HP StarLAN Networking

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Introduction

Hewlett-Packard has received considerable attention over the past few months after announcing a 10 Mbps LAN that runs over unshielded twisted-pair wire: HP StarLAN 10. In addition, HP has been recognized for its leadership role in developing an IEEE standard for this technology. This paper discusses the two networking solutions available from HP based on a star topology and unshielded twisted pair wiring: HP StarLAN and HP StarLAN 10.

HP's site wiring architecture follows a distributed star topology which is compatible with existing telecommunication systems. HP StarLAN is a low cost, 1 Mbps network solution. HP StarLAN 10 provides a 10 Mbps networking solution for environments where heavy network traffic and use of high performance workstations require a wider bandwidth. When combined with the OfficeShare Family of Network Software and Business System Plus, users can take advantage of shared data and resources and the best PC/Mini integration in the industry. [1]

This paper includes information about how these networking links can be used to meet organizational needs providing users cost effective access to information and resources. It will also discuss how HP's commitment to standards has influenced these products and review some configuration information on HP StarLAN, HP StarLAN 10 and mixed cable networks. This paper is organized into the following sections:

- Topology and Wiring
  - Topology Advantages
  - HP SiteWire Architecture
- Meeting Organizational Needs
  - HP StarLAN and StarLAN 10 capabilities
  - Advantages of the HP Solution
  - Scalability of HP Networks
  - Performance
  - Commitment to Standards
- HP StarLAN, HP StarLAN 10 and Mixed Cable Networks
  - HP StarLAN
  - HP StarLAN 10
  - Mixed Cable Networks
- Summary

Topology and Wiring

The wiring infrastructure of a building or campus is the foundation upon which any well conceived network design must rest. If this foundation is inadequate it is impossible to build an effective, flexible and manageable network solution.

While the cost of network user interface hardware and software has been decreasing significantly, the cost of network cabling has remained relatively constant. In addition, building wire has a life span two to six times greater than the equipment it connects, increasing the strategic importance of wiring. Because of this, the choice of wiring media is one of the most important long-term decisions management can make.

To aid in this decision, HP has developed a complete set of communications wiring guidelines, products and services, called HP SiteWire. HP SiteWire adheres to an open, multi-vendor wiring foundation and is based on emerging industry standards. For both StarLAN and StarLAN 10, HP's site wiring architecture follows a distributed star topology compatible with existing telecommunication systems.

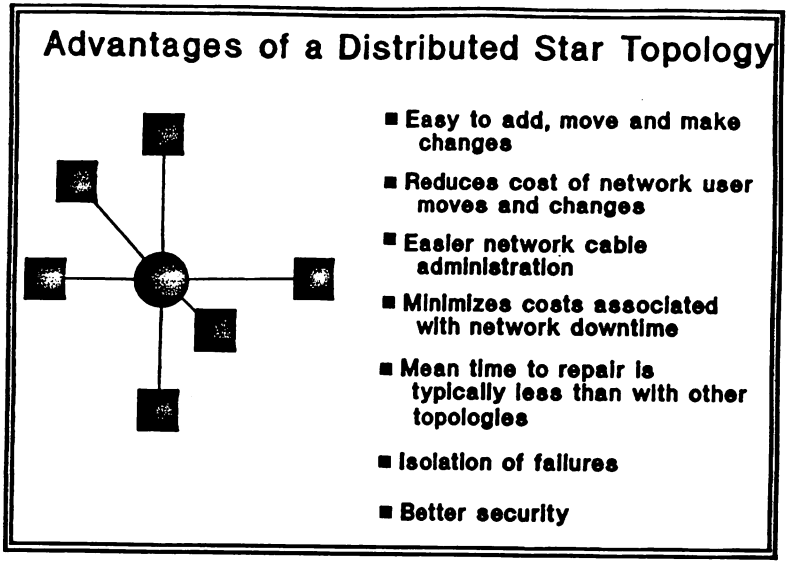

Diagram 1

Advantages of a Distributed Star Topology

As mentioned, HP StarLAN and HP StarLAN 10 use a distributed star topology. A star tolopogy connects individual nodes to a central device which performs all the logic and switching functions required of the system. Star topologies provide a number of benefits including the following items:

Easy to add, move and make changes:

Because wiring closet management using cross connect blocks is centrally managed, network managers are provided with the most simple, expedient method to add or move LAN nodes.

