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Features And Performance of HP<->HP

Data Communication Products

1984 HP International User's Group

Anaheim, California

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Introduction

Hewlett Packard's 3000 computer family has a number of HP-to-HP communication products falling into two categoies: cpu-to-cpu and terminal-to-cpu. 1983 and 1984 will see major changes in both categories of products. The biggest changes in 1983 included:

(1) The maturing and acceptance of X.25 technology:
   (a) Certification of many packet networks.
   (b) Certification of a low cost packet processor for use in small private networks, and also for use as a gateway to public networks (if wanted).
   (c) The introduction of a packet assembler/disassembler (PAD), or X.25 statistical multiplexor, by HP Grenoble. The HP2334 can connect 4, 8, 12 or 16 ports to a packet network at speeds up to 19.2 KB.
   (d) Terminal block mode support for VPLUS applications when used with the 2622, 2624 or 2627 CRT's.
   (e) Allowing a character printer on a 2334 PAD to be a shared printer. All X.25 HP3000 CPU's can build a switched circuit to a 2334 PAD connected printer. The FOPEN intrinsic will allow REMOTE NODEID's from the NETCON database to be used as a CLASSNAME.

(2) The Multidrop Terminal Support (MTS/3000) product matured by:
   (a) Adding support for the HP2333 cluster controller which permits all HP CRT's and character printers to be supported as if they were hardwired to an ATP.
   (b) Adding support for several HP line printers. This is especially useful when wanting to place a medium speed printer at a few hundred feet from the cpu, or across the country.
   (c) Adding both diagnostic and statistical reporting facilities to the product.

(3) Adding block mode terminal support to the Series 100 and 200 personal computers, as well as convenient file transfer programs from PC-to-PC and PC-to-HP Computer.

(4) The introduction of HPTELEX which enables an HP3000 to send or receive messages from the world wide TWX/TELEX network.

(5) The addition of autodial capability to dial-up DSN/DS-3000, MRJE/3000 and RJE/3000.

(6) The introduction of the Workstation Configurator product on the HP-3000, which allows you to custom modify the terminal ADCC and ATP driver tables to control such items as: hand- shake method, timeouts, timing delays, and input editing.

(7) Significant field organization changes: to better support datacomm; to better train HP field employees; and to better train our customers.

(8) Terminal voice output and terminal bar code input was introduced.

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(9) Support of PBX's from Rolm, Northern Telecom and Intecom.

(10) Standardization of HP's Telesupport program for better CE and PICS response to your hardware/software interruptions.

(11) Regionalized PICS with full time SE's to provide long term continuity, and a better 'first call' success rate in handling your questions to your satisfaction.

As we look forward to 1984 we are anticipating making some further HP-to-HP communications enhancements:

(1) The DS/3000 product will be restructured so the X.25 capability is separated from the point-to-point product. Both resulting products will carry lower individual pricing.

(2) A base-band 10 megabit per second IEE-802 local area network DS product will be introduced:

  (a) Cable and cable interfacing hardware products.
  (b) Computer to network controllers.
  (c) Restructured software that is closely aligned to the International Standards Organization (ISO) Open System Reference Model (OSRM) seven layer architecture.
  (d) Network Management software.
  (e) Store and forward capability .

(3) New Series 100 personal computers will be introduced with both character and block mode support.

(4) A one-megabit local area network product for the Series 100 and Series 200 computers will be introduced.

(5) VPLUS X.25 block mode terminal support will be extended to more terminal models.

(6) VPLUS will be enhanced to support touch screens on one or more workstation products.

(7) Terminal-to-cpu speeds will increase to 19.2 KB for selected terminals when connected to the ATP.

(8) Satellite circuits will operate with greater efficiency than at present for cpu-to-cpu DSN/DS usage.

(9) Additional printers will be supported by MTS-3000.

(10) Software differences between ATP, ADCC and MTS connected terminals will be greatly reduced.

(11) A lower cost HP3000 will be introduced.

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(12) A workstation multiplexor for IEE-802 LAN's will be introduced.

(13) An SDLC IBM batch print and job input product will be introduced.

As I look at what has happened, and what will be happening, it becomes obvious to me that the datacomm strengths of the HP3000 have become second to none in the marketplace. It gives me great personal pleasure to be an area level specialist devoting full time to helping you install and use HP datacomm products.

Let us look in some detail at the topics we have briefly introduced.

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HP's DSN/DS Networking Capabilities

* Terminal Pass-Thru From One Host To Another
* Remote File Access By A Program At One Node To A File At Another Node
* Remote Database Access
* Program-To-Program Communication Via Sub Tasking (i.e. Father at one node and son at another)
* Program-To-Program Communication Via Message (MSG) Files (i.e. Store and Forward, similar to UNIX "pipes")
* Support PAD connected terminals in character mode.
* Support 2622's, 2624's & 2627's with VPLUS via PADs

Let us review the capabilities of DSN/DS. The slide above gives the major functions supported. The last two functions

X.25 support allows a single DS monitor program to simultaneously support all cpu-to-cpu and terminal-to-cpu activity. Up to 127 concurrent users of the "network" can enter/leave a CPU via the one INP and associated DS monitor program. So, internal CPU overhead goes down and only one modem services both types of users.

X.25 has vastly superior error recovery capability compared to the bi-sync product. Terminals may cross the continent for costs in the $6-$10 per hour range when connecting to the HP3000 via a public packet network. Of the three major U.S. domestic X.25 networks, Uninet seems to have the lowest prices, but Telenet appears to have the fastest thru-put.

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Question: How can I ensure secutiry over who accesses my CPU via the X25 network?

Answer: There are two concerns:

1) **CPU-to-CPU is handled by a security/routing table called NETCON. This table can only be changed by MANAGER.SYS. Two CPU's may only DS to each other if each CPU's NETCON has the other CPU in it.**
2) **Terminal-to-CPU is handled in one of several ways:**
   a) **Private Virtual Circuits (PVC's) connect one terminal to a single port of a single computer. This is just like a leased line.**
   b) **Closed User Groups (CUG's) the X25 network can have a group of PAD's and HOST's be limited to only talking to each other.**
   c) **Password on the USERID and/or ACCOUNT ID**
   d) **The HP2334 local user group feature allows network id's contained in an internal table to validate incoming calls to the PAD.**

X.25 DSN/DS allows additional security to be implemented over what a user with dial modems has with the bi-sync based product. When an X.25 network allows an HP3000 to be connected, that connection is via a leased (dedicated) circuit. The network access port to which the leased line is attached has a network controlled X.121 address.

When a CPU places a call through the network, the network ensures that in the call request packet the correct calling DTE's network ID is properly coded.

The receiving host does a table lookup in the IMAGE database named NETCON (network configuration) and will only accept a call request packet if the calling DTE's ID is in NETCON. So, CPU-to-CPU access is much tighter with X.25 than it was with bi-sync.

