HYBRID NETWORKS
PUBLIC VERSUS PRIVATE PACKET NETWORKS
THE BEST OF BOTH WORLDS

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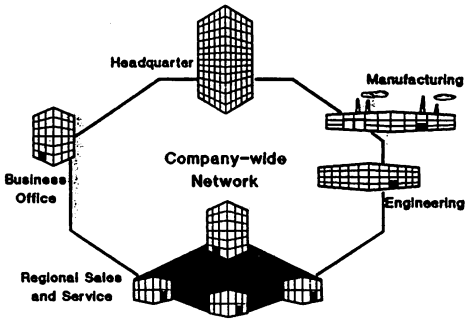
COMPANY ENVIRONEMENT

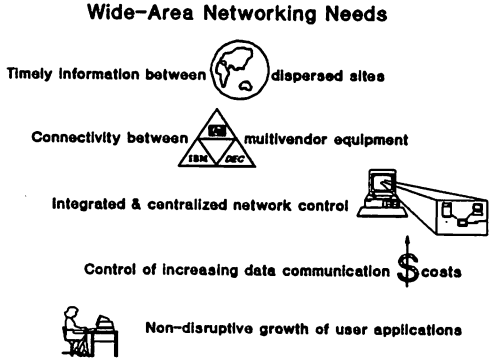
Maintaining the competitive edge in todays'changing market place is becoming more and more dependent on efficient management of information flow. Getting the right information to the right people at the right time means cutting operation costs, boosting productivity and increasing overall customer satisfaction. Keeping abreast with datacommunications technology ensures that your organization maintains that competitive edge.

A typical company wide network environment reflects geographical dispersion, equipment from multivendors, rising datacommunication costs and integrated applications.



WIDE-AREA NETWORKING NEEDS

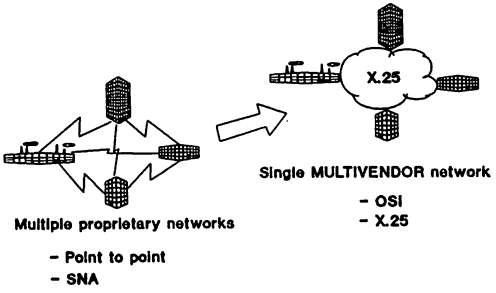
Very often company-wide network, due to a decentralized approach or an approach tailored to sysyem applications, results in the establishment and operation of sevearal independant data networks. Each network is optimized for a particular application and is usally incompatible with the other networks. Within such an environment the company expects multivendor connectivity, integrated network control, security, reliability and cost control.
The company-wide network sould have the ability to provide connection of any data processing equipment (IBM, DEC, HP ...), should be able to share the network facilities for intra vendor comunications (HP to HP, IBM to IBM, ...) as well as for transmitting information between each other.
With the wide area network becoming such a crutial element of the company's business, the company wants to retain integrated and centralized control of the network.
The network should offer sufficient modularity and flexibility to enable the company to optimize the cost of datacommunications. Cost is generaly not the initial motivating factor behind a wide area network program, but it rapidly becomes important as the investigation starts. Datacommunications costs are spead out over the entire company and are relatively insignificant compared to voice communications costs, however looking closer, more alarming is the growth rate of the datacommunications costs which is estimated to thrirty to forty percent each year.
The wide area network is the backbone of the company allowing various entities to communicate. Without a very reliable network the efficency of the company will be strongly affected.



COMPANY WIDE NETWORK ALTERNATIVES

In our current market situation, emphasis is placed on dedicated networks that incorporate multiple proprietary architectures with point-to-point connections and access to public data networks (PDN). The trend, however, is moving towards a multivendor solution on a single network using a backbone based on the X.25 standard. X.25 offers a reliable protocol based on industry standards, full routing capability, and optimal use of transmission link capacity.
As a Yankee Group report said, "Packet switches are and will increasingly become the network node of choice for large organisations with the need to connect greographically disrtibuted computers from a variety of vendors".