Reduces cost of network user moves and changes:

The cost of user moves and changes can be reduced with a star topology and unshielded twisted pair wire from an average of $1,000 - $1,500 for coaxial cable changes to $200 -$300 per move or change.[2] A savings of about 80%. Most locations are already wired and as a result the cost of moves and changes drops significantly.

Minimizes costs associated with network downtime:

With the auto-segmentation capability of the hub, faults are usually be contained to a single node, rather than impacting the entire network

Mean time to repair is typically less than with other topologies:

Again, troubleshooting is more centralized, with all nodes connecting to a central hub.

Better security can be provided with a Star topology:

Users cannot add themselves to the network without accessing a port on the Hub. The Hub is typically located in the wiring closet which can be locked.

HP SiteWire provides a wiring infrastructure that will meet the requirements for voice, data and office products. The same wiring system that supported only the phone system can now include support for users' data and voice applications.

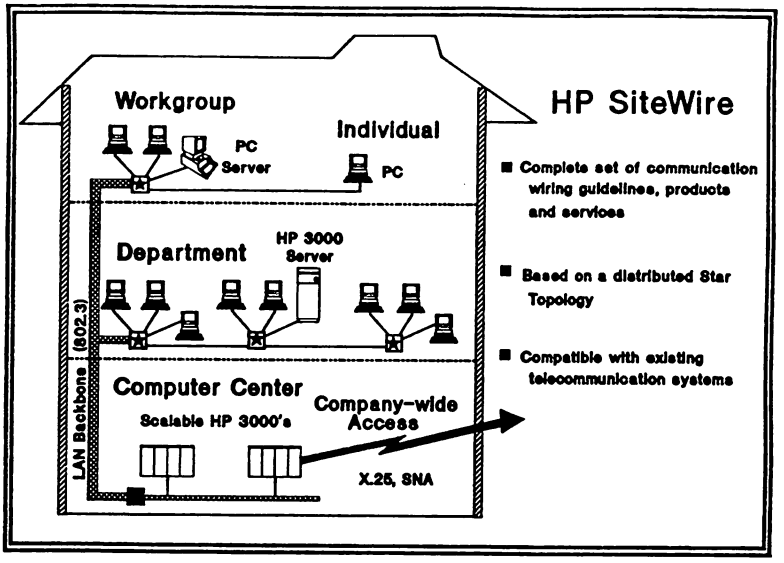

Diagram 2

HP SiteWire Architecture

HP SiteWire Architecture

HP SiteWire architecture uses a thin or thick coaxial backbone cable running horizontally and/or vertically through a building, connecting horizontal subnets of unshielded twisted pair or coaxial cabling, depending on the environment.

There are numerous benefits to using of unshielded twisted pair wiring in the work area compared to shielded twisted pair wiring or coaxial cable.

Lower cost and ease of installation:

Unshielded twisted pair cable costs less and is easier to install. The wire requires less physical space than coax or shielded twisted pair wire, making installation easier and requiring less space in ducts and satellite closets.

Flexibility:

Unshielded twisted pair wire is more pliable than coaxial or shielded twisted pair wire. The pliability of the wire makes installation of the wire easier. Ease of installation is significant as labor costs are the greatest component of cable installation.

Use of existing wire:

The existing unshielded twisted pair voice system in a building may also be able to support data. This virtually eliminates the large cabling cost component of a LAN and the need to support two wiring infrastructures.

Ease of network cable administration:

Administration of phone systems is a familiar concept to many companies. In addition, only a single type of wiring needs to be administered.

As network hardware and software costs continue to decrease compared to the relatively constant cost of wiring, the cost of adding a LAN to an appropriately cabled building will also continue to drop.