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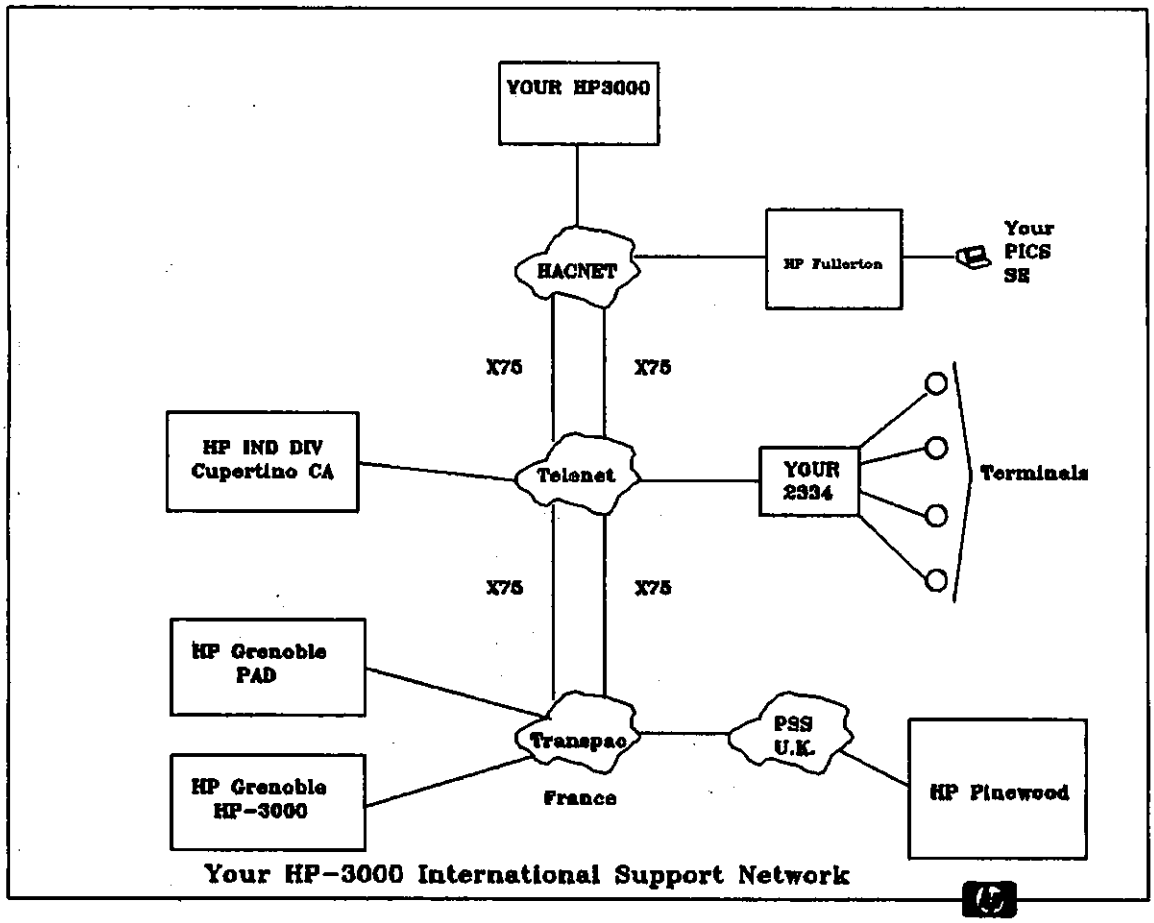

Here is an example of how four packet networks interconnect five HP3000's and two HP2334 PAD's into a "sub-network". The HP customers on a public network can be accessed by their HP branch office PICS SE for direct ONLINE support. The PICS SE can access software division cpu's in this and other countries, using DSCOPY to bring new software fixes from the divisions to your CPU in real time.

We feel it is feasible for you to discover a compiler bug, have it verified by a PICS SE, and have a later version compiler installed on your CPU, all in a matter of a few hours.

The support potential of such networks is truly exciting.

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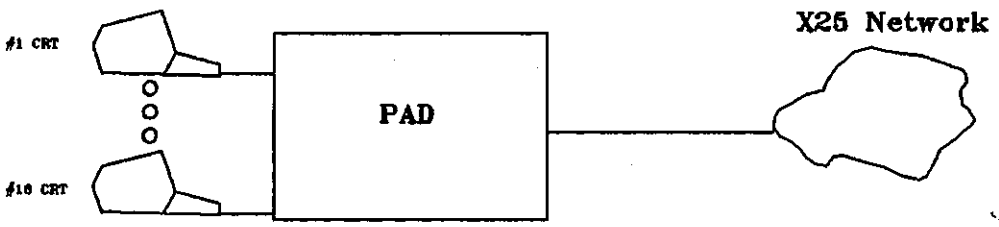
PAD = Packet Assembler Disassembler



A PAD Is: A Protocol Convertor
A Multiplexor

A PAD's benefits Are: Hi-Speed Terminal Operation
Error Free Data Transmission
Host Switching

PAD's can have modems on their terminal ports or leased line tail circuits.

The HP2334 Packet Assembler Disassembler (PAD) is a multiplexor, speed convertor, protocol convertor that allows up to 16 devices at a remote site to enter the network over one modem link. The usual crossover point economically to justify a PAD is three or more devices at a site each using the network for about 4 hours per day each.

The HP2334 is manufactured in HP's Grenoble France division. As you saw from the previous slide, the U.S. support sites have all day every day access to the Grenoble support computer to pick up new firmware revisions that can be burned into EPROM's at your U.S. support site.

Grenoble support engineers are usually able to duplicate customer problems without traveling, once they have been given a play script of a potential problem and temporary access to your X.25 host. Once they can duplicate a problem, the fix is not long in being DSCOPY'd to your U.S. support site.

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The HP-2334 PAD (from Grenoble)

* Supports 4, 8, 12 or 16 Ports
* Supports up to 19.2KB from terminal to PAD
* Supports up to 19.2KB from PAD to Network
* Z80 CPU for every four terminal ports
* 16 port PAD has 5 Z80 CPU's, 72K ROM and 40K RAM
* Mnemonie Connect Table
* Closed User Group Table
* PVC Support
* Incoming SVC Support (i.e. two way SVC's)
* 25 Private User Facilities To Implement HP CRT Block Mode Support

This slide outlines the main features of the HP2334 PAD product. Note that a 16 port PAD has not less than five microprocessors. The HP2334 supports a Mnemonic Connect Table. Instead of having to remember an X.121 address of up to 14 numeric digits, you simply type a number sign (#) followed by up to an 8 character name.

Any HP character printer can be connected to the 2334 and receive printout from multiple remote HP3000's. The MPE file system can now build a switched virtual circuit to the 2334 port at the time of an FOPEN, and disconnect at the time of an FCLOSE. This basic facility allows public domain programs such as RSPOOL to drive 2334 connected printers as spooled devices.

The Closed User Group table permits the 2334's support personnel to limit what remote nodes are connected to, or that may access the devices on the 2334.

The HP2334 is the hardware around which full VPLUS support of all terminals will be based. As each future MIT of MPE is released, the number of terminal types and software supported will increase.

