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ATM Network Technologies

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Abstract: ***ATM networks use a range of technologies, including wired and wireless communication systems, advanced security features, and specialized hardware components to provide various financial services to customers. Traffic management techniques are also employed to ensure efficient use of network resources. ABR (Available Bit Rate) traffic management is a specific technique that allows the network to analyze traffic levels and adjust bandwidth allocation in real-time, ensuring optimal network performance. By implementing these technologies, ATM networks are able to provide a high-quality user experience while managing network traffic in an efficient and effective manner.***

I. INTRODUCTION

Asynchronous Transfer Mode is a high-speed networking technology. This would provide number of services WRT efficient data transfer, good video, and accurate voice. This is a switching method used by telecommunications networks which reduces information into packets, fixed-sized cells using asynchronous time-division multiplexing. This provides both Real-time as well as Non-Real Time Services for transferring data. It occupies high Bandwidth and low delay, which is used in Telecom, media, and much other industries, ATM networks are guaranteed to operate effectively and reliably.

In the following review, we shall survey about the ATM networks and its components. Such as, number of services, ABR traffic Management for analyzing traffic. Traffic management system concentrates on controlling network congestion, allocation of system services and to have good Quality of Services. Comparison of ATM networks for other technologies such as Ethernet, IP Address of the network. This survey gives design and deployment of ATM networks for numerous applications.

A. Broadband-ISDN Protocol Model

The pillar figure depicts the architecture of the ATM protocol. Like X.25, ATM is a technique of transmitting packets over a network interface. The use of common channel signaling by X25 as opposed to control signaling on a separate channel by ATM is one way that the two protocols differ from one another. Another distinction is that, unlike ATM packet sizes, X25 packet lengths are automatically decided and are referred to as sales.

A method of communication used for transmitting information among networked devices is called ATM (Asynchronous Transfer Mode). The user plane and the control plane are the two primary planes that make up the ATM protocols architecture.

While ATM associations are created and handled by the control plane, user data is sent via the user plane. The user plane consists of the extra two layers known as the ATM adaptation layer (AAL) and the ATM layer.

User data must be converted into ATM cells, the fundamental units of data transport in ATM networks, by the AAL layer. There are several AAL kinds, each of which is intended for a certain kind of data, such as speech, video, or data.

ATM connections must be established and maintained by the control plane. It also involves regulating traffic flow through virtual networks (VCs), that serve as logical links between network components. To ensure dependable data transport, the control plane also has methods for fixing mistakes and flow management. Figure 1.1 depicts the Protocol Architecture.

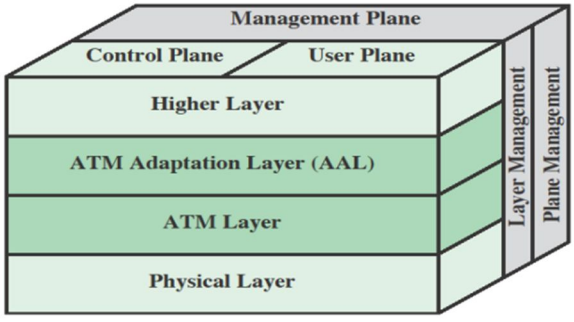

Figure 1.1 ATM Protocol Architecture

II. ATM NETWORK TOOLS AND TECHNOLOGIES

Hardware and Software tools used in ATM networks:

1) *ATM Switches:* Data packets can be routed and switched over a network using Asynchronous Transfer Mode (ATM) switches as shown in the Figure 2.2. ATM switches make links between devices using virtual circuits, enabling strong-speed, minimal latency data transmission. The header and payload of every single cell are fixed by length, and ATM swaps route cells according to the header data. Voice, video, and data traffic are just a few of the kinds of traffic that ATM switches may handle. ATM switches were widely employed in the 1990s for high-speed networking applications, but different technologies, such Ethernet and IP, have now fully superseded them.
2) *ATM Routers:* The routers that support asynchronous transfer mode (ATM) may forward and route data cells across a network as shown in the Figure 2.2. ATM router can handle a variety of traffic categories, like audio, video, and information, and they link devices using virtual circuits. ATM routers employ the header data to direct cells to their target; each cell has a fixed-length header and payload. ATM routers are helpful for applications that operate in real time because they can deliver high-speed, low-latency data transport. ATM devices were widely employed in the 1990s for high-speed networking applications, but Ethernet and IP have now largely taken their place.
3) *ATM Adapters:* Computers and ATM networks can communicate with the use of Asynchronous Transfer Mode (ATM) adapters. ATM adapter transform computer data into ATM cells that may be sent over a network. ATM adapters are capable of handling a variety of traffic kinds, including video, audio, and information and are capable of supporting a range of information transfer speeds, from 25 Mbps to 622 Mbps. The ATM protocol is used by ATM adapter to create virtual connections among networked devices. ATM adapters were common in the 1990s for high-speed networking applications, but different technologies, such Ethernet and IP, have now fully superseded them.
4) *Virtual Circuits:* A virtual circuit is a networking technique for establishing a logical link between two connected devices. Physical circuits employ physical links, as opposed to virtual circuits, which use logical connections made by software. Virtual circuits can either be connection-oriented or feel left when established utilizing several protocols, including as ATM, Frame Relay, and X.25. In order to facilitate effective data flow and lessen the risk of congestion, a virtual circuit offers a dedicated link between two networked devices. Since virtual circuits are easier to operate and monitor than physical circuits, they may provide greater dependability and safety.
5) *ATM signaling protocols:* ATM signaling protocols are used to establish and maintain virtual connections between devices on an ATM network. User devices are connected to networks via the UNI (User-to-Network Interface) and NNI (Network-to-Network Interface), respectively, which are two ATM signaling protocols. Signaling protocols are used by devices to communicate details about the kind of connection, data transfer rate, and other connection parameters. Thanks to the error detection and recovery mechanisms provided by ATM signaling protocols, the dependability of data transfer is guaranteed. The signaling protocols employ a variety of message types and signaling strategies to establish, maintain, and end virtual connections. Overall, ATM signaling standards allow ATM networks to operate efficiently and dependably.
6) ATM Management and Monitoring tools: Data, phone, and video may all be sent over a network thanks to the telecommunications technique known as asynchronous transfer mode (ATM). ATM networks need management and monitoring tools to make sure they are operating effectively and to find and fix issues. Here are some illustrations of tools for managing and watching ATMs. Network device management and monitoring are done using the SNMP (Simple Network Management Protocol) protocol. Network administrators may use it to monitor the functionality of ATM switches and routers as well as to find and fix issues. Network traffic may be observed using the RMON (Remote Monitoring) protocol. To find patterns and trends, network managers might gather data on network traffic and analyses it. MIB (Management Information Base) for ATM Forum.

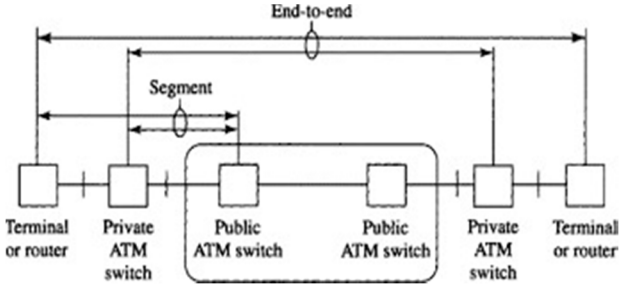

Fig2.2: hardware and software tools of atm network

III. SERVICES PROVIDED IN ATM NETWORK

Various services offered by ATM networks such as:

1) *Voice and video transmissions:* Fixed-size cells are used in asynchronous transfer mode (ATM) to transmit data. Using AAL1 for real-time VBR communication and AAL2 for real-time CBR movement, voice and video can be transmitted over ATM networks. AAL converts visual and aural data from its original form to the size-corrected cell structure. To reduce jitter, delay, and loss of packets, Quality of Service (QoS) techniques give voice and video data the highest priority. [4] Few of processes are Traffic Shaping, Congestion Control and Resource Reservation. [5] These network gives more dependable and efficient voice and video transmission.
2) *Data transfer:* Asynchronous transfer mode (ATM), a high-speed networking technique, is used to send data utilizing fixed-sized cells. Asynchronous data transfer is used by ATM networks, which implies that data is transferred in discrete, small cells without respect to timing. ATM networks allocate resources for data transfer and establish interconnections between nodes via simulated circuits. The virtual circuits may be flipped or permanent, according to the network configuration. ATM networks may be used to support voice, video, and data traffic. These networks also guarantee the quality of service (QoS) for each kind of traffic. The primary applications of ATM networks are backbone networks and high-speed data transfer across extensive distances.
3) *Internet Access:* Internet access in Asynchronous Transfer Mode (ATM) networks involves the use of an ATM switch to connect to an Internet Service Provider (ISP). The ATM switch acts as a gateway, providing a connection between the local ATM network and the ISP's network. ATM networks support multiple access technologies, such as ADSL, T1/E1, and SONET/SDH, for connecting to the ISP. The ATM network uses virtual circuits to establish connections between the local network and the ISP, with the ISP providing access to the internet. ATM networks provide high-speed internet access and can support multiple types of traffic, including voice, video, and data. ATM networks are widely used in backbone networks and for high-speed data transfer over long distances.
4) *Multimedia Services:* A multimedia service is any kind of service that incorporates numerous media kinds, such as text, graphics, audio, video, and interactive elements. Due to the growth of the internet and technical advancements, multimedia services have permeated every aspect of our lives, from pleasure to business. Examples of typical multimedia services include: Streaming services make it possible to watch films, TV shows, and other video material online. Examples include Netflix, Hulu, and Amazon Prime. gamification services Customers may connect with players from all around the world to play video games online with the aid of gaming services. Some examples include Xbox Live, PlayStation Network, and Steam (multimedia service).
5) *Virtual Private Networks (VPNs):* By using a Virtual Private Network (VPN), you may establish a private and secure connection between your device and the internet. Your internet traffic is routed through a distant server run by the VPN provider while being encrypted using a VPN. This makes it impossible for anybody, including your internet service provider (ISP), hackers, or governmental monitoring, to intercept or monitor your online activities. VPNs are often used by both people and companies to safeguard their online security and privacy. You can access stuff that might be restricted in your area by using them to get around geo-restrictions and internet censorship.