Company-Wide Network Alternatives



X.25 PUBLIC VERSUS X.25 PRIVATE

It is however important to keep in mind the differences between a public packet switching network and a private one, and the benefits of each. Public packet switching networks are supplied to the public by the local PTTs in each European country,and by VAN's in the US. The PTTs or VANs supply telecommunication facilities and provide packet switching for computer networks.

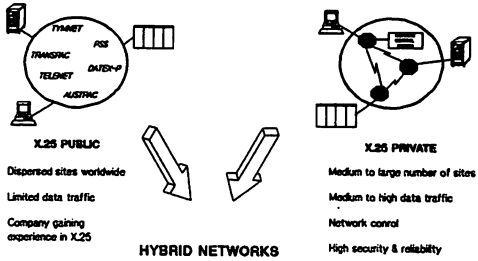
Private packet switching networks are designed and implemented by private organizations, and are tailored to the organization's specific needs. The transmission facilities needed to interconnect the switching nodes, users, and computer systems are normally leased from the PTT's.

But for most users, the issue is not public versus private packet switched network. The question is rather how to combine the features of both into a network that is tailor to specific requirements and conditions. Such hybrid networks are often the solution.

Both public and private networks offer specific strengths that a hybrid network can selectively incoporate. A public packet network reaches low-density sites which are widely dispersed more cheaply than a private network does. In addition, the public network can be used as a back up for private packet network peak loads or failure. Public networks also relieve operators of the responsabilities for network administration, access control and user authentification.

Private packet networks have their own advantages. They offer users centralized management and control that is tailored to the organization needs. Private packet network being based on X.25, insures multivendor connectivity and easy coexistence with SNA environments. An X.25 private network also provides high connectivity for remote sites, which makes it easier to interconnect an entire organization.

Backbone Network
X.25 Public Versus Private



Let's look in more detail at how public and private packet networks compare.

1) Connectivity : As the Gartner Group report explains, private packet switching offers better connectivity by providing easier terminal-terminal and terminal-host connectivity, wider range of protocol conversion, and ensures effivcient use of costly long-haul facilities.

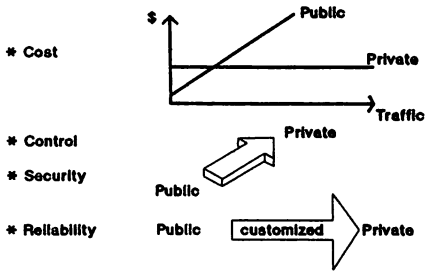
2) Control and Security : A private network means better control and security for the network. Superior network management and security are often what motivates users to move to private packet switching. Public networks typically address the issue of security by setting up procedures for verification and access control. These procedures are however administrated by the local PTT's, not the users. Control of planning, design, availability, cost, security and capabilities are inherent in private packet networking.

Public packet switching offers several operational pluses. Users do not have responsibility for operation or maintenance of the network, nor are they responsible for data integrity. The public network offers the ability to link up with multiple locations, and usually does not require a lot of initial expenditure.
Alternatively these pluses also have drawbacks, specifically lack of controlis an issue. A private packet switching network offers increased security, reliability and full network management control as well as customized design for cost effectiveness, availability and performance.

3) Reliability : Businesses whose operations span the globe need continuous operation of their networks. Public networks reliability varies from country to country, and provides standard reliability for all location. The configuration of a Private network, with an appropriate network design, tailors the reliability to the company needs, ensuring high availabilty in the critical parts of the network.

4) Cost-effectiveness : The rising costs of datacom lines make the advanced X.25 switching technology very cost effective compared to traditional point-to-point links. Although public networks provide X.25 switching technology, when a certain volume of traffic is generated it becomes more cost effective to lease dedicated lines and install your own private network. PTT's tariff charges inside a public private switching network are based on connection time and volume and not on distance covered. Thus typically companies with a large number of sites spread over great distances especially internationaly with medium traffic are prime candidates for a private packet network.
With medium-to-high volume traffic, the advantages of private packet switching play a large role. These systems blend the multiplexing of public packet switching with the time and volume independence of private circuits. Control of all aspects of the network sets private packet switching apart as an alternative.