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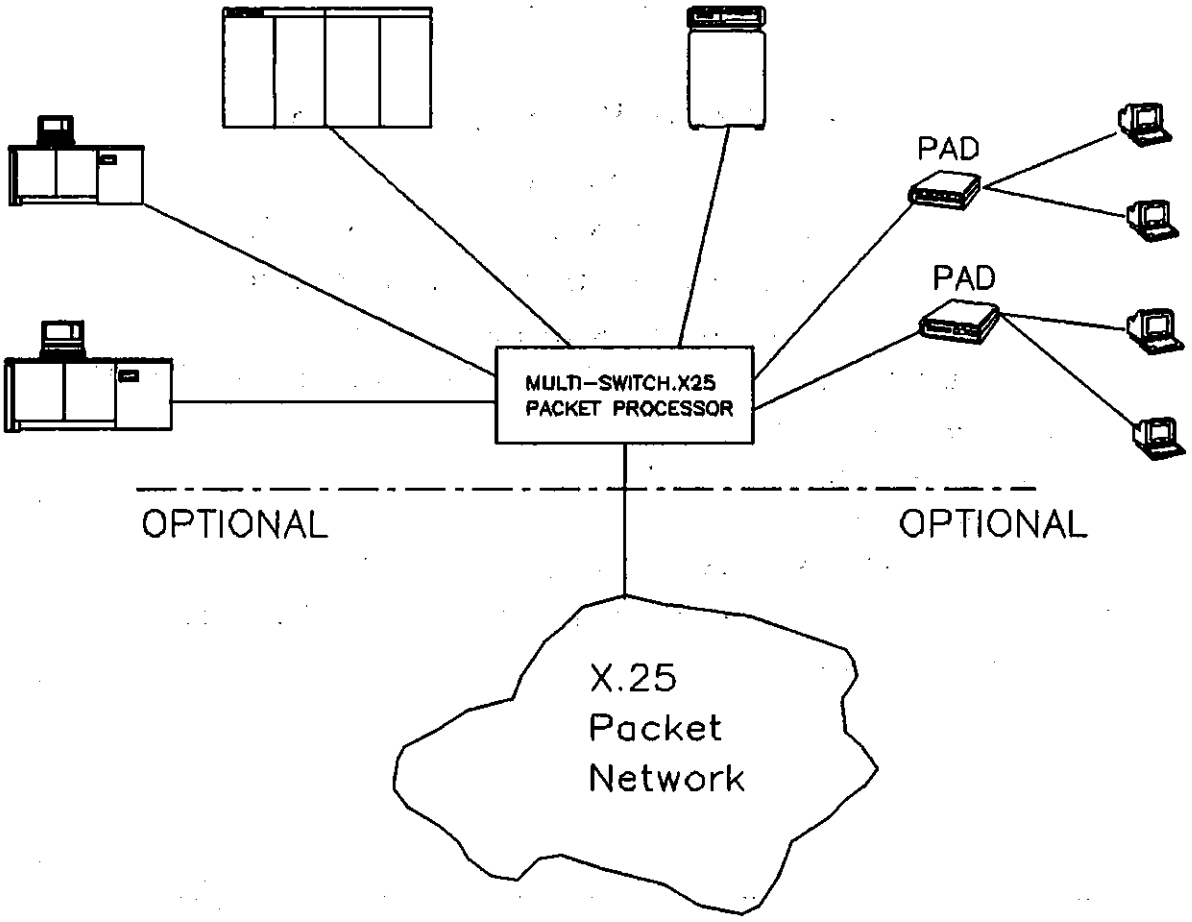

Dynatech Packet Technology Corporation of Alexandria, VA makes a (approximately) $6,000 packet switch that from casual observation is the size and appearance of an 8 port statistical multiplexor. This packet switch can sustain roughly 34 KBS aggregrate throughput. You can run leased phone lines from each packet switch port to either a CPU or PAD and operate your own private packet switched network. Data lines should not exceed 9.6 KB on any port.

By hooking a public packet network access line to one of the packet switch's ports, you have created a `gateway'. Any PAD or CPU in your private network may now access the public network. The access facility (typically $1,500 per month) is shared.

Any DTE in your private network is accessible from the public network. Any DTE in your private network may access the public network. All of your DTE's share the cost of the one access facility.

Multiple "Multi-Switch X.25" units can connected to form larger private networks, including parallel trunks between the same two switches for greater tandem switching speed.

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The Memotec 2500 Packet Processor is another private network/gateway product similar to the Dynatec product. The MPAC-2500 has roughly an 84 KB aggregate thruput, and will support hosts/pads up to 19.2 KB in speed. Memotec is headquartered in Toronto, with US operations based in Denver and Los Angeles (Yorba Linda suburb).

The two packet processors mentioned are just representative of many coming onto the market in 1984. Both vendors mentioned have larger switches in design, and many other vendors are introducing X.25 switches this year.

An X.25 packet processor allows you to implement a wide area network where any cpu talks to any other cpu (concurrently) with only the cost and overhead of a single datacomm controller card (INP) and a single software monitor (DSN/DS).

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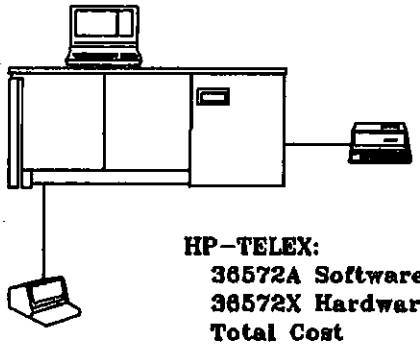
HP-TELEX WAS INTRODUCED IN JULY '83



Up to 10 hardware interfaces can be controlled by the one copy of software.

HP-TELEX:
36572A Software - $3,000
36572X Hardware - $2,500
Total Cost - $5,500

HPTELEX is a combination of hardware and software that allows many concurrent users of your HP3000 to both send and receive Telex and TWX traffic from around the world. HPTELEX is a product of HP Pinewood (UK)

Any text preparation package on the HP3000 can be used to prepare a Telex message. HPTELEX can be told when to dial the receiving Telex station, so as to minimize dial cos

Western Union, ITT and RCA are supported in the U.S. British Telecom is supported in the U.K., and other countries are being added.

Self paced instruction leads the user through simple menu driven access to HPTELEX from any block mode terminal. Documents created by EDIT/3000, HPWORD, HPSLATE and/or TDP can be mailed with HPTELEX.

Both incoming and outgoing Telexes are queued. The queueing facility allows other users to schedule transmissions while the hardware is busy sending an earlier message. Many users can be concurrently preparing text for a single interface to transmit.

For outgoing traffic HPTELEX does all dialing, answerback code generation and verification. If a destination number is busy then HPTELEX will keep re-trying at intervals determined by the sender.

Statistics are collected and logged for all traffic. All incoming and outgoing traffic is logged, including failures and re-tries. The text of all incoming and outgoing traffic can also be conveniently reprinted or archived.

