



# WATER FACT SHEET

U.S. GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

## DISTRIBUTED INFORMATION SYSTEM

### INTRODUCTION

The Water Resources Division, U.S. Geological Survey (USGS), has the principal responsibility within the Federal Government for providing hydrologic information and for appraising the nation's water resources. Water Resources Division (WRD) offices nationwide require computer support for the efficient use and management of hydrologic data.

During 1982-85, the WRD installed over 70 large minicomputers in offices across the country to support its mission in the science of hydrology. These computers are connected by a communications network that allows information to be shared among computers in each office. The computers and network together are known as the Distributed Information System (DIS). The computers are accessed through the use of more than 1500 terminals and microcomputers.

### COMPUTATIONAL NEEDS OF WRD

The WRD has three fundamentally different needs for computing:

- o Data management;
- o Hydrologic analysis; and
- o Administration.

Data management accounts for 50 percent of the computational workload of WRD because hydrologic data are collected in all 50 states, Puerto Rico, and the Pacific trust territories. Streamflow is measured at about 11,000 locations, water levels are measured in 39,000 wells, and water-quality is sampled at over 14,000 locations. An extensive program to collect water-use data has also been established. All of these various types of data are stored in computerized data bases.

Hydrologic analysis consists of 40 percent of the computational workload of WRD. Computer simulation is used to predict the movement of water and contaminants both in surface and ground water. The simulation programs require large amounts of both computer storage and time to execute. The related tasks of data entry, statistical analysis, and graphical analysis also require large amounts of computer resources.

Cost accounting, payroll, personnel records, and planning for WRD programs occupies an estimated 10 percent of the computer workload.

### NEED FOR DISTRIBUTED COMPUTING

Before the DIS was installed, WRD personnel used main-frame computers, mainly at USGS headquarters. Although a substantial amount of work was done on these computers, access was difficult because most WRD users are not located at headquarters. The cost of communicating to the main-frame computers from the field was high, the transmission of data was slow, and access was inconvenient.

Distributed processing meets the demand for increased computing capabilities without a prohibitively high cost of communications. As implemented by the WRD, each major office has its own large minicomputer, which is powerful enough to allow that office to do most of its work on site. At these major offices, high-speed interactive terminals are connected directly to the computer without the need for costly telecommunications links. WRD offices without computers must communicate with the nearest computer, but because this distance is generally short, the cost of communication is small.

The DIS communications network allows offices to share information and programs when needed. Identical

programs and data can be used on all of the DIS computers, so one office can develop a program for use by all. Offices can share data when working on problems of a regional or national nature. Even so, the volume of information that is shared among offices over the DIS network is small when compared with the volume required if all offices used main-frame computers. A relatively inexpensive communications system connecting all the computers is all that is needed.

### THE COMMUNICATIONS NETWORK

As stated before, the DIS communications network connects all of the WRD minicomputers, allowing a user of any of the DIS computers to connect to any other DIS computer. The network also allows smaller offices that don't have their own computer to connect to the nearest office that has one. The network is connected at all times, and no dialing is required. A user on one computer enters a simple command in order to connect to another computer. The user can then use the remote computer as if it were a local computer, except that the flow of information is generally slower.

The DIS communications network is shown on the map. The cost of the network is minimized by using what is called a "packet-switched network." Messages from many users are carried on the same communications line. Communications equipment controls the flow of messages (packets) among users at the various sites and ensures that the correct message gets to the correct user. Four regional switching sites are connected, and each office that has a computer connects into the nearest regional site. Smaller offices without computers connect to the nearest office with a computer. The communications software determines the best route to use when a user on one site requests to connect to another. This connection method minimizes the length and number of communications lines, and is cost effective.

For more information about the DIS, write to:

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## DISTRIBUTED INFORMATION SYSTEM NETWORK MAP

