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(54) Title: METHODS AND APPARATUS FOR SWITCHING ATM, TDM, AND PACKET DATA THROUGH A SINGLE COMMUNICATIONS SWITCH

(57) Abstract: A network switch includes at least one port processor and at least one switch element. The port processor has an SONET OC-x interface (for TDM traffic), a UTOPIA interface (for ATM and packet traffic), and an interface to the switch element. In one embodiment, the port processor has a total I/O bandwidth equivalent to an OC-48, and the switch element has 12x12 ports for a total bandwidth of 30 Gbps. A typical switch includes multiple port processors and switch elements. A data frame of 9 rows by 1700 slots is used to transport ATM, TDM, and Packet data from a port processor through one or more switch elements to the same or another port processor. Each frame is transmitted in 125 microseconds; each row in 13.89 microseconds. Each slot includes a 4-bit tag plus a 4-byte payload. The slot bandwidth is 2.592 Mbps which is large enough to carry an E-1 signal with overhead. The 4-bit tag is a cross connect pointer which is setup when a TDM connection is provisioned. The last twenty slots of the frame are reserved for link overhead. Thus, the frame is capable of carrying the equivalent of 1,680 E-1 TDM signals. For ATM and packet data, a PDU (protocol data unit) of 16 slots is defined for a 64-byte payload. The PDUs are self-routed through the switch with a 28-bit routing tag which allows routing through seven switch stages using 4-bits per stage. Bandwidth is arbitrated among ATM and Packet connections while maintaining TDM timing.

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