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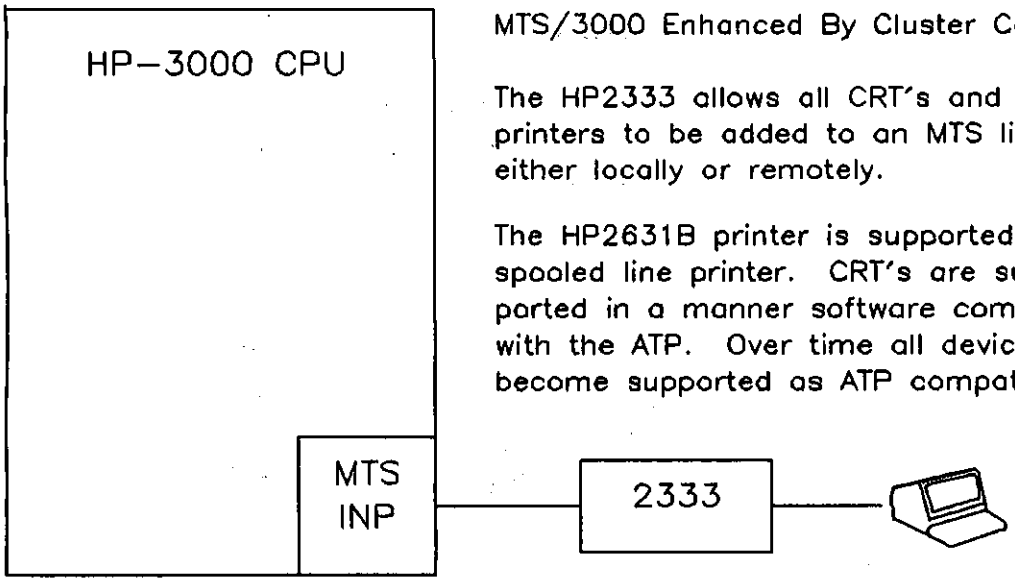

MTS/3000 Enhanced By Cluster Controller

The HP2333 allows all CRT's and character printers to be added to an MTS line either locally or remotely.

The HP2631B printer is supported asa spooled line printer. CRT's are sup-ported in a manner software compatible with the ATP. Over time all devices will become supported as ATP compatible.

(1) The HP2333 is supported at speeds up to 19.2 KB between the INP and cluster controller, as well as between the CRT and controller. Series II/III's get relief from the 2.4KB ATC barrier.

(2) The HP2333 may be either hardwired or connected via modems. Besure to use the 31390A Modem BypassCable. The 13232U cable has to have pins 15 and 24 jumpered at both ends.

The HP2333 is a new product that brings with it a new software direction for MTS/3000. HP is commited to making MTS/3000 as close in function and software compatibility with the ATP controller as is possible.

The HP2333 offers a very worthy option to Series II/III owners to greatly speed up terminal I/O and possibly reducing CPU overhead. We know that when a Series II/III is handling 2000 character interrupts per second the cpu is 100% consumed by cycle stealing! Stop and think of the impact of only four spooled 2631B's on a Series II/III. Four printers at 1200 bps each is 4800 bps aggregate or 600 chars/sec. 30% of the cpu is devoted to driving those four 2631B spooled printers!

Put the same four printers on an MTS line with a 2333 and the overhead will drop to 10-12%. Now, however, all of the CRT's on the line can operate at 9600 bps. This is very important when running VPLUS, or other terminal block mode, applications.

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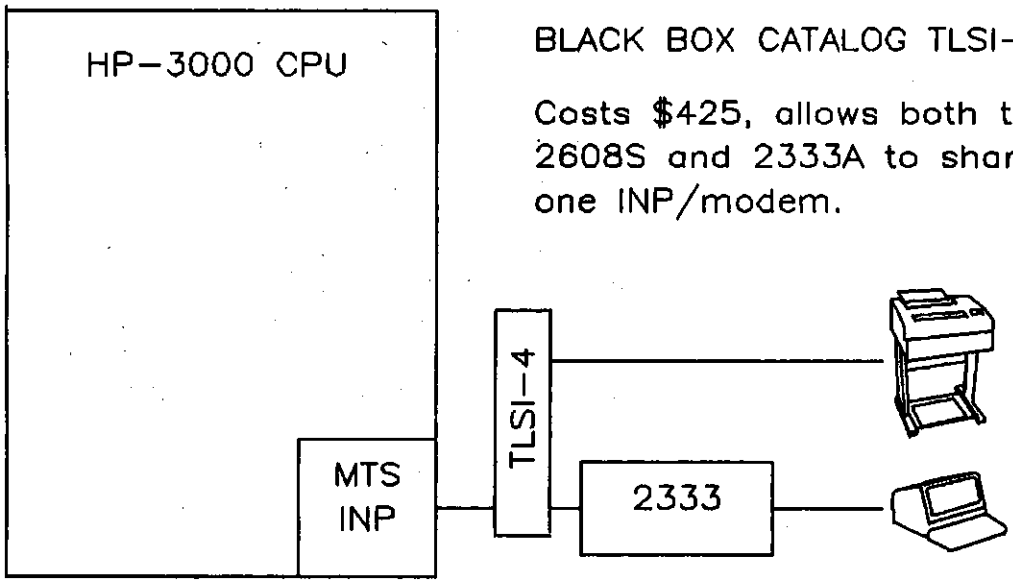

BLACK BOX CATALOG TLSI-4

Costs $425, allows both the 2608S and 2333A to share one INP/modem.

(1) The modem sharing device allows four remote controllers to share one modem.

(2) The INP-2333A line can run Full Duplex.

(3) On a 9600 bps line expect 200 LPM printing with 1-3 sec CRT delays.

When you need both a cluster of terminals and a remote line printer at a remote site, or in the same complex, you may connect a modem sharing unit to the remote modem and then plug in up to four control units. Both the HP2333 and HP2608S want to act as control units. They both have a 25 pin male connector to plug into a modem. The TLSI-4 allows both controllers to share the one modem.

Now, the further away from the computer center the remote site is the more favorable the economics of this type of configuration become.

The HP2631B spooled printer is really only good for about 400 pages per day. An HP2608S costs about 2.5 times an HP2631B. So, about 1000 pages per day is the economic cross-over of one 2608S versus two 2631B's.

The 2608S will print at an honest 200 LPM without degrading the CRT performance more than two seconds. That is, if your CRT gives you 3 second response without an HP2608S, then you will get roughly 5 second response when the printer is running.

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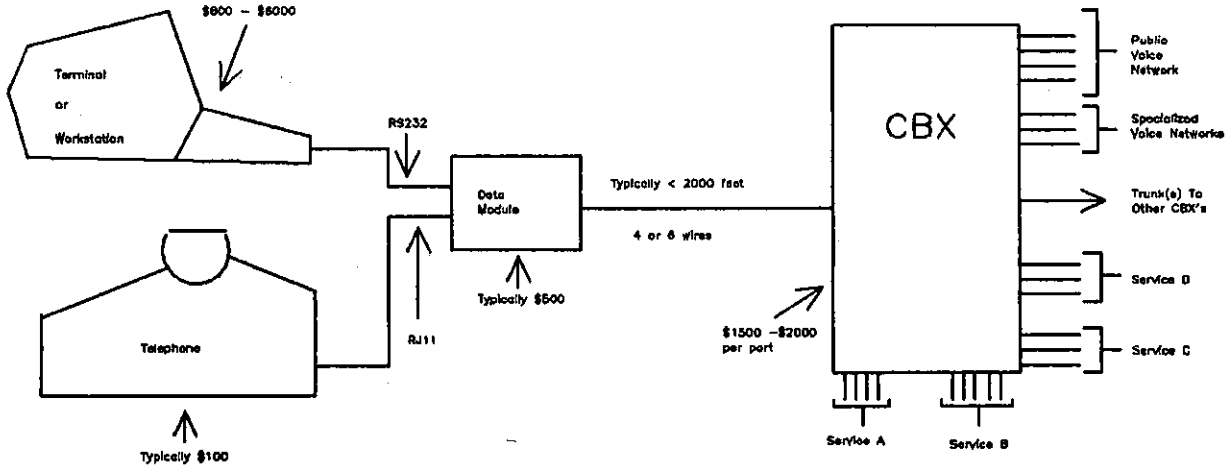

PBX's use a data access module to connect both a terminal and phone from a desk to the PBX.

