William C. Y. Lee

Mobile Cellular Telecommunications

ANALOG AND DIGITAL SYSTEMS

SECOND EDITION

Mobile Cellular Telecommunications

Analog and Digital Systems

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equipment. A local-area network (LAN) offers connectionless, i.e., "best effort", service for transferring variable size data packets. The term *best effort* means that the lost or corrupted packets are not retransmitted. Users are not required to establish a connection before submitting data for transmission, nor are they required to define the traffic characteristics of their data in advance of transmission.

Connectionless service. ATM switches are connection-oriented. A connectionless server (a packet switch) attached to an ATM switch can provide connectionless service. The connectionless servers are connected together with virtual paths through the ATM switches to form a "virtual overlay network," the same as is used for narrowband ISDN.

Star configuration. The physical topology of a LAN has migrated from the ring and multidrop toward the star (hub) configuration. As the bandwidth requirement of LAN approaches the gigabit per second range, switched star topologies are the most likely to be chosen in the commercial environment.

ATM packet-switching techniques. ATM is a high-speed packet-switching technique using short fixed-length packets called *cells*. Fixed-length cells simplify the design of an ATM switch at the high switching speeds involved. The short fixed-length cell reduces the delay, and most significantly the variance of delay, which is *jitter,* for delay-sensitive services such as voice and video. Therefore, short fixed cells are capable of supporting a wide range of traffic types such as voice, video, image, and various classes of data traffic.

ATM applications

1. ATM multiplexing and switching technologies are used for the B-ISDN.
2. ATM offers LAN, a high-capacity network.
3. ATM's switching technique offers seamless access to private wide-area networking.

Connection-oriented service. All ATM cells belong to a preestablished virtual connection. All traffic is segmented into cells for transmission across an ATM network. The ATM standard or broadband ISDN defines a cell as having a fixed length of 53 bytes, consisting of a header of 5 bytes and a payload of 48 bytes. Each cell's header contains a virtual channel identifier (VCI) to identify the virtual connection to which the cell belongs. An ATM switch will handle a minimum of

several hundred thousand cells per second at every switch port. Each switch port will support a throughput of at least 50 Mbps, while 150 Mbps and 600 Mbps are proposed as standard ports. A switch, if it has more than 100 ports, is considered a large switch. The general structure of an ATM switch is shown in Fig. 17.8. In an ATM switch, cell arrivals are not scheduled. A number of cells from different input ports may simultaneously request the same output port. This event is called *output contention.* A single output port can transmit only one cell at a time. Thus, only one cell can be accepted for transmission and others simultaneously requesting that port must either be buffered or discarded. Therefore, the most significant aspects of the ATM switch design are (1) the topology of the switch fabric, (2) the location of the cell buffers, and (3) the contention resolution mechanism.

Switch fabric. A switch fabric can be based on time division and space division.

1. *Time division.* All cells flow across a single communication highway shared in common by all input and output ports. The communication highway may be either a shared medium such as a ring or a multidrop bus, or a shared memory as shown in Fig. 17.9. This single shared highway fixes an upper limit on the capacity for a particular implementation.
2. *Space division.* A plurality of paths is provided between the input and output ports. These paths operate concurrently so that many cells may be transmitted across the switch fabric at the same time.

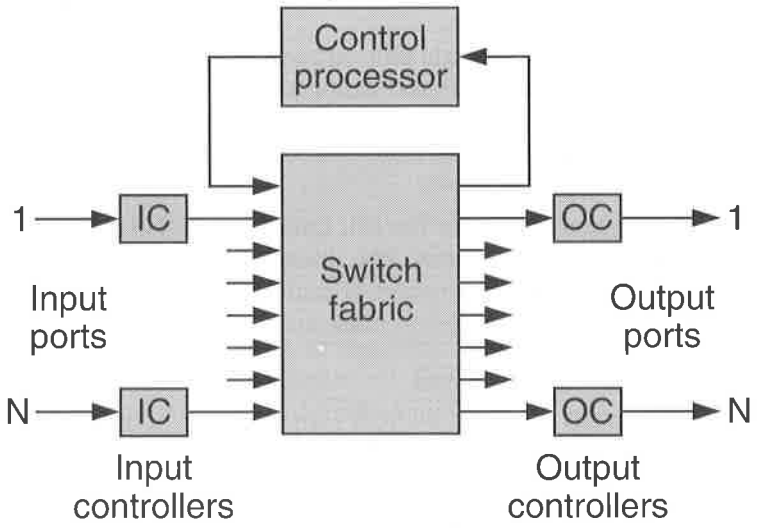

Figure 17.8 General structure of an ATM switch.