IV. RECENT DEVELOPMENT IN ATM NETWORKS

ATM (Asynchronous Transfer Mode) networks have been in use for decades, but recent developments have brought about new technologies that enhance their capabilities. These developments include advancements in network security, traffic management, and integration with other networking technologies such as IP and MPLS.

1) *Quality of Service (QoS) enhancements:* ATM (Asynchronous Transfer Mode) networks offer Quality of Service (QoS) enhancements to ensure reliable and efficient delivery of services. These enhancements include prioritization of traffic, traffic shaping, and ABR (Available Bit Rate) traffic management. Prioritization of traffic allows important data to be given higher priority over less critical data. Traffic shaping is used to manage network congestion by regulating the flow of data, while ABR traffic management allows the network to dynamically allocate bandwidth based on network traffic. These QoS enhancements enable ATM networks to provide a consistent and reliable user experience while ensuring efficient use of network resources.

a) Traffic Management And Shaping

Traffic management and shaping are essential techniques used in ATM (Asynchronous Transfer Mode) networks to ensure efficient use of network resources and reliable service delivery.

Traffic shaping involves regulating the flow of data to manage network congestion, while traffic management techniques such as ABR (Available Bit Rate) and UBR (Unspecified Bit Rate) enable dynamic allocation of network bandwidth based on network traffic. These techniques ensure that important data is given priority and that network resources are utilized efficiently, resulting in consistent and reliable user experiences.

2) *IP-over-ATM integration:* The integration of IP (Internet Protocol) and ATM (Asynchronous Transfer Mode) networks enables the transmission of IP traffic over ATM networks. This integration is achieved through the use of protocols such as Classical IP-over-ATM (CLIP) and Multiprotocol-over-ATM (MPOA). CLIP provides a way for IP traffic to be encapsulated in ATM cells, while MPOA enables the efficient forwarding of IP traffic across ATM networks. This integration enables the delivery of IP services over ATM networks and provides a flexible and scalable solution for data transmission.
3) *ATM-over-SONET integration:* The integration of ATM (Asynchronous Transfer Mode) and SONET (Synchronous Optical Network) networks enables the transmission of ATM traffic over SONET networks. This integration is achieved through the use of protocols such as ATM-over-SONET (AoS). AoS provides a way for ATM cells to be transported over SONET frames, enabling the efficient transmission of ATM traffic across SONET networks. This integration enables the delivery of ATM services over SONET networks and provides a reliable and scalable solution for data transmission.
4) *MPLS-over-ATM integration:* The integration of MPLS (Multiprotocol Label Switching) and ATM (Asynchronous Transfer Mode) networks enables the transmission of MPLS traffic over ATM networks. This integration is achieved through the use of protocols such as MPLS-over-ATM (MoA). MoA provides a way for MPLS traffic to be encapsulated in ATM cells and enables the efficient forwarding of MPLS traffic across ATM networks. This integration enables the delivery of MPLS services over ATM networks and provides a flexible and scalable solution for data transmission.