You may have up to 4000 feet of wire from your data module to the PBX.

Four standard telephone wires are used to connect the data module to the PBX.

Norther Telecom PBX's require six wires from the data module to the PBX.

The PBX is connected to "services" such as an X25 PAD, a pool of auto-dialer modems, or a local HP-3000.

PBX's permit terminals to switch from 'service' to 'service' at 9600 bps, and to concourrently use your phone.

In early 1983 HP announced a cooperative support agreement with the PBX vendors Northern Telecom, Rolm and Intecom. The agreement calls for the vendors to work together whenever common customers are having interfacing problems between the two product lines.

A PBX appears to the HP3000 as a 9600 bps dial-up modem. Each CRT is hardwired to the PBX at 9600 bps. Some vendors also support 19.2 KB switching. The user gets the benefit of hardwired speeds and the flexibility of dialing.

Any time you have more than one computer a workstation would like to access, the PBX approach makes sense. You can place sharable autodial modems on the PBX to be shared by the hardwired CRT's. PAD's to an X.25 network are another common "service" connected to PBX's.

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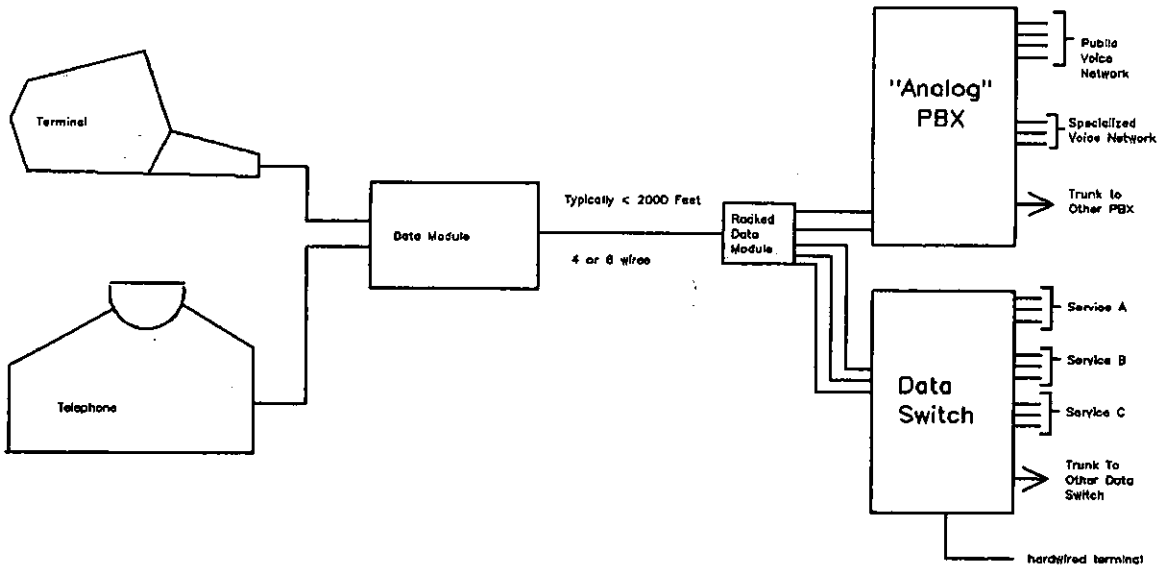

A 'data switch' can be used in conjunction with an older 'analog' PBX.

Data switches in combination with an analog PBX are called 'hybid' systems.

Data switches can be added to olderPBX installations to modernize them.

As with digital PBX's, your phone and terminal can be simultaneously used.

Data modules permit your phone wiring to carry both voice and data.

If you have an older analog PBX that will not be amortized for several years, a number of HP customers are enhancing their older analog PBX's with digital switches to produce a hybrid switched network. A number of these customers make a point of seperating their voice switch (PBX) from data switch (PABX) for reliability reasons. They are more comfortable not putting all communication eggs in one basket.

Vendors such as Infotron, Gandalf, Micom and Develcon have successfully been added to older style analog PBX's.

The "data switch" vendors allow you to install two "data modules" per workstation if the cost of running terminal data wiring is prohibitive. The data modules multiplex your desk phone and data terminal over the two pairs of telephone twisted wiring. One data module goes on your desk and one by the PBX. RS-232 wiring goes from the PBX data module to a regular computer port.

It appears to be about a 50/50 split amongst HP's customers when we ask whether customers are planning to use local area video networks or PBX's to connect workstations to multiple servers (cpu's, print stations, electronic filing cabinets).

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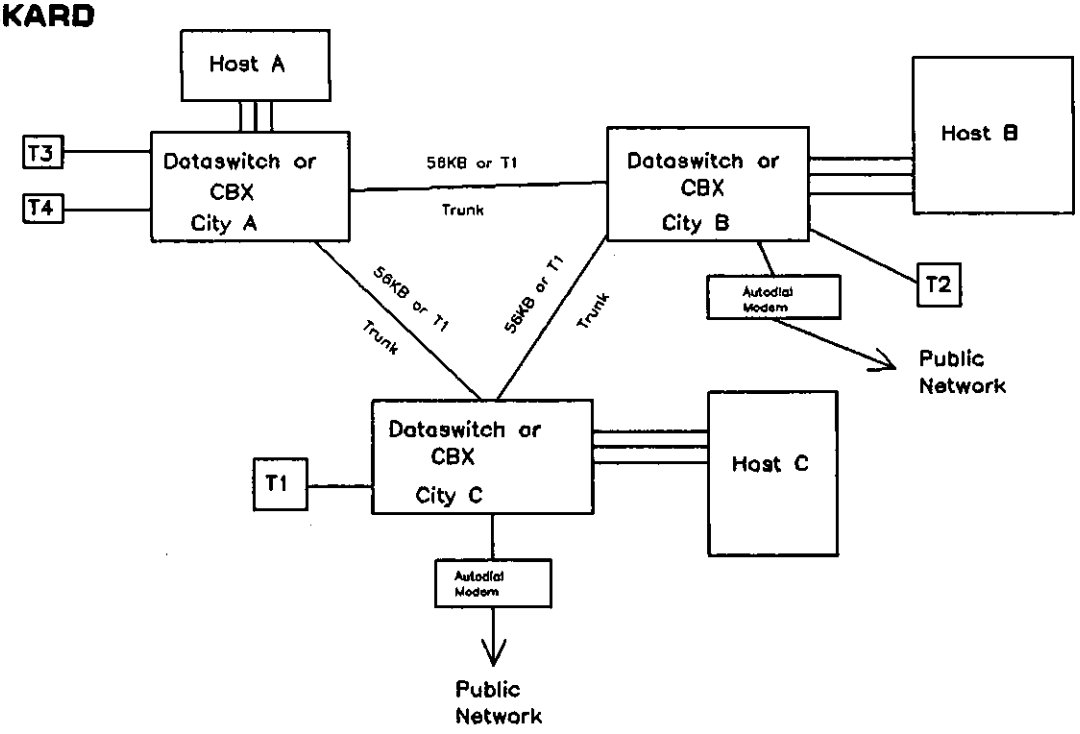

CBX's permit trunk lines to iterconnect all other CBX's into an integrated voice/data network. Capitalization can be as high as $2,500 per port. Terminals1 thru 4 may switch to any host using their keyboard number pads and still operate at 9.6 KB.

