Evening sunlight traces a network of switches at the Santa Fe Railway’s Barstow, Calif., classification yard. The railroad, linking major Midwestern cities with destinations throughout California, needed to solve some problems not unlike those facing digital communications engineers: efficiently moving long strings of data (here, cars in a train) from \( n \) input ports (lines from originating stations) to \( n \) output ports (destinations) via a finite number of transmission circuits (here, a double-track mainline from Los Angeles to Chicago).

To solve the problem, Santa Fe engineers designed automated classification yards in Chicago, Kansas City, Pueblo, and Barstow to switch the “data” for more effective “transmission.”

At Barstow, trains arriving from Northern and Southern California are broken up and the cars are classified to provide optimum car arrangements for shipment east. (“Classification,” in the railroad sense, means rearranging strings of cars so they can be placed in the right trains going to the right destinations.) Trains incoming from points east are similarly classified for individual California destinations. The various classification yards, combined with Santa Fe’s switching capability all along the 2000-mile Los Angeles to Chicago mainline, can be viewed as a far-flung switching network permitting rerouting of cars for optimum traffic flow.

The $50-million Barstow facility, with 320 computer-controlled switches, can classify more than 2700 cars daily at peak capacity. Designed for flexibility, the switching network allows concurrent handling of over 75 blocks of cars going in three directions.

Computer control is central to the Barstow operation. Automatic Car Identification, or ACI—a trackside scanning system which reads coded labels on passing cars—and input data provided by personnel in both the Barstow Yard and throughout the 12,000-mile Santa Fe system provide a real-time data base of traffic information.

Stored and maintained at a central computing facility in Topeka, Kansas, this information is accessed by Barstow’s IBM 370/135. By means of CRTs in the yard tower, supervisors obtain up-to-date reports on incoming traffic down to the individual carload and destination level.

Using the data base, the 370 passes information about the handling of cars to a network of four Data General Nova minis. These machines control the actual classification of cars. Three of the Novas set the switches, brake the cars, and monitor the whole process, with the fourth serving as a standby unit. After the cars are classified, yard personnel and ACI provide updated information about outbound cars to the 370, which passes the data back to Topeka.

Santa Fe also relies on programs designed to minimize the amount of switching needed to classify cars (see diagram at left). The programs seek strategies for switching the most cars with the least moves, while preserving the best “consists”—the railroader’s term for the configuration of cars in a train—in terms of destinations and timetables.

Computer control plays an increasingly important role throughout Santa Fe’s rail network. The Barstow Yard shows how computer techniques can boost the efficiency of a transportation mode already notable for squeezing the most ton-miles out of the least fuel.