Public Versus Private



These guidelines do not exhaust the questions to be considered in implementing a packet switching network, but they do provide a sound basis for planning.

BEST OF BOTH WORLD

It is a tradeoff -- with a public network, users are buying services ; in a private packet switching network, they buy the entire system.

Hybrid networks, which combine private and public networks, offer the ultimate in flexibility and are increasingly the choice of businesses that rely heavily on their networks. A hybrid enables an organization to set up its own private network, but use public services for connectivity to very remote locations with low traffic volume.

These advantages are expected to become increasingly important to all types of organizations in the next few years. Industry analyst groups that have studied the market see a bright future for hybrids of private and public networks that are tailored to the specific needs of their users. As hybrid systems become more common, many large multinational organizations will learn what many Fortune 100 companies have known for years.

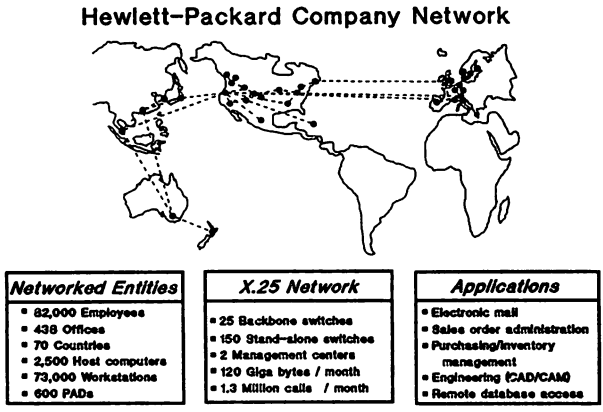
Since both private and public packet switching have their pluses, it is logical to seek to combine them in a way that maximizes these trends. That is what is driving the growth in hybrid networks. Connecting private X.25 networks to the public X.25 networks is what companies including Citibank, Bank of America and Shell have done in the last several years. The advantages of hybrids -- superior network managment and control, better load sharing and network availability from private, reduced costs from a mix of private and public -- are attractive to many companies.

Hewlett-Packard EXAMPLE

Among those companies is Hewlett-packard, the international manufacturer of computer systems, test and measuments and scientific instruments. The company employs 82,000 people worldwide, and in the early '80s its internal networking costs were rising steeply.

HP decided to implement a hybrid network based entirely on X.25 technology in several phases. The network connects 2,500 systems, uses 40 backbone switces and handle both batch and interactive traffic. Electronic mail, sales order administration, engineering (CAD/CAM) as well as pushasing and inventory management are the applications running over the network. The company's investment in its revamped corporate network was just under $6 Million. In the time it has been operational, cost savings have been running at almost $2 million per year, which means that the payback period is a mere 3-4 years.

HP's Hybrid network has met other company objectives in addition to cutting costs. It has contributed to improvements in the assembly of and access to financial and analytical data, reductions in production cycle times, shortened product developement cycles and enabled the company to reduce overall inventories.



Telecommunications vendors were the first to offer packet switching services, and many have started to add private services. Now computer vendors, with Hewlett-Packard first into the market place, are offering such services as well.

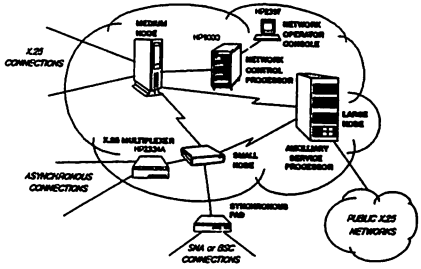
HP PRIVATE PACKET NETWORK OFFER

In early 1987 the Hewlett-Packard Company announced that its company-wide networking solution would be based on packet-switching. HP had decided that packet-switched networking tailored to customer needs, delivers the optimal networking solution.

The HP Private Packet Network (HP PPN) is designed to provide a highly reliable packet capability of connecting devices having standard CCITT X.25 packet interfaces, and non-packet mode devices through Packet Assembler Disassemblers (PADs).

With HP X.25 PPN you can build your own dedicated private X.25 network. It is composed of a wide range of switching nodes , a Network Control Processor and Auxiliary Service Processors that manage all network activities, through Network Operator Consoles. Its modularity insures a cost-effective implementation for small as well as very large networks.

HP PRIVATE PACKET NETWORK



The key benefits and unique product features are as follows :

* CONNECTIVITY

The HP PPN provides the general utility network. The following are included:

- X.25 Connections - High speed up to 64 Kbps
- X.25 Gateway for access to public or other private networks
- Asynchronous, SDLC and BSC protocols support, through PADs

* NETWORK CONTROL

The Network Control System allows effective network management from a central site or through remote operator consoles.

- Easy-to-use, forms-based operator interface
- Configuration control - Online, offline, real-time changes
- Automatic statistics collection
- User definable report generation
- Event and alarm filters for rapid isolation of failures
- Centralized capabilities which provides robust control

* RELIABILITY

The HP Private Packet Network features both hardware and software redundancy.

- Redundancy within the large nodes - sparing of the switching boards, multiple buses, and redundant power supplies
- Online Service - switchover is automatic
- Dual Control Processors can be distributed for disaster backup, independant operation and databases duplication to insure system integrity, fall back capability, ease of network expansion
- Auxiliary Service Processor in the large nodes further enhances reliability and performance
- Adaptative routing provides transparently to the user, call rerouting upon link or node failure or if more cost effective path available

* SECURITY

The HP Private Packet Network is protected against unwarranted use and access.

- Internal access restrictions done by security checking on network access points, both on source and destination addresses, with time and days filters
- Access restriction to Public networks
- Multiple user classes, which can restrict routes used, and give priority to types of traffic

* COST EFFECTIVENESS

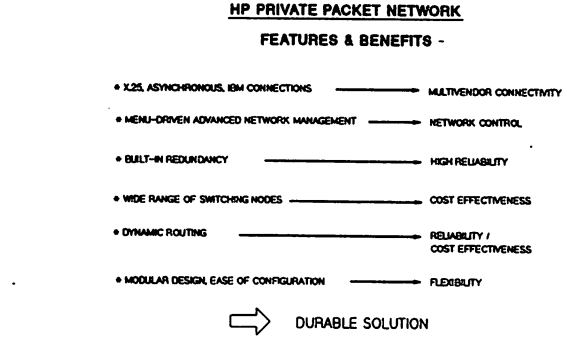
Due to its advanced technology, HP PPN minimized communication costs .

- Wide range of switching nodes, from 8 to over 500 ports with modular design providing nodes upgrate capability
- Three types of Nodes - small node Model 60, medium node Model 70, and large node Model 80, Model 70 expandable to Model 80
- Built-in redundancy which reduces maintenance costs, and "out-of-service" losses
- Dynamic Routing ensures least cost routing and best efficient use of link resources
- Online Remote Reconfiguration reduces personnel costs, changes take minutes rather than days to perform.

* EASE OF USE

The HP Private Packet Network offers high flexibility.

- "Hot" module replacement enables boards removal while equipment continues normal switching operation
- Logical X.121 addressing allows easy network changes, address plan being independant of network topology.
- Menu-driven operator interface, network control no longer requires specific command language



SUMMARY

"How networking helped one industry cut paper mountains to bits" (Data Communications).
"Switch to private net satisfies users's need for control" (Computer World).
" Packet switching is firm's link to greater productivity" (Data Communications).

Reading and hearing about such success stories from our industry peers, suppliers or even competitors, are powerful incentives to get start on a similar project. More and more companies are discovering the benefits of wide area networking. A private network means better control, security for the network, and the X.25 standard ensures multivendor connectivity, in addition the combination with public networks for dispersed sites with low volume offers the best cost effective implementation.

If your company is willing to optimize or install a wide area network, Hewlett-Packard proposes hybrid networks, which combine HP Private Packet Network and public networks, offering the ultimate flexibility and the best of both worlds.

COMPANY-WIDE NETWORKING