

APLNET – A LOCAL AREA COMPUTER NETWORK

APLnet is a high data rate system developed at APL to interconnect dissimilar computers in order to share computer resources and functions. It can be expanded to include additional computers from a variety of vendors.

BACKGROUND

Modern computer systems such as the IBM 3033, VAX-11, and CRAY-1 internally perform significant numbers of reliable data transfers and data manipulations. However, when data must be transferred at high rates between dissimilar computers or when the distance is greater than 200 feet between similar equipment, special hardware and software are required.

In the past, data communication between dissimilar computer architectures has required computer links that were both very expensive and technically difficult to implement and use. These systems were usually one of a kind, with many operational and maintenance limitations.

When either of the linked computers was modified or enhanced or a new release of software was installed, additional changes were usually required in the communications system, with an associated downtime to deal with the problems. If either computer is replaced (even with the same manufacturer's equipment), the communications link usually also needs to be replaced because of subtle differences between the hardware and software of the computer technologies employed and the design of later-generation equipment. This would include both hardware interfaces and the communications software.

The F. T. McClure Computing Center at APL, in conjunction with several other APL technical groups, has been studying the development of wide-bandwidth data communications for computers. A general-purpose computer networking technology is now available so that heterogeneous networks are a practical option.

WHY A NETWORK?

With increasing frequency, APL is engaged in projects for which distributed computing is a necessity. In the past, the transfer of data from one computer to another was an awkward process involving either the physical transport of magnetic tapes or the use of modems and low-speed telephone communications lines.

Applications that use distributed computing include image processing and the formatting and processing of large databases. An example of this work is the processing that involves the creation and manipulation of graphic images on the IBM 3033. The images (con-

taining up to a million bytes per frame) need to be viewed, processed, and/or printed on film or paper. In the past, these data from the IBM 3033 were stored on a magnetic tape and hand carried to another building for viewing, printing, and processing.

Resource sharing has become one of the main advantages of a computer network. Expensive and sophisticated peripherals need not be duplicated on each computer. With a network, the peripherals are available to all users of the network.

WHAT IS APLNET?

A network task force team was formed in 1980 to study, plan, and implement a general-purpose wide-bandwidth data communications system for the sharing of computer resources. Many types of computer networking architectures and systems designs were evaluated for use at APL. The results of these studies—the design goals—used in the development of a local area computer network are listed in Table 1. The boxed insert shows the components of the network that have evolved as APLnet.

Table 1—APLnet design goals.

The APLnet network was designed to

- Interconnect computers of various manufacturers, initially Digital Equipment Corp. and IBM
- Have high intercomputer data rates (up to 50 megabytes per second)
- Build on commercially available hardware and software
- Have high intercomputer communication data rates over distances up to 5000 feet
- Have expansion capability
- Provide user-friendly software protocols

The implementation of a unified Laboratory-wide local network for interconnecting computers, with well-defined and consistent user interfaces, has made distributed processing applications easier to implement, faster, and more interactive. In addition, a network makes feasible new applications and the sharing

APLNET COMPONENTS

HYPERchannel. Hardware to interconnect dissimilar computers. A high-speed 50 megabytes per second serial "bus" with intelligent node interface adapters, manufactured by Network Systems Corp. Almost any computer can be connected to the network adapters through its standard input/output interfaces or channels. The adapters manage the flow of data to

and from the attached computers and include a microcomputer that manages the buffering and formatting required on HYPERchannel.

NETEX software. Designed to connect the HYPERchannel adapter to the associated computer's operating system and to provide a user interface. Netex, developed by Network Systems Corp. and available for most

popular computers, provides single-vendor support for both hardware and software.

APLnet. The combination of equipment supplied by Network Systems Corp. and the APL-developed utilities and application programs that do the intercomputer communications and the data-conversion routines, and make the system convenient and easy to use.

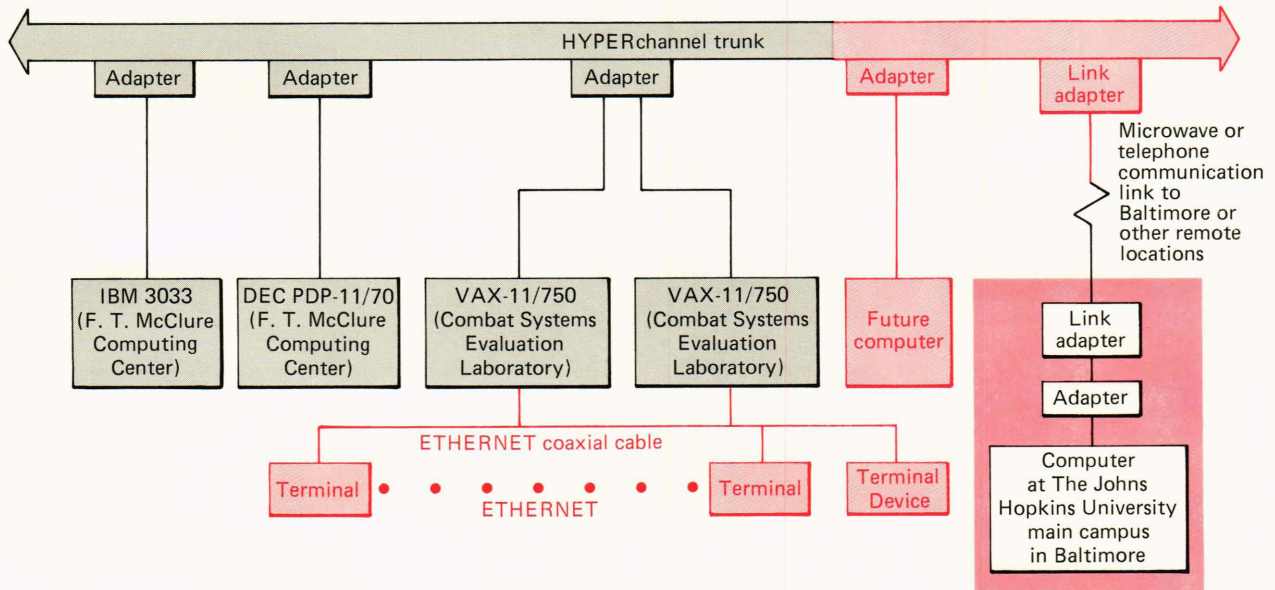


Figure 1—The block diagram of the current configuration of APLnet hardware is shown in black; the red sections illustrate how APLnet may be expanded. The portion in light red is a diagram of how this network may be expanded to include additional computers and access to ETHERNET devices at APL and to computers at remote locations. Although the equipment in the dark red box illustrates a link to The Johns Hopkins University campus in Baltimore, the link could be to any place in the world with the appropriate microwave, telephone, or satellite communications.

of expensive peripheral equipment among various computer systems. Data conversion routines are provided that allow the translation and conversion of numbers or characters to the format needed for each computer.

The black portion of Fig. 1 is a block diagram of the current configuration of APLnet hardware, which connects computers in three different buildings via a 1200 foot coaxial cable.

APLnet is used daily to transfer data from the IBM 3033 to the PDP-11/70, which is in a separate building, for processing and use of the special peripherals

such as the Dicomed color film recorder and the multiple-pen CalComp drum plotter. The PDP-11/70 and VAX-11 also use the network—moving files between the systems—and such resources of the IBM 3033 as the laser printer.

With the advent of the ETHERNET network on the VAX-11, the APLnet will have additional resources available. Another natural expansion of the network would be to provide a remote link to The Johns Hopkins University. This could be implemented by means of a microwave link or high-speed telephone lines, as shown in Fig. 1.