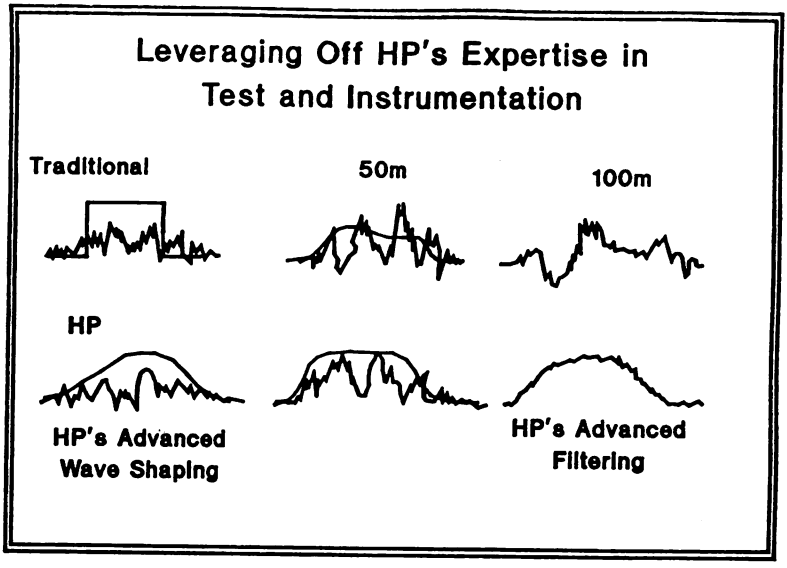

Diagram 3

Wave Shaping/Filtering

HP has addressed several technological challenges in order to provide a high-speed networking solution over unshielded twisted pair wire; these include: attenuation (weakening of the signal strength), radio frequency interference, and protection from electromagnetic susceptibility. HP has employed its technical expertise in test and instrumentation to discover techniques that allow a reliable transmission rate of 10 Mbps over unshielded twisted pair wire. Wave shaping and filtering techniques have been used to preserve the signal integrity

while meeting FCC emissions requirements. Through the use of these techniques, HP can ensure an effective solution.

When you want to utilize an existing unshielded twisted pair wiring system whose condition is unknown, a wire test may be necessary. HP offers a unique service, called HP WireTest, which strengthens our StarLAN offering by providing you with an evaluation of the suitability of your existing unshielded twisted pair wiring for a StarLAN or StarLAN 10 network. The availability of HP WireTest reinforces HP's commitment to the development of complete networking solutions.

Your wiring is an investment. HP StarLAN and HP StarLAN 10 allow you to make the most of this investment by using it for LAN connectivity while not impacting the telecommunication services it currently provides.

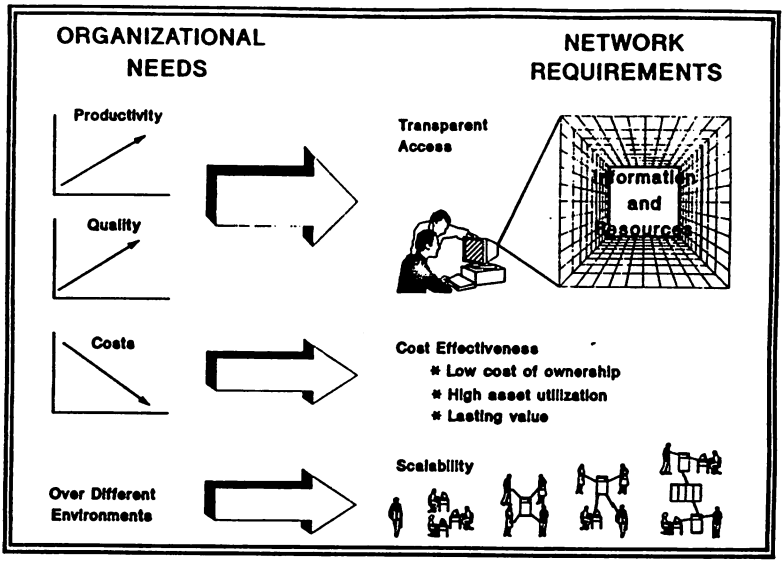

Diagram 4

Organizational Needs/Network Requirements

Meeting Organizational Needs

The HP AdvanceNet Strategy addresses organizational needs through effective networking solutions providing you with a scalable, cost effective window into the world of information and resources and ensuring a growth path for the future. StarLAN and StarLAN 10 provide the physical connection that gives users access to this world of information and resources.

