto the public telephone network. Due to budget pressures there was great reluctance to increase the bandwidth of these leased lines (especially considering Japan's high tariffs). Clearly the voice network needed a new backbone capable of getting more "bang for the buck" in terms of cost-effectively using bandwidth.

Two other features of the voice network are worth mentioning. First, the voice switches make extensive use of the Japan-unique 30-channel TTC-2M interface, necessitating any new network to support it as well. And second, there is a wide range of ages, features and sizes within the voice switches themselves. Both these factors add challenges to the backbone network design, but are very typical of Japan voice networks.



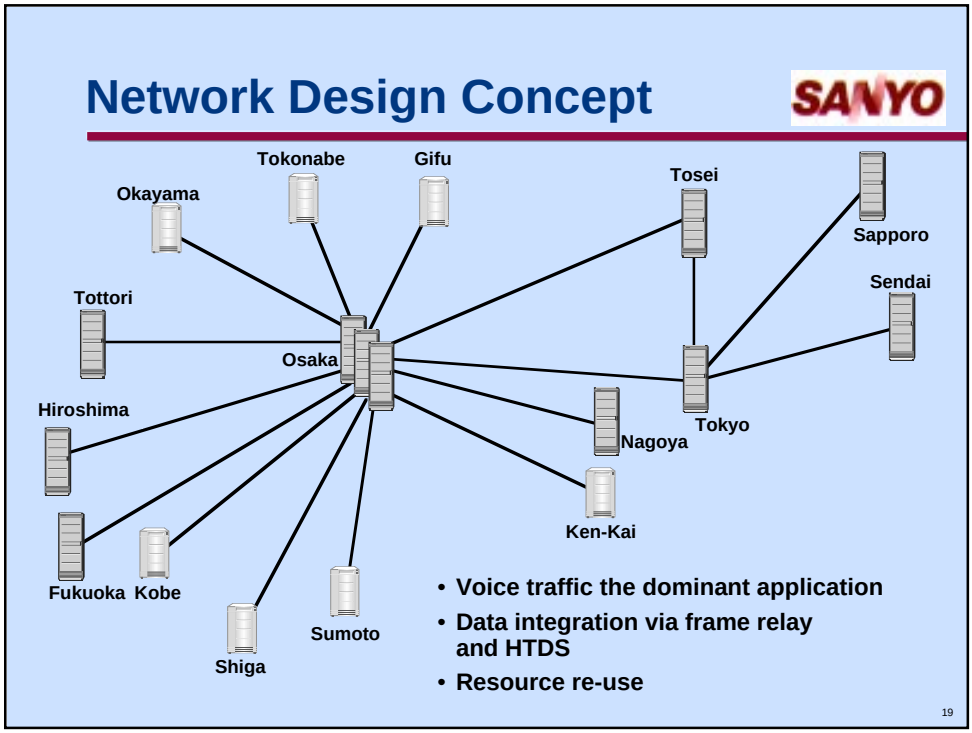
The other major application category to be included in the new ATM Backbone project was a variety of data networks. They were categorized as follows:

1. Router inter-networks:
   - Commercial Internet service: public Internet access service offered via frame relay*
   - Sanyo internetwork: "Intra-net" for Sanyo users
   - Two divisional general-purpose LAN inter-networks
2. IBM inter-controller traffic:
   - Previously carried over TDM (fixed bandwidth, less than 30% utilized)
   - Incorporated onto new backbone in order to achieve flexible bandwidth allocation
3. Other data networks:
   - Not yet included in scope of the new network project

The diagram shows the importance of phasing to network consolidation projects. Including all the networks into the initial backbone would have been risky. So key networks were selected for initial implementation (based on traffic requirements and user needs) and the others were left to run over the older backbone for consolidation later.

The existing frame relay/X.25 backbone switches were also to remain in place for now and needed to be inter-connected over the new backbone.

*New service implemented for the first time on the new backbone



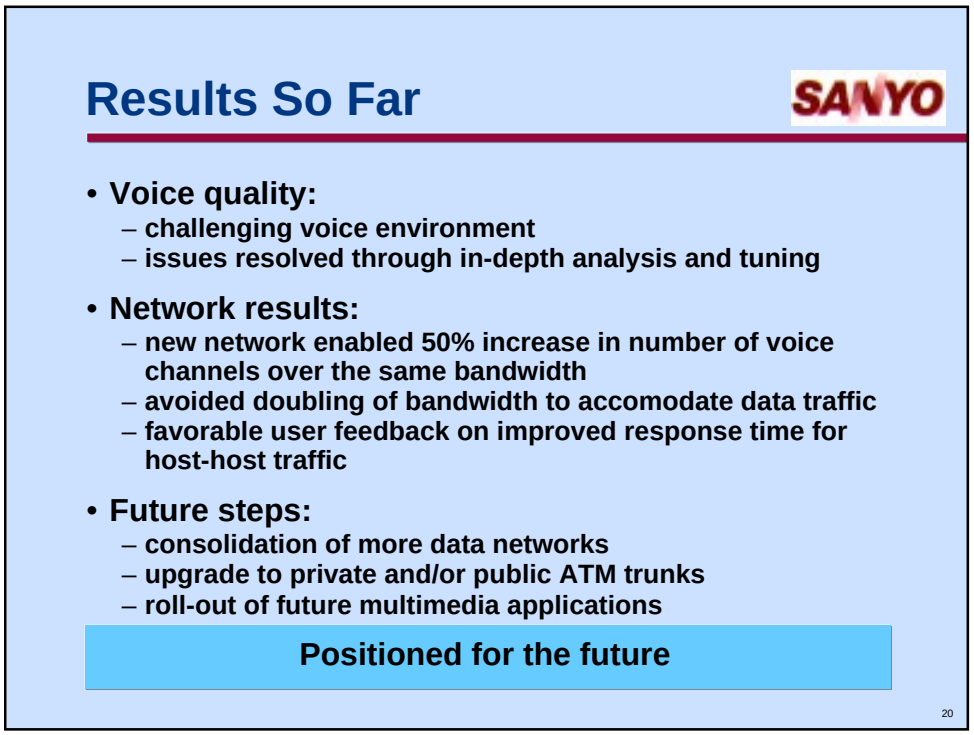
This diagram shows the new backbone network design. The backbone is heavily driven by voice traffic, but also includes the data applications shown on the previous page. The network design criteria for current applications were as follows:

