NATIONAL INSTITUTE OF TECHNOLOGY
SRINAGAR

COMPUTER NETWORK PROJECT

COMPARISON OF ELASTIC AND INELASTIC TRAFFIC

SUBMITTED BY

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TERMINLOGY

1. Network Traffic

Network traffic or data traffic is the amount of data moving across a network at a given point of time. Network data in computer networks is mostly encapsulated in network packets, which provide the load in the network. Network traffic is the main component for network traffic measurement, network traffic control and simulation.

2. Elastic Traffic

Elastic traffic is not sensitive to delay. Figuratively speaking, it can spread in time. This kind of traffic is associated with applications that send their data using TCP protocol. They are application such as FTP, WWW and e-mail. They direct to transport protocol a continuous set of data (file, message, e-mail or web page) and the transmission rate of this data depends on transport protocol mechanisms and network conditions. Because this transmission does not have time borders (e.g. file transfer can last one minute as well as 10 seconds) it doesn't have to meet real time conditions.
Because real time conditions don't have to be met, elastic traffic is invulnerable to delay and jitter. It also doesn't have minimum bandwidth requirements (but high throughput is desirable). But it requires correct data transmission, which is achieved by reliable transport protocol (as TCP). Because of that there is no need to employ quality of service techniques. Default best-effort service is enough.

3. Inelastic Traffic

Inelastic traffic is vulnerable to delay – it cannot be spread in time. This kind of traffic is associated with applications, which use RTP protocol. The main services that generate inelastic traffic are VoIP, VoD, IPTV, audio- and videoconference. They direct to transport protocol discrete stream of data (e.g. image from camera in form of video frames sent every 40 ms) and the rate of transmission is determined for encoding and compression method of multimedia data. In case of streaming applications, data should be received in the same rate they are generated, so real time conditions must