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Time Division Switching

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ABSTRACT

Time Division Multiplexing is a method of transmitting and receiving independent signals over a common signal path by means of synchronized switches at each end of the transmission line so that each signal appears on the line only a fraction of time in an alternating pattern. This form of signal multiplexing was developed
in telecommunications for telegraphy systems in the late 1800s, but found its most common application in digital telephony in the second half of the 20th century. This paper describes the various time division switching techniques.

1.INTRODUCTION

Time-division multiplexing was first developed for applications in telegraphy to route multiple transmissions simultaneously over a single transmission line. In the 1870s, ÉmileBaudot developed a time-multiplexing system of multiple Hughes telegraph machines.In 1953 a 24-channel TDM was placed in commercial operation by RCA Communications to send audio information between RCA's facility at Broad Street, New York and their transmitting station at Rocky Point and the receiving station at Riverhead, Long Island, New York. The communication was by a

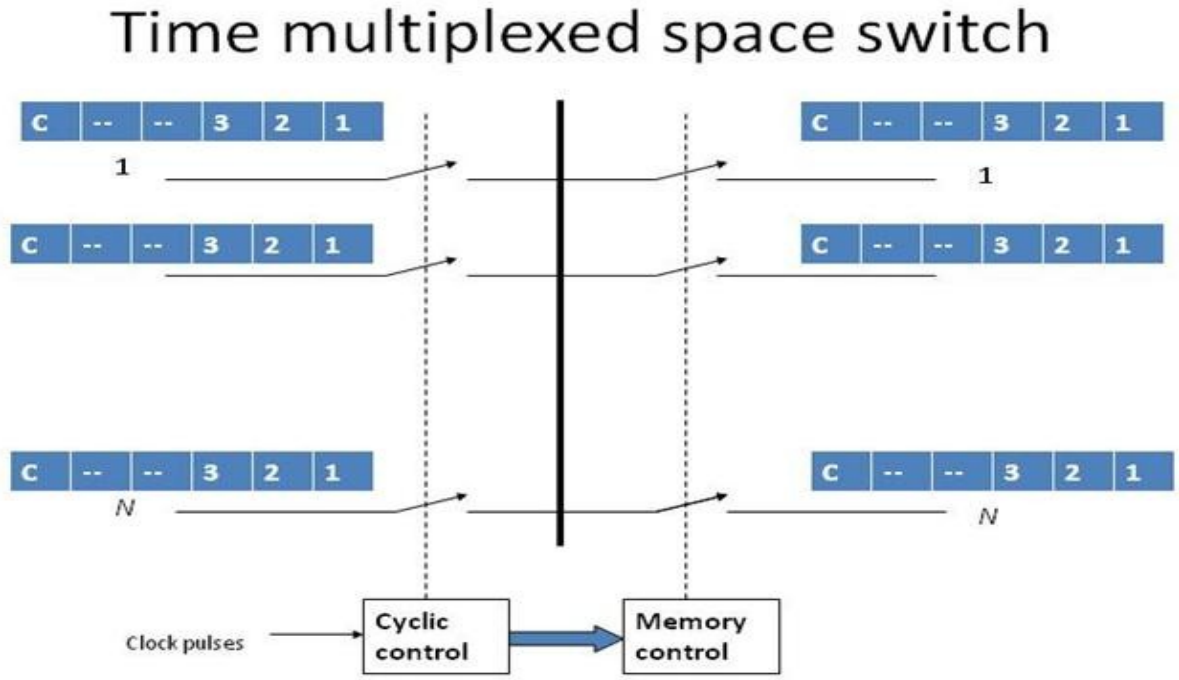
microwave system throughout Long Island. The experimental TDM system was developed by RCA Laboratories between 1950 and 1953.In 1962, engineers from Bell Labs developed the first D1 Channel Banks, which combined 24 digitized voice calls over a 4-wire copper trunk between Bell central office analogue switches. A channel bank sliced a 1.544 Mbit/s digital signal into 8,000 separate frames, each composed of 24 contiguous bytes. Each byte represented a single telephone call encoded into a constant bit rate signal of 64 kbit/s. Channel banks used a byte's fixed position (temporal alignment) in the frame to determine which call it belonged to.

2. TYPES OF TIME DIVISION SWITCHING

2.1 TIME MULTIPLEXED SPACE SWITCHING

The switch that we have just studied is known as a Space Switch. This is a Time Multiplexed Space switch. When electronic switch is used, it is called as Electronic Switching System ESS. It became popular when the switch is TMSS. It is not digital switching. These switches are required in transit exchanges. Here, the inlets and the outlets are trunks which carry time division multiplexed data streams. Time multiplexed switches do not provide full availability. Each incoming trunk carries multiplexed samples form M different voice sources and each stream on the outgoing trunk is demultiplexed to M different destinations. Sources, trunks, destinations have one-to-one time relationship as follows: 1. sources and incoming trunks time slots 2. outgoing trunk time slots and the destinations 3. time slots of incoming and outgoing trunks The sample of the source I is always carried in time slot I of the inlet and time slot j of the outlet is

