A panel session—Small computers for data terminal network control

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Small computers in data networks

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Small computers, costing between, say $10,000 and $50,000 each, are rapidly proving to be very important elements in data communications networks. The value of these machines lies in their high speed data manipulation capability rather than in their computing power; in fact, the direct arithmetic capability rarely exceeds simple binary addition and subtraction.

The uses of these small computers can be grouped into two main areas:

1. Remote message concentrators and terminal controllers, and;
2. Communication interfaces for larger machines.

The primary function of remote concentrators is to reduce line costs by multiplexing the data from many low speed lines, up to 150 Baud, on to one or more medium speed lines. This function, by itself, can be achieved by many hardwired devices as well as by a stored program computer; however, the use of a computer with significant storage and data manipulation capability immediately brings many other advantages. Data can be blocked before transmission over the medium speed line, thus, normally eliminating demultiplexing at the large computer site, code conversion and data editing can take place, and various terminal control functions such as automatic answering, polling and error control can be implemented quite flexibly.

The system that Honeywell has implemented in conjunction with American Airlines on the Sabre reservation system is a good example of both concentration and terminal control (see Figure 1).

DDP-516’s with two Data Line Controllers interface to the two 2400 Baud lines used for data transmission and hub polling on the Sabre network. On the low speed side up to 60 IBM 1977 agents sets operating at 148.5 Baud are interfaced to the DDP-516 via a multi-line controller. The DDP-516 handles the functions of assembling data blocks, editing out meaningless blanks, responding to polling messages, and the generation and checking of error control information. A number of these remote concentrators have now been in operation for more than six months and they have demonstrated an improvement in response time of about 30 percent over the previous IBM 1006 hardwired terminal control.

Figure 1
From the collection of the Computer History Museum (www.computerhistory.org)
units. This is largely due to the data editing taking place in the DDP-516 so that redundant information does not have to be transmitted to Sabre or to the agents sets.

As an indication of the flexibility of the system it was found desirable to add a line printer since some of the reports required on a daily basis from Sabre took an inordinately long time to print on the IBM 1977, 15 character/second agents sets. The standard DDP-516 line printer was, therefore, added to the system, but since this is only an output device, it was not possible to treat it simply as a higher speed version of the 1977 terminal. The Sabre system always responds with a message directed to the terminal that made the request, so "output only" terminals are normally excluded. In this case, with the DDP-516 as the terminal controller, it is possible to monitor input messages from the appropriate agents sets and look for the code indicating that reply is required on the line printer. The message that is actually passed on to Sabre is then a modified version of the request which makes it appear to Sabre as though it had come from the line printer. Sabre then makes its reply back to the apparent originating terminal as usual, and the print-out appears as required on the line printer. This kind of modification would be a major undertaking with a hardwired controller.

The price of the DDP-516 system, with 12K of core, was approximately half that of the corresponding hardwired system. Price comparisons are, however, misleading and need to be considered in each individual situation. In particular, the programming costs need to be considered in relation to the design costs of a hardwired system and general comparisons only tend to be useful when significant quantities are being considered, say, above 10 or 20, so that one-time costs become minimal.

The second use for small computers in data communications, interfacing to larger computers, is illustrated by a number of applications in which DDP-516's and 416's have been interfaced to IBM 360/50 and 360/67, Honeywell H-1200 and 2200 and, perhaps, more interestingly, large scale DDP-516 systems.

The Honeywell H-1648 Time-Sharing System (see Figure 2) illustrates the use of a 4K DDP-416 computer to provide the communications interface to a pair of 32K DDP-516's which are providing a time-sharing service for up to 48 simultaneous users. The two DDP-516's, the Control Computer and the Job Computer, are normally fully occupied providing the time-sharing and computing operations required by users, while the DDP-416 is dedicated to handling the communications lines. The control computer is the heart of the system and provides the terminal users with the ability to create and manipulate files on the disc complex. When computing operations are required (rather than control or editing functions) such as compilation of a file or the running of an already compiled file, then the control computer schedules these tasks, provides core allocation and disc references for the job computer and initiates operation via the ICCU (Inter-Computer Communications Unit). The job computer allocates a predetermined time period (between 100 ms and one second) for the running of each job and if it is not completed within that time, swaps it out on to the disc and starts the next job. The I/O structure on the DDP-516 allows processing concurrently with transfers to and from the disc so that delays due to disc access time are not important.

The DDP-416 handles all communication functions and simply presents the control computer with strings of characters and an indication of the terminals from

![Figure 2](https://example.com/f2.png)

![Figure 3](https://example.com/f3.png)