HP StarLAN and HP StarLAN 10 Capabilities

When HP StarLAN or HP StarLAN 10 are used with the OfficeShare Family of Networking Software and Business System Plus, you benefit from a star topology and unshielded twisted pair wiring and have access to powerful capabilities from a friendly PC interface. PC applications such as Lotus 1-2-3 (R) and AdvanceMail are combined with HP 3000 applications such as Information Access, HP DeskManager, and Resource Sharing to provide excellent PC/Mini integration. Users have access to the resources and information they require, all from a single familiar interface, the PC.

Specific capabilities offered by this solution include:

- Transparent, programmatic PC access to information and applications on the HP 3000

- Access to transparent disc and file sharing

- Printer and plotter sharing with spooling

- Unattended backup and restore

- PC interface to a powerful electronic mail system

- Terminal emulation with file transfer from personal computers to HP 3000 Systems

- Transparent disc and file sharing and printer and plotter sharing with spooling on a personal computer server.

This combination of network and system hardware and software also benefits the MIS department by providing ease of installation, simple support, automatic updates to PC software, and centralized backup.

Advantages of HP's Solution

The use of a solution that combines a star topology and unshielded twisted pair wire with powerful applications such as HP OfficeShare and Business System Plus also provides a cost effective solution. Areas that illustrate this include:

Existing wiring may be used for networking:
The large cabling cost component of a LAN may be eliminated entirely.

Network management and troubleshooting is simplified:
With a star topology troubleshooting is more centralized, better security is provided; faults can be contained to a single node; and adds, moves and changes are greatly simplified. In addition, Business System Plus provides a utility that simplifies the addition of PCs onto a network.

Shared peripheral utilization:
People can make better use of expensive peripherals when they are easy to share.

Centralized PC software update services:

PC software management is centralized with Business System Plus. Saving considerable time. In addition, centralization of PC software updates provides version consistency throughout an organization.

Access to electronic mail:

Electronic mail provides cost savings by eliminating phone tag. The increased effectiveness of communication can improve the decision-making process.

Data backup:

We recognize that it is vital that companies protect against loss of data. Business System Plus provides automatic backup capability for personal computers ensuring protection against data loss.

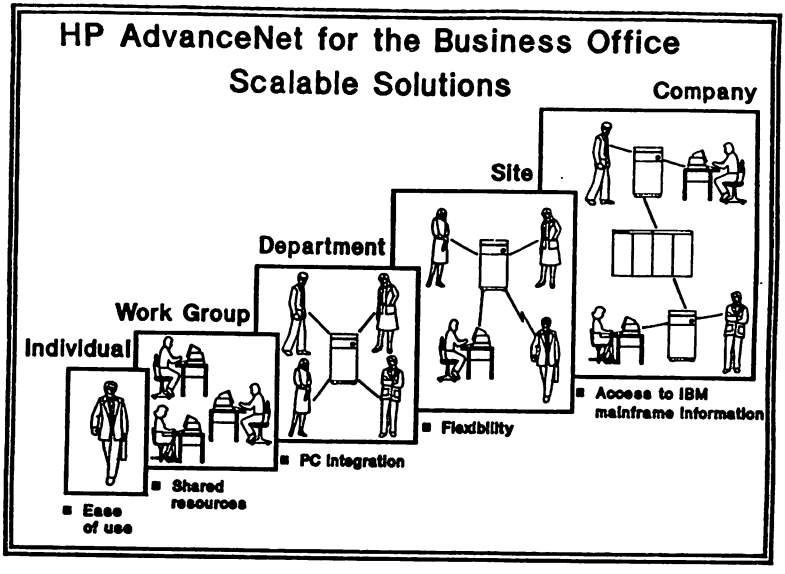

Diagram 5

Scalable Solutions

Scalability of HP Solutions

HP StarLAN and HP StarLAN 10 networks are scalable, providing growth capability as your workgroup grows and additional LAN connectivity and capabilities are required. Additional users and PC servers can be added as required. Users can begin using a PC Server and migrate to an HP 3000 server when they need increased functionality and access to additional resources and data. Users of HP StarLAN

and HP StarLAN 10 can access information and peripherals residing on multiple hosts. This allows users to consolidate information which may be located on different systems, aiding effective timely decisions. Hewlett-Packard is committed to providing intuitive, transparent user interfaces to complex, powerful capabilities. As capabilities and equipment are added to the network, the impact on users is minimized, requiring minimal re-training and down time.

HP can also provide your company with comprehensive network support services. These services include analysis of your company's needs, assistance in defining a network strategy that addresses those needs, network design services, on-going training, network management and maintenance services.

Performance

In providing networking solutions, performance is an important consideration. The primary factors affecting LAN performance are:

- The network software being used

- The types of applications each user requires

- Disc performance

- The number of users requiring simultaneous access across the network.

- The CPU speed of the processors being used

- The load on each system from non-network applications

In an office environment a 1 Megabit-per-second link provides ample capacity for typical user activity. A user on a small network may perceive little or no performance difference between the 1 Mbps speed of HP StarLAN and the 10 Mbps speed of HP StarLAN 10. StarLAN 10 provides performance benefits in environments where heavy network traffic, a large number of nodes or high performance workstations exist.

Commitment to Standards

HP's commitment to standards is reflected in both StarLAN and StarLAN 10. HP StarLAN conforms to the IEEE 802.3 (Institute of Electrical and Electronic Engineers) Type1BASE5 specifications. Hewlett-Packard has been leading the standards effort to develop an IEEE standard for a 10 Mbps LAN over unshielded twisted pair wire, currently known as 10BASET. The HP implementation of this technology is now the basis for the 10BASET standard, meeting IEEE economic and technical feasibility criteria and receiving IEEE approval with respect to broad market potential, compatibility, and distinct identity.

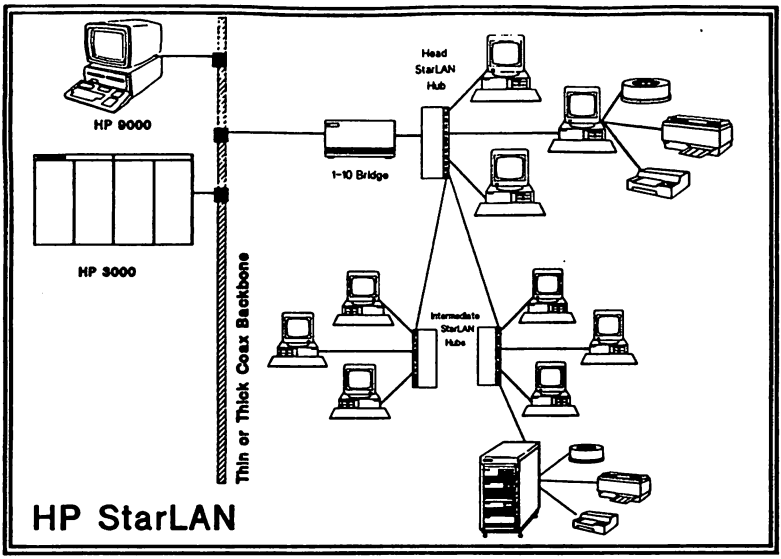

Diagram 6

HP StarLAN

HP StarLAN, StarLAN 10 and Mixed Cable Networks

HP StarLAN

HP StarLAN provides a low-cost networking solution over unshielded twisted pair wire for Business Office Environments.

The hardware components that comprise an HP StarLAN network are shown in Diagram 6. In an HP StarLAN network, each PC user workstation and PC server requires an HP StarLAN interface card and the HP OfficeShare User Services and Configuration/Diagnostics Software. Each PC server requires Server Software. HP Micro 3000 systems can attach directly to a StarLAN network with a LAN Interface Controller (LANIC). PC user workstations, Micro 3000s and PC Servers (nodes) are connected to the HP StarLAN Hub with unshielded twisted pair cable. The maximum distance between a node and an HP StarLAN Hub is 250 meters. Hewlett-Packard supports two levels of hubs with HP StarLAN. The head hub can support connections to a maximum of 11 nodes or intermediate hubs. Each intermediate hub can support connections to 11 nodes. The maximum number of nodes that can be connected to establish a standalone StarLAN network is 50.

To interconnect HP StarLAN subnetworks, which include the head hub, intermediate hubs and the nodes below the header hub, use coaxial backbone cabling and the HP StarLAN-10 Mbps 802.3 Bridge. The bridge supports communication between nodes on a StarLAN subnetwork and other systems or subnetworks connected to the backbone cable such as ThinLAN or StarLAN 10. The HP StarLAN-10 Mbps 802.3 Bridge also provides important address filtering, ignoring traffic which is not intended for the subnetwork. Nodes on a StarLAN subnetwork can transparently communicate with nodes on a ThinLAN or StarLAN 10 subnetwork.

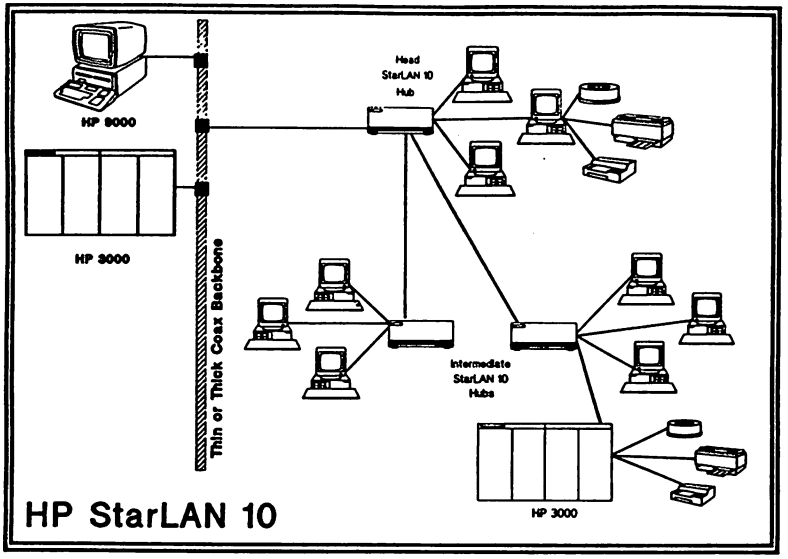

Diagram 7

StarLAN 10

HP StarLAN 10

StarLAN 10 provides a high speed twisted pair solution in Business Office, Engineering and Manufacturing environments and transparently supports a variety of networking software. The hardware components that comprise an HP StarLAN 10 network are illustrated in Diagram 7.

Each Vectra or IBM PC in a StarLAN 10 network requires an HP StarLAN 10 Interface Card. The StarLAN 10 Interface Card has one 8-pin modular plug and one 6-pin modular plug, providing for PC and phone connectivity. Other computer systems (including the HP 3000, HP 1000, and HP 9000) require a LAN interface card with an IEEE standard 15-pin AUI connector. An HP Twisted-pair MAU provides the connection from the AUI port on the LAN Interface Card to the twisted pair wire. Each node is tied to the HP StarLAN 10 Hub with unshielded twisted pair cable.

The maximum supported distance between a node and an HP StarLAN 10 Hub is 100 meters. Hewlett-Packard supports three levels of Hubs with StarLAN 10. However, we recommend limiting hubs to two levels. IEEE limitations specify a maximum of four StarLAN 10 Hubs between any two communicating nodes. (Each StarLAN 10 Hub is considered to be a full repeater.) When cascading three levels, this limitation is quickly reached. Each StarLAN 10 Hub can support twelve twisted pair and one AUI connections.

The maximum number of nodes supported by a 2-level StarLAN 10 subnetwork is 144. Multiple subnetworks can be linked via a 10 Mbps coaxial based backbone cable. This connection is made via a MAU and tap or a 10 Mbps-10 Mbps LAN Bridge may be used to connect to the backbone providing filtering capabilities for the subnetwork.

Mixed Cable Networks

HP networks are designed so that several types of network cable can be combined into one logical network. In Diagram 8, any computer can communicate with any other computer on this network. The computer can use servers, transfer files, and use terminal access. For example, a ThinLAN user could share a printer on the StarLAN 10 PC server or store files on the HP StarLAN PC server disc. Mixed cable networks may be useful when you wish to:

- Connect StarLAN, StarLAN 10 and ThinLAN subnets together directly.

- Provide access to an HP 3000, 9000 or 1000 connected to a backbone cable to users on a subnetwork.

- Connect StarLAN subnets together for more than 50 users or 1000 meters.

- Connect two-level StarLAN 10 subnets together for more than 144 nodes or 400 meters.

- Connect ThinLAN subnets together for more than 116 nodes or 740 meters.

- Connect remote PCs to an HP 3000 server via SERIAL Network along with local PCs on StarLAN, StarLAN 10 or ThinLAN.

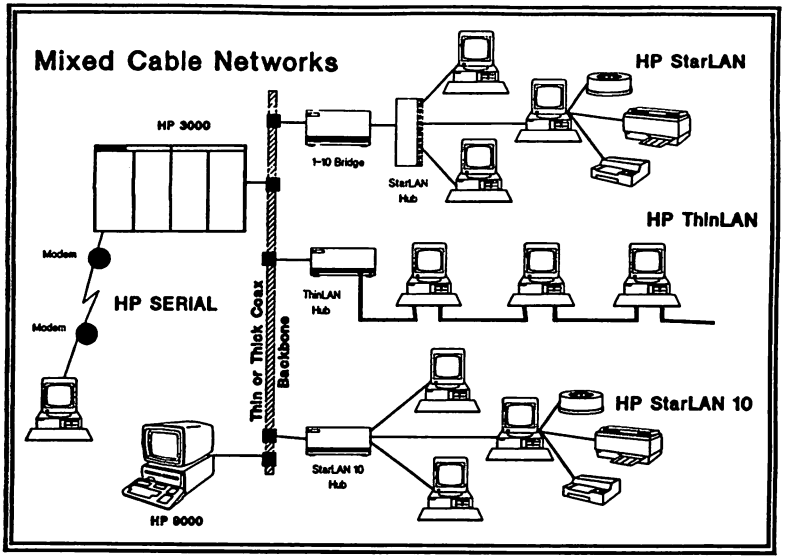

Diagram 8

Mixed Cable Networks

As shown in Diagram 8, a StarLAN subnetwork can be attached directly to ThinLAN backbone cable with a StarLAN-10 Mbps 802.3 Bridge with a ThinMAU. This connection can also be made using a ThickLAN backbone.

A StarLAN 10 subnetwork can be attached directly to ThinLAN or ThickLAN backbone cable. A MAU and tap are run from the backbone cable to the AUI port on the StarLAN 10 Hub.

A ThinLAN subnetwork can be connected to a ThickLAN backbone via an HP ThinLAN Hub. A MAU and tap are run from the ThickLAN backbone cable to the AUI port on the HP ThinLAN Hub.

Summary

HP StarLAN and HP StarLAN 10 provide several advantages through the use of a Star topology and unshielded twisted pair wire. When combined with OfficeShare software and Business Systems Plus applications a powerful, cost effective, scalable solution that effectively meets the needs of users in a Business Office environment is provided.

[1]M. Kerstettrer, "A Product Model for Departmental Computing: How do the Major Vendors Stack Up?", Small Computer Systems (Gartner Group, Inc., Feb. 25, 1987, p. 34.

[2]"Structured Distribution Systems", Local Area Communication (Gartner Group, Inc., January 30, 1987, Key Issues K-CBL-319.1