CBX's, PBX's and data switches all seem to permit a "trunk" line to be run between each other. These "tie lines" allow both voice and data switching between sites to occur.

Terminals at one site may now connect to services at all PBX sites.

Companies with enough voice and data volume between two sites should give serious consideration to "trunking" their PBX/CBX's. Most planners feel that when the total phone bill between two sites is about 50% more than the cost to lease a trunk line, then the crossover point has been reached. The capital and administrative costs of upgrading the PBX's accounts for the need to be 50% over the cost of a simple leased line.

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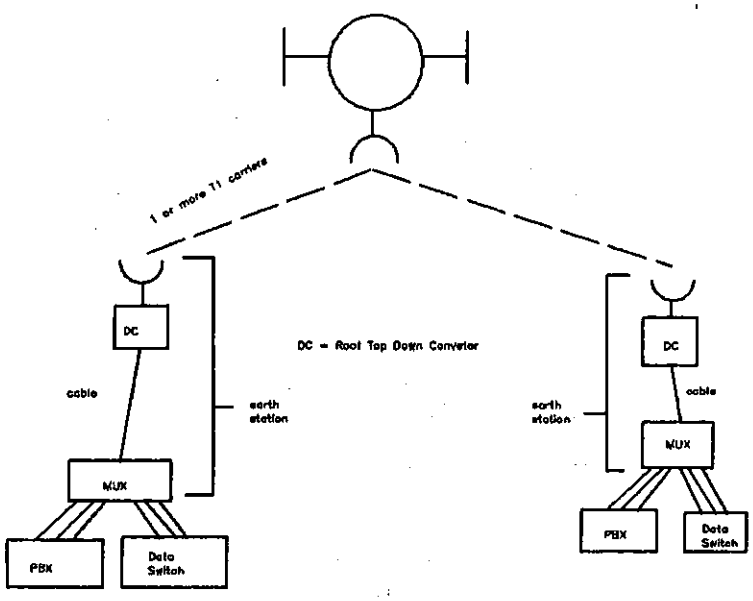

Major organizations may completely bypass the telco for all traffic between their own sites by using satellite circuits and their own earth station equipment. A complete earth station costs about $250,000. But, costs are comming down at a 30% per year rate. This sort of trunking will be very common by 1985. The dish antennas are about 10 feet in diameter.

Satellite circuits are approximately half the price of a similar land based service. The satellite circuit typically has about 60% of the data capacity of a land line.

Protocols such as HDLC and SDLC are full duplex in nature and allow for a number of unacknowledged buffers to be sent before the sending DTE stops and waits for acknowledgement of error free receipt. Data can be going in both directions concurrently.

HP3000 users of remote DS/3000 may want to switch to the X.25 based DS/3000 over leased satellite circuits. While individual data streams may run somewhat slower, aggregate thru-put should increase. The big thing to remember is the lower individual data stream rates are offset by an even lower decrease in datacomm cost.

Summarizing, the X.25 protocol allows multiple concurrent DS users to achieve better link usage than the bisync protocol. Satellite circuits will be slower than land lines, but at a better price performance ratio.

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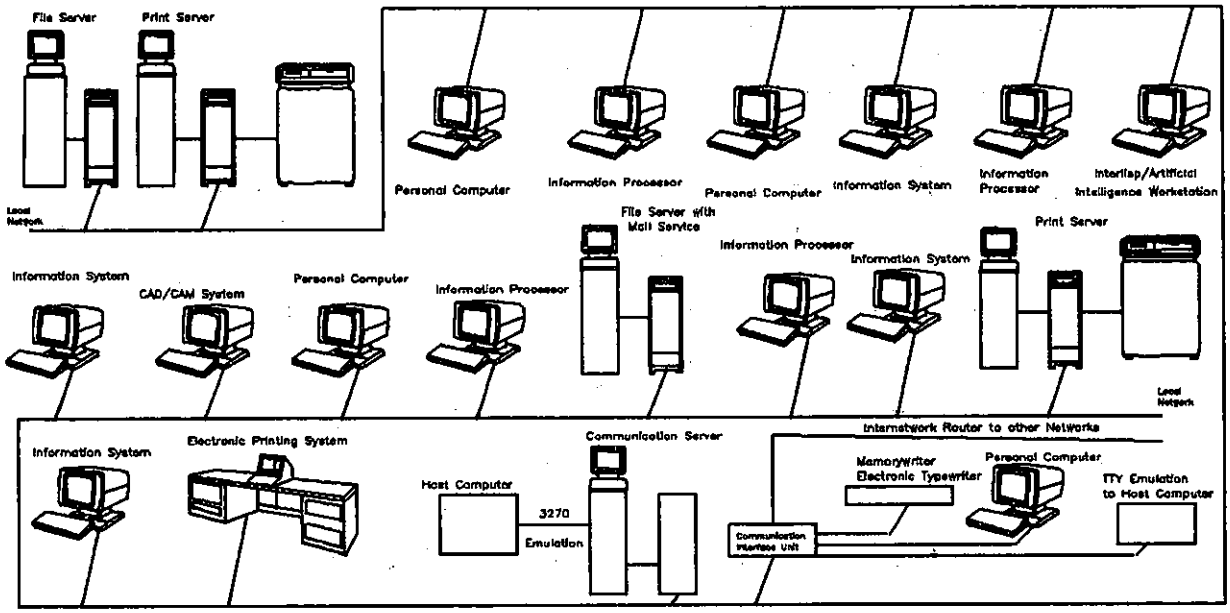
A HYPOTHETICAL LOCAL AREA NETWORK



Switching the topic to Local Area Networks (LAN's) this slide shows a hypothetical network. File servers allow common data to be shared among the individual nodes on the video cable network. High cost disks with backup facilities may be shared across multiple workstations and be very cost competitive to personal Winchester disk drives at each station. The backup facilities cannot be over emphasized.

Print server's allow an expensive printer, such as a fancy laser printer that can mix diagrams, words and graphs on one page, to be shared by enough workstations that individual daisy wheel printers become archaic. Laser print servers can print multiple spooled copies of documents while the individual workstations proceed to do other work.

