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## PERFORMANCE EVALUATION OF VIDEO CONFERENCING IN VARIOUS NETWORKING ENVIRONMENT

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### Abstract

Video conferencing plays a vital role in business and educational institutions which indicates that efficient transmission with less packet loss that pose major challenge. In this paper, we evaluate the performance of video conference in various network environments like Ethernet and ATM using OPNET modeler. Experimental scenarios are designed to investigate the changes in delay and throughput for ATM and Ethernet networks.

**Keywords:** Video Conferencing, Ethernet, ATM, OPNET

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### 1. Introduction

Video conferencing is a two way audio and video communication technology enabling people in different places to meet and talk as if they are interacting face to face. It allows people to exchange information faster compared to indirect communication methods such as email and fax. Video conferencing involves several participants that are not possible as in video phone. The main components for video conferencing includes Video input, Video output, computer Audio input, Audio and Network transmission, such as wired or wireless LAN and internet. [1][9].

In the OSI reference model, Ethernet technology operates at the physical and data link layers - Layers One and Two respectively. Ethernet supports all popular network and higher-level protocols. Traditional Ethernet supports data transfers at the rate of 10 Megabits per second (Mbps). Fast Ethernet extends traditional Ethernet performance up to 100 Mbps and Gigabit Ethernet up to 1000 Mbps speeds. 10 Gigabit Ethernet (10000 Mbps) also remains an active area of research. Ethernet cables likewise are manufactured to any of several standard specifications. The most popular Ethernet cable in current use, Category 5 or CAT5, supports both traditional and Fast Ethernet. The Category 5e (CAT5e) cable supports Gigabit Ethernet. [6][7]

Asynchronous Transfer Mode (ATM) is considered to be a high speed networking standard designed specially to support both voice and data communications. ATM operates at the data link layer (OSI Reference Model- Layer 2) over either fiber or twisted-pair cable. ATM is normally utilized by Internet Service Providers (ISP) on their private long-distance network. ATM differs from more common data link technologies like Ethernet in several ways. For example, ATM utilizes no routing. Hardware devices known as ATM switches establish point-to-point connections between endpoints and data flows directly from source to

destination. Additionally, instead of using variable-length packets as Ethernet does, ATM utilizes fixed-sized cells. ATM cells are 53 bytes in length which includes 48 bytes of data and five bytes of header information.

ATM is well suited for multimedia applications due to its intrinsic characteristics of supporting multiple streamlines with varying data rates and Quality of Service (QoS) features that can be adjusted to user's needs.[6][7] All services (voice, video, and data) can be transported via ATM, including connectionless services. To accommodate various services an adaptation function is provided to fit information of all services into ATM cells and to provide service applications like online transaction processing, packet voice often has more stringent QoS requirements. If the network is not properly conditioned to meet these requirements, the quality of the speech may be impacted. This is particularly true if voice is carried on public data networks like the Internet, where voice users have few options for securing end-to-end quality of service. ATM is considered as a specific packet oriented transfer mode based on fixed length cells. Each cell is mainly used to determine the virtual channel and to perform the appropriate routing. Cell sequence integrity is preserved per virtual channel. ATM is connection-oriented. The header values are assigned to each section of a connection for the complete duration of the connection. Signaling and user information are carried on separate virtual channels. [9]The information field of ATM cells is carried transparently through the network. The ATM Technology is the merged result of Packet Switching. Packet switching is a store and forward data transmission technique in which a message is broken up into small parts each called packet and Time Division Multiplexing (TDM) is a method of putting multiple data streams in a single signal by separating the signal into many segments.

## 2. Related Work

We compare and analyze the video conferencing packet transmission in various networking type such as Ethernet, ATM. Both the networks are configured in a grid based environment. To connect Ethernet cables to a computer, a person normally uses a network adapter, also known as a network interface card (NIC). Ethernet adapters interface directly with a computer's system bus. The cables, in turn, utilize connectors that in many cases look like the RJ-45 connector used with modern telephones. ATM Network is designed to carry different type of traffic at the same type. Traffic could be voice, video or IP traffic. Internally all different traffic is carried as 53 byte cells

## 3. Simulation

The Simulation tools used is OPNET Modeler version (14.5).OPNET Modeler accelerates the R&D process for analyzing and designing communication networks, devices, protocols, and applications. Users can analyze simulated networks to compare the impact of different technology designs on end-to-end behaviour. Modeler incorporates a broad suite of protocols and technologies, and includes a development environment to enable modeling of all network types and technologies including VoIP, TCP, OSPFv3, MPLS, IPv6.[2][10] The Key features of OPNET modeler are as follows:

- Object-oriented modeling
- Fastest discrete event simulation engine among leading industry solutions.
- Hundreds of protocol and vendor device models with source code.
- Hierarchical modeling environment
- Discrete Event, Hybrid, and optional Analytical simulation
- Optional System-in-the-Loop to interface simulations with live systems
- Realistic Application Modeling and Analysis
- Open interface for integrating external object files, libraries, and other simulators
- Integrated, GUI-based debugging and analysis.[2]

## 4. Experimental Scenarios

Two types of experimental scenarios are used – Video Conferencing using Ethernet and Video Conferencing using ATM. They are simulated using OPNET Modeler to obtain better results.