- Major reduction in trunk bandwidth consumption mandatory (using Passport's voice silence uppression, frame relay and HDLC-Transparent Data Service as key elements in making improvements over the previous TDM system)
- Major increase in throughput for data applications (eg. host-host traffic)

At the same time, the network needed to be ready to handle the following future requirements:

- Backbone migration to private and/or public ATM
- High-speed frame relay support (>2 Mbit/s)
- Bandwidth-intensive application support (multimedia)

A final element of the design is that wherever possible, resources were re-used. This included attached devices such as PBXs, Routers, and TDM multiplexers. But even the existing leased bandwidth has remained in place through the whole design and implementation. This focus on re-use was driven by budget-consciousness as well as a desire to migrate to the new backbone with minimum impact to end-users.



The new ATM Backbone project has been very successful. The initial phases are now complete:

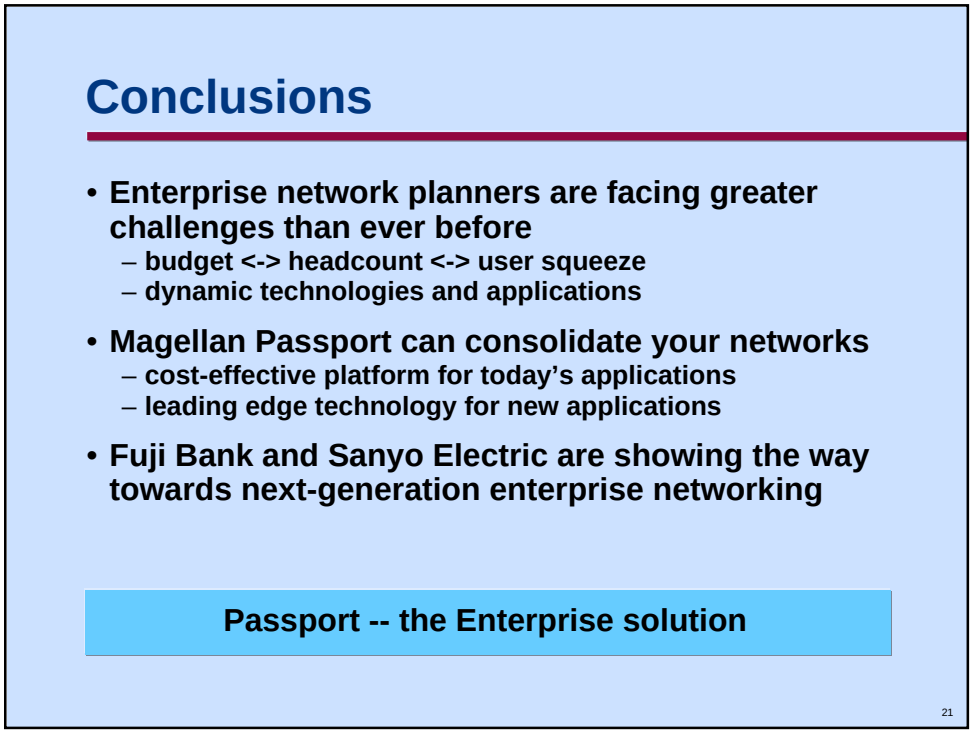
- Multi-node live traffic trial: started August 1995
- Production network cut-over: November 1995
- 18 Passports now installed at 16 sites

There have been some challenges along the way. Voice quality was elusive at first, but a program of joint voice testing activities and system tuning was developed to track down and address the source of the problems. The main issues turned out to be the high background noise in many Sanyo sites, combined with low Echo Return Loss characteristics of some PBXs and sensitive microphones used in terminal equipment.

In terms of the original objectives, the project has been highly successful to date:

- >50% increase in voice channels using the same trunk bandwidth
- Avoided a doubling in trunk bandwidth for data traffic (previously projected based on growth patterns in data traffic and the use of TDM technology)
- There has also been considerable favourable user feedback on the improvements in response time for some data applications

The network is now ready to incorporate some of the future steps already described. So Sanyo Electric Software has also escaped the budget squeeze and is ready to move forward aggressively into the future.



During this workshop we have covered some of the challenges currently faced by enterprise network planners and the ways that Magellan Passport can help to address these challenges. We have focused on how two customers are using Passport to break out of the traps of today's technologies and move into the future.

Passport is the solution for today's enterprise networks.