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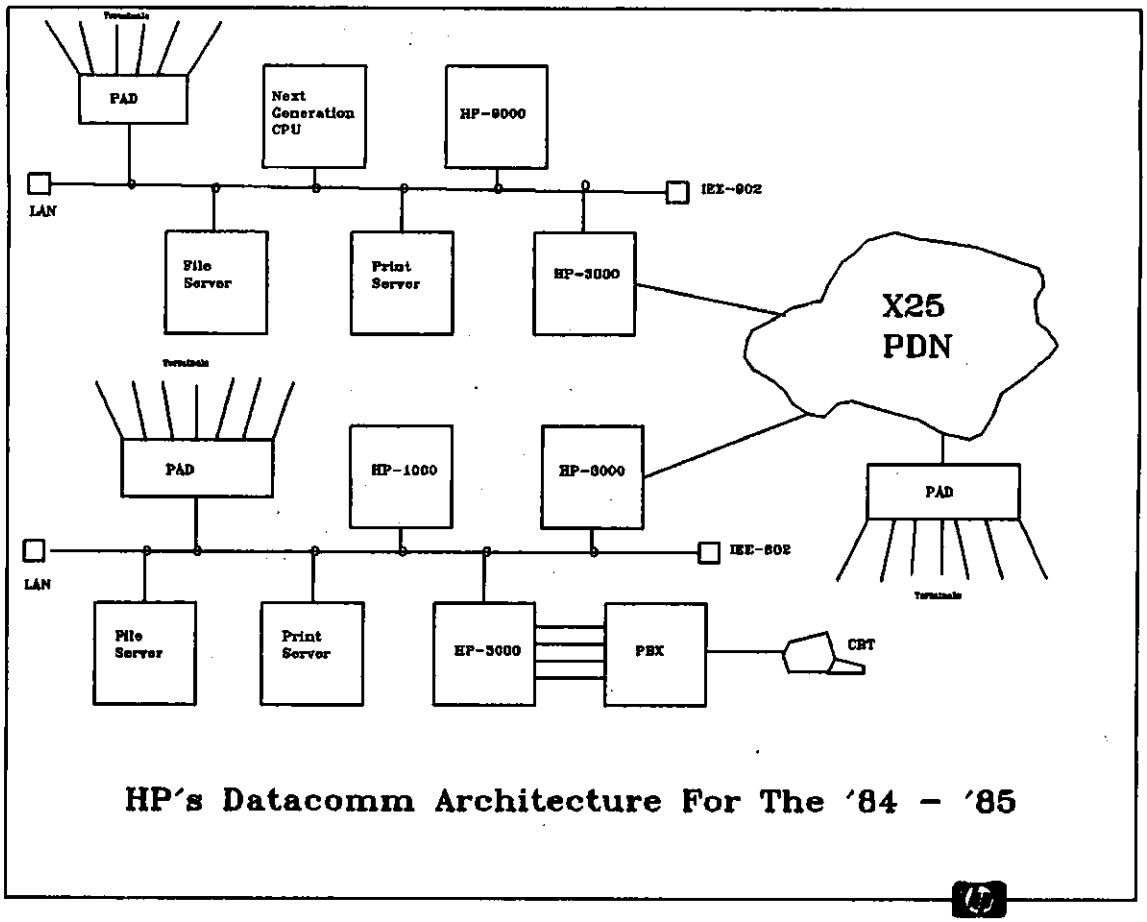

HP's Datacomm Architecture For The '84 - '85

This very busy slide shows partially where HP is, and the rest shows where we are going. Today, HP supports both X.25 packet networks and PBX's. Sometime in 1984 we will be adding support of IEE-802 Local Area Networks (LAN's). LAN's will need a PAD product to economically connect multiple terminals to the cable network.

Once a LAN is introduced it will become the backbone of HP's MPN architecture. Personal workstation products will be connected to cpu's, shared database nodes and printer nodes via LAN's.

Communication within an area of several adjacent buildings will be via LAN's. Individual LAN's (subnets) will be networked together via "gateway" cpu's and X.25 packet networks.

You will see LAN PAD's and at least one file server and one print server product from HP in 1984. Initial CPU support will include HP3000, HP1000, HP9000, HP210 and the Shared Resource Manager. In addition, the HP200 and HP100 products will have a low speed LAN (i.e. 1 MB/sec) and file server, with gateway products for the IEE-802 and other communication services.

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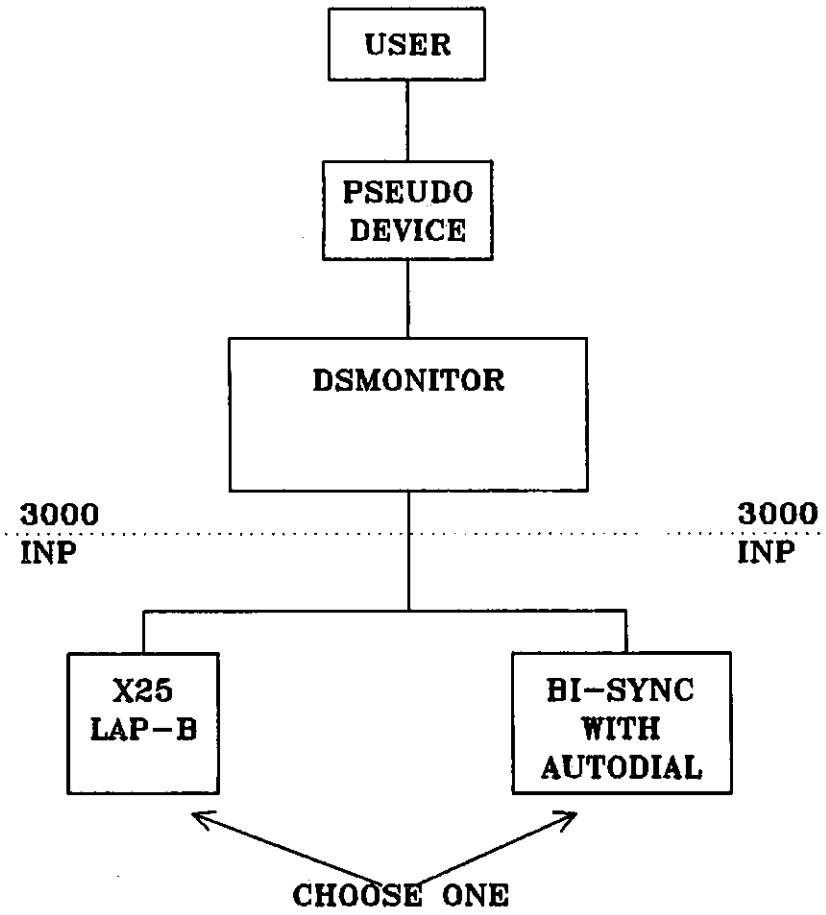

The last two slides I want to present go into the architecture of DSN/DS, as it is today and as it will be in 1984. Clearly HP is moving towards the ISO Open System Reference Model of seven layer software.

This slide shows how the present DSN/DS (which we shall call DS 1) is structured. A pseudo device is used for interprocess communication between a program and the DS monitor program (DSMON).

The monitor program downloads an INP with software layers 1 and 2. The monitor is layer 3. Layers 4 thru 7 run on the user stack as extensions of the MPE file system.

The architecture of DS-1 does not permit such niceties as: store and forward networking; alternate path routing; transparent pass- thru of intermediate nodes.

And so ..... we have come up with an architecture for DS-2 (that is an internal name) which greatly enhances DSN/DS.