#### 4.1 Video Conferencing using Ethernet

Ethernet Network is our first type of network for video conferencing analysis .Ethernet network is a commonly used and deployed in major Industries it is also cheaper and easy to implement

Table 1.0 Simulation Parameters (Ethernet)

Environment	GRID
Total No of System	60
Network Components	1) Video Conferencing Server, 2)3 Cisco router , 3) Marconi 16 port Switch
Applications	Video Conferencing, HTTP
Routing algorithm	OSPF

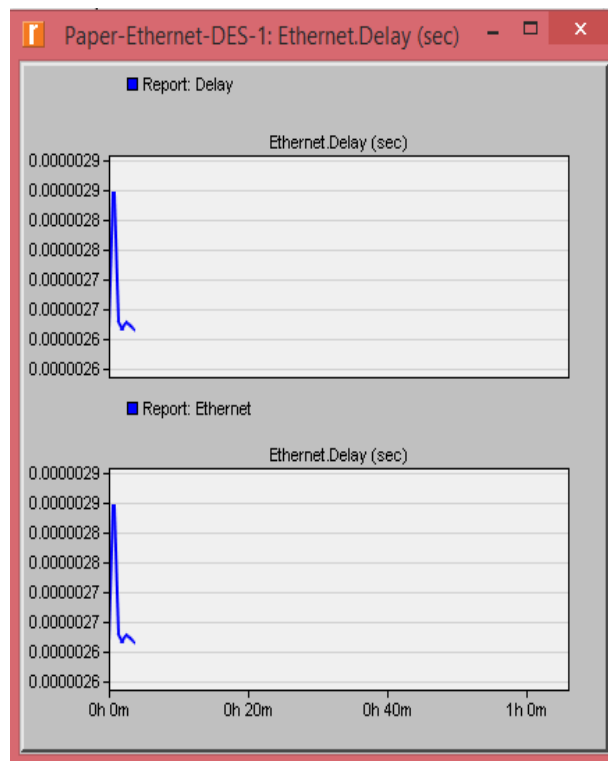


Figure 1.0 Ethernet Delay

- 1 The Fig 1.0 shows that there is a Ethernet Delay during the video conferencing of 1 hour session.
2. The Fig 1.1 shows that traffic is stable during the Video conferencing.

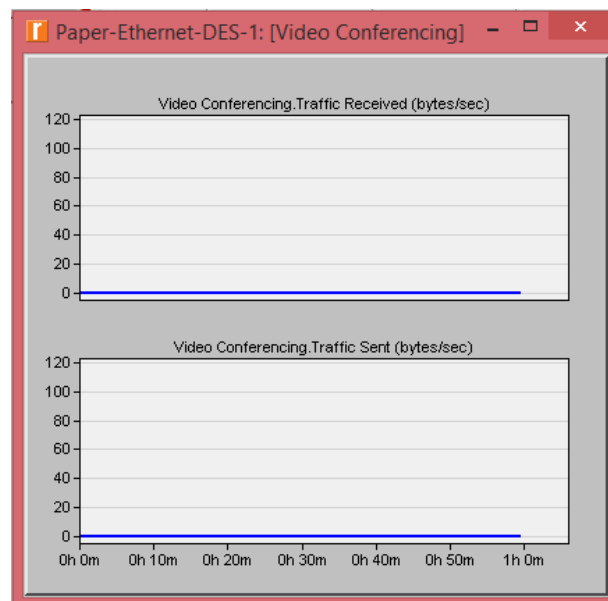


Figure 1.1 Traffic Sent / Received in Ethernet

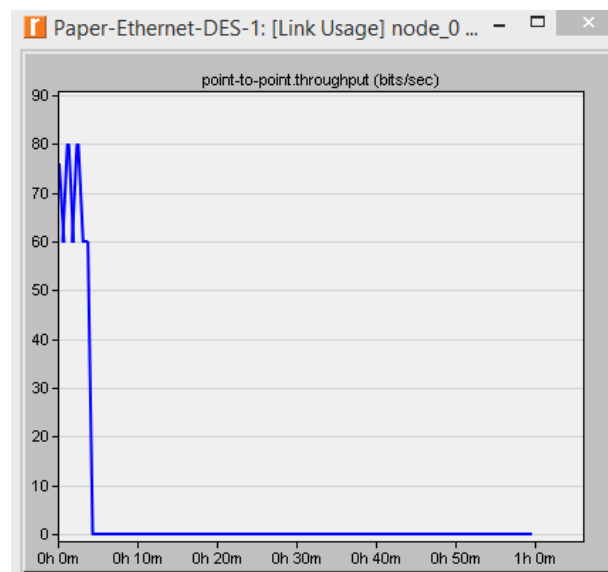


Figure 1.2 Ethernet Throughput

The Fig 1.2 shows the throughput of video conference during a one hour session there is delay during the first 10 minutes of video conference where there is lot of packet loss due to link failures so OSPF algorithm is implemented to reduce the packet loss during the video conferencing session. This will make the video conferencing stable till the one hour.

#### 4.2 Video Conferencing using ATM

Asynchronous Transfer Mode (ATM) is a switching technique for telecommunication networks. It uses asynchronous time-division multiplexing, and it encodes data into small, fixed-sized cells. ATM is a high speed network link failures can be recovered quickly in this type of network.

Table 2.0 Simulation Parameters (ATM)

Total No of System	60
Network Components	1) Video Conferencing ATM Server, 2) Router 3) 8 port ATM switch
Applications	Video conferencing , Http
Routing Algorithm	OSPF

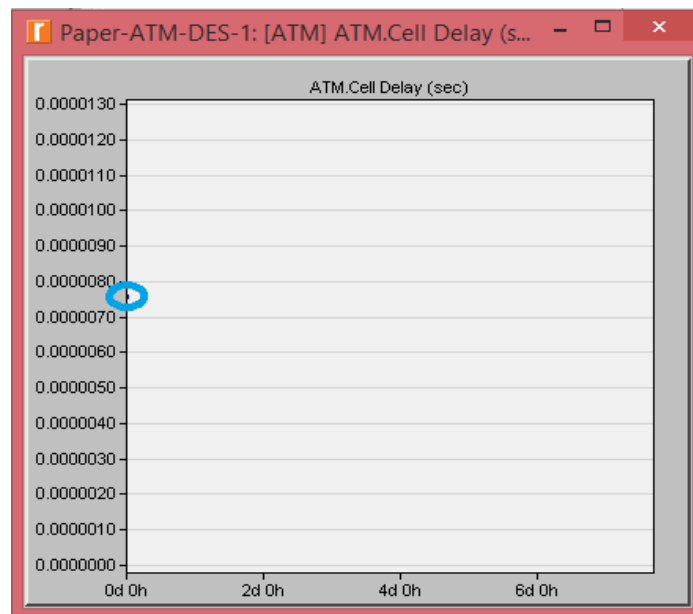


Figure 2.0 ATM delay

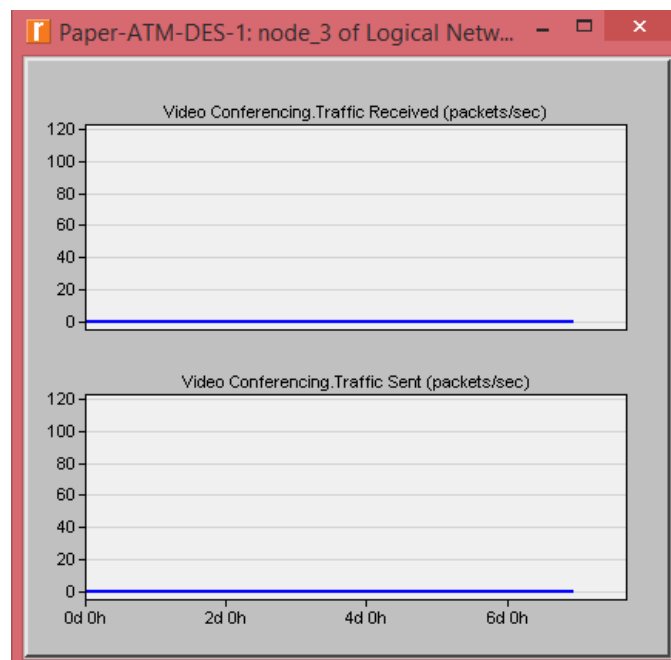


Figure 2.1 Traffic Sent / Received in ATM

The above figure 2.0, 2.1 shows there is very less number of delay of Video conferencing in ATM networks. OSPF algorithm is used for implementation .The Video conferencing traffic is absolutely clear and there is no traffic delay due to other applications

#### 4. Conclusion

From the above related work, it is to be concluded that the performance of video conferencing in ATM network environment is very high and the packet delay is very less when compared to other network environment like Ethernet and DSL lines. Our future works include video conference in a Wireless Grid environment with various mobility nodes.

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