V. CONCLUSION

ATM was a popular networking technology in the late 1990s and early 2000s, but it has largely been replaced by newer technologies like Ethernet and IP (Internet Protocol) networks. ATM was designed to provide high-speed data transfer rates, low latency, and the ability to handle different types of traffic such as voice, video, and data. It accomplished this by using fixed-length cells for data transfer, which allowed for more efficient use of bandwidth than traditional packet-based networks. However, ATM had some limitations, including high cost, complexity, and lack of scalability. These factors made it less appealing to businesses and organizations looking for more cost-effective and easier-to-manage networking solutions. Today, ATM is mainly used in legacy systems, such as older banking networks and some telecom applications. Overall, while ATM played an important role in the development of networking technology, its use has largely been superseded by newer and more flexible technologies.

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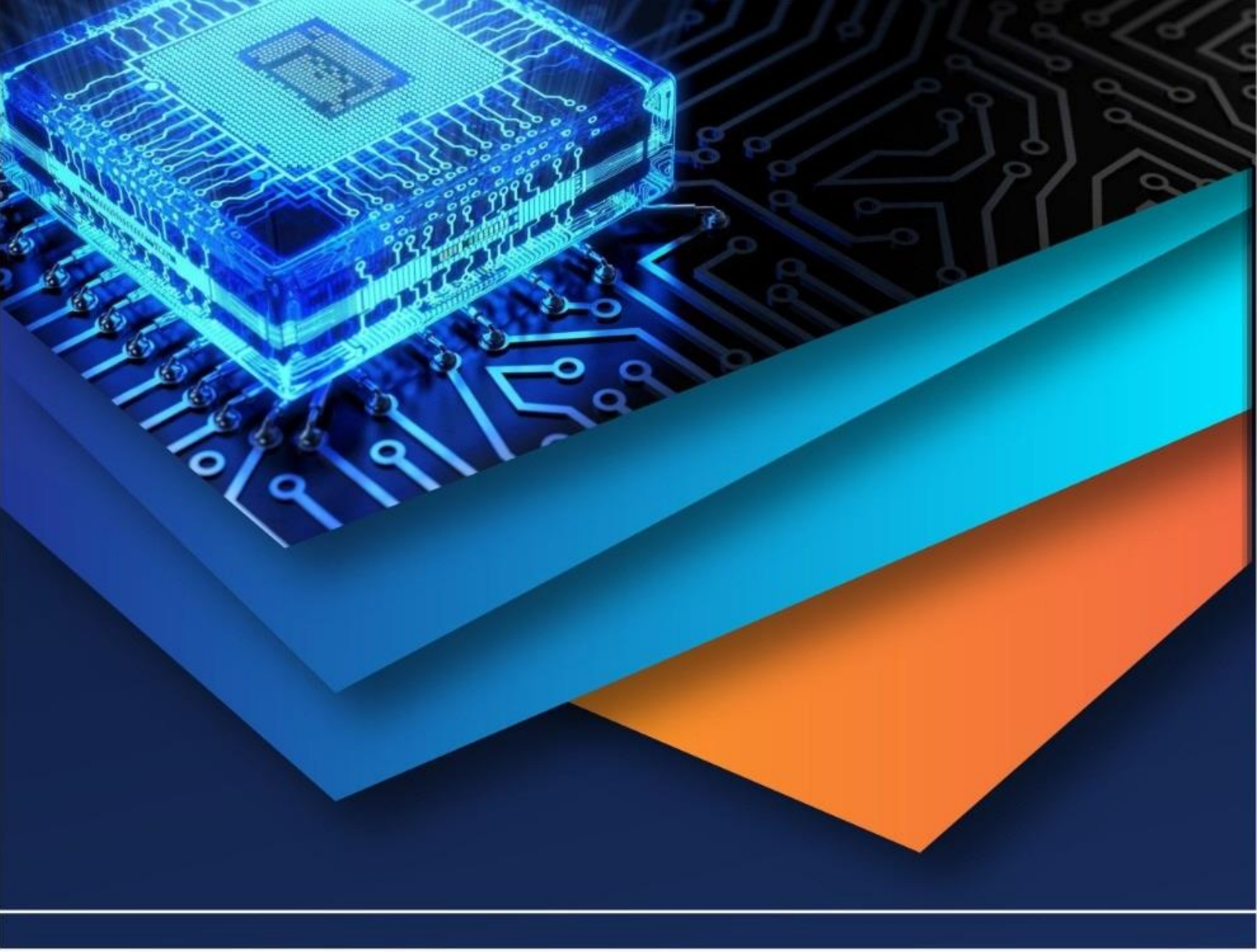

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