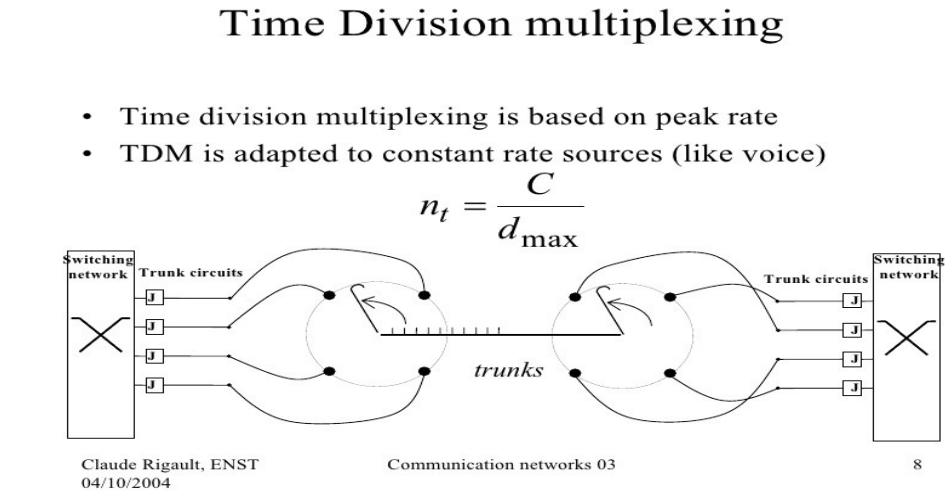
always demultiplexed to destination j. the time slot k of any incoming trunk is transferred to time slot k on any outgoing trunk. As a result, a voice sample of slot I from any inlet cannot be transferred to slot k of any outlet (i!= k). a sample from input slot I can only be transferred to destination I of one or more outlets. In other words, interchange of samples among different time slots is not possible. Thus, the switch does not provide full availability. In every time slot, up to N or M samples are switched simultaneously. The control store has N addresses corresponding to N vertical outputs with each address selecting one gate in each vertical output.



2.2 TIME MULTIPLEXED TIME SWITCHING

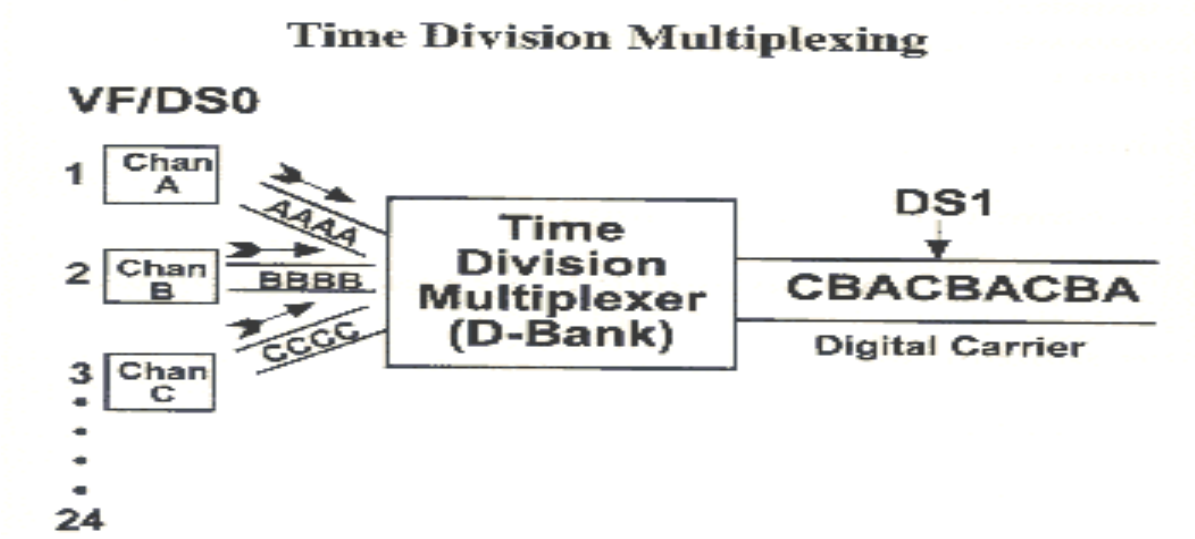
In the 1960s Bell Labs introduced the Time switch or Digital switch. This switch is nothing but a delay device. So a memory can be used as a switch. Time multiplexed time switches permit time slot interchange (TSI) of sample values. In TSI, a speech sample input during one time slot maybe sent to the output during a different time slot. Such an operation necessarily implies a delay between the reception and the transmission of a sample. The switch is organised in the sequential write/random read fashion. The time slot duration tTS is given by tTS = 125/M. The time slot clock runs at the time slot rate, i.e. at the rate of one pulse every 125/M microseconds. The time slot counter is incremented by one at the end of each time slot. The contents of the counter provides location addresses for the data memory and the control memory; Data memory and control memory accesses take place simultaneously in the beginning of the time slot. Thereafter, the contents of the control memory are used as the address of the data memory and the data read out to the output trunk. The input sample is available for reading in at the beginning of the time slot and the sample is ready to be clocked in on the output stream at the end of the time slot

Time division multiplexing



2.3 BASIC TIME DIVISION TIME SWITCHING

Both voice and data can be transmitted using digital signals through the same switches. All modern circuit switches use digital time-division multiplexing (TDM) technique for establishing and maintaining circuits. Synchronous TDM allows multiple low-speed bit streams to share a high-speed line. A set of inputs is sampled in a round robin manner. The samples are organized serially into slots (channels) to form a recurring frame of slots. During successive time slots, different I/O pairings are enabled, allowing a number of connections to be carried over the shared bus. To keep up with the input lines, the data rate on the bus must be high enough so that the slots recur sufficiently frequently. For 100 fullduplex lines at 19.200 Kbps, the data rate on the bus must be greater than 1.92 Mbps. The source-destination pairs corresponding to all active connections are stored in the control memory. Thus the slots need not specify the source and destination addresses



3.CONCLUSION

These are the various techniques used in the mobile communication for efficient data transfers.

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