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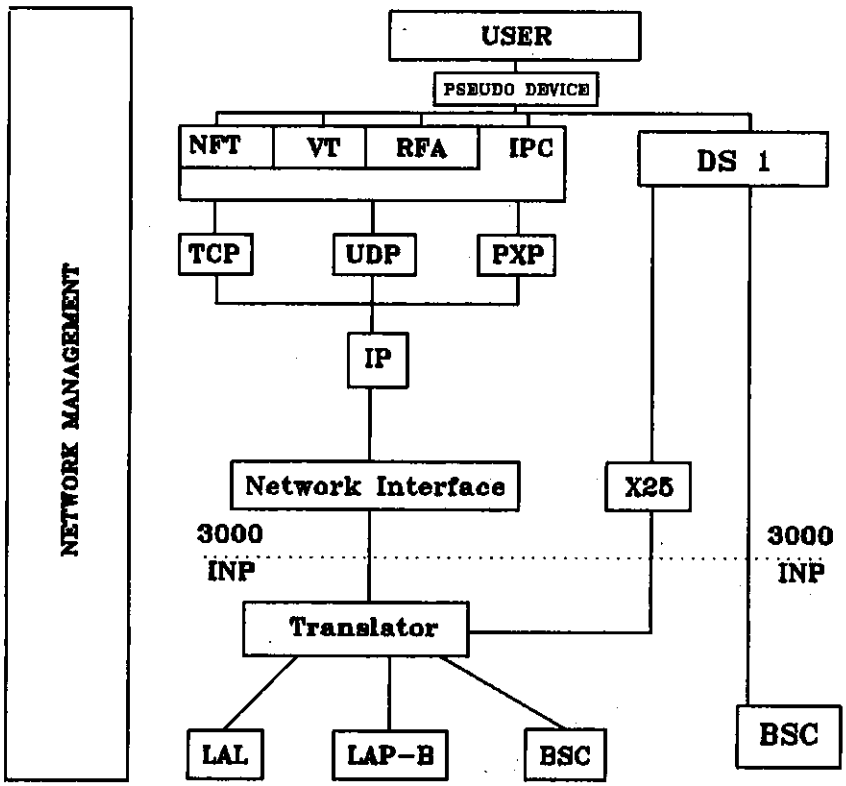
ARCHITECTURE OF NEXT GENERATION DSN/DS



This slide shows how DS-1 will be integrated into DS-2. The present HP-32190 product (or its replacement HP-32189/HP-32191 products) will be able to co-exist with the new architecture. But DS-2 introduces several major new software components:

(1) The Network Interface or "transport" layer will allow a circuit to come in from a LAN and go out on a X.25 or Bi-sync link. This pass-thru will not require a session to be started on the local HP CPU.

(2) The Arpanet level 4/5 protocols known as TCP/IP will be the HP level 4/5 protocols. Network Interface expects to see TCP/IP protocol for activity originating above it, or destined for layers above it.

(3) Alternate path routing when one link fails.

(4) Extended error recovery so that when a remote session becomes unreachable temporarily that traffic for it is stored, and then forwarded when the link can be reestablished.

You will see this architecture in the DSN/DS that supports local area networks.

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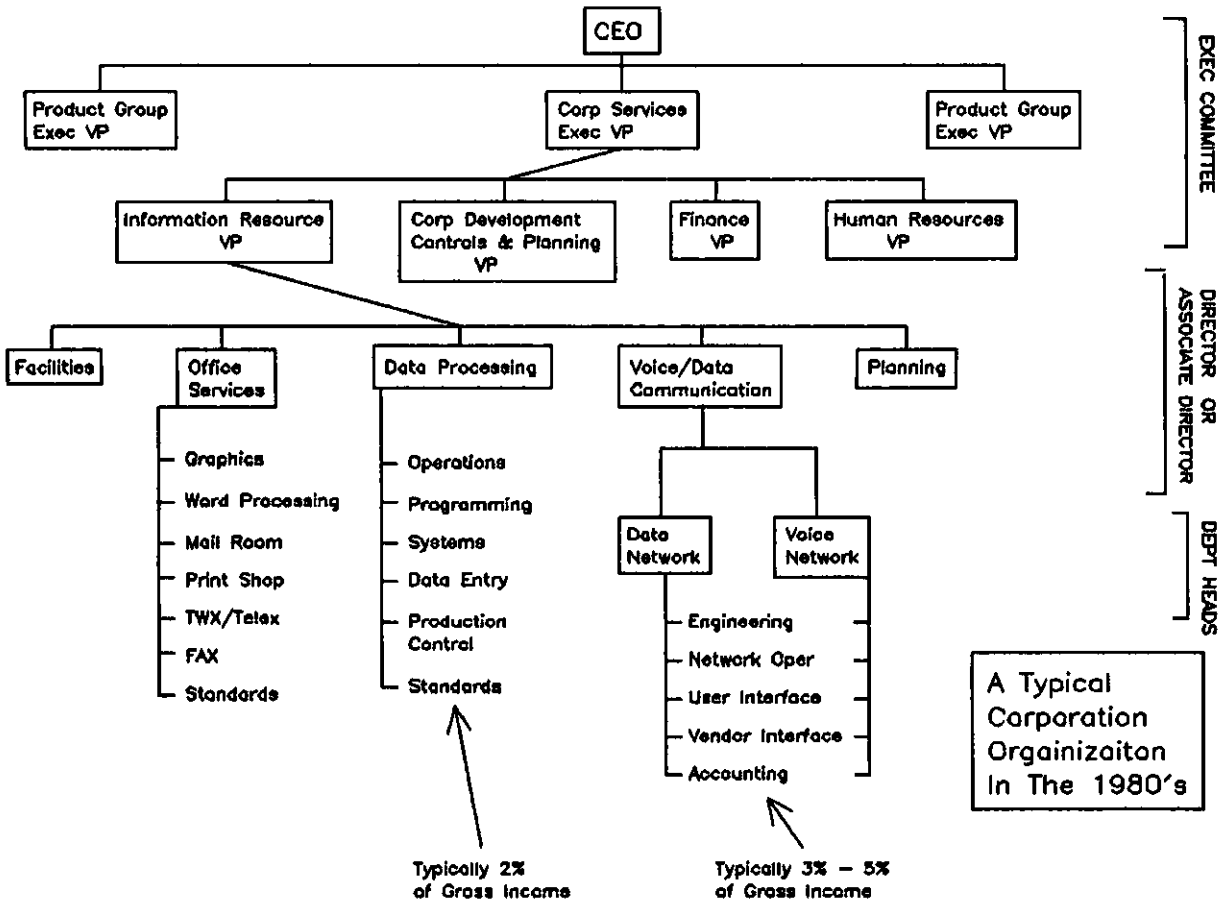

When we look at the sum of our installed base, HP sees its customer organizations reorganizing to reflect the span of control needed as companies really move into distributed computing. The data and voice networks of organizations are being merged to allow common management.

This slide presents what we feel is a trend in customer organization structure. In "Information Resource" executive is routinely being given control of the "network" and administrative organizations that most heavily use and/or administer the network.

More organizations now merge the voice and data network management than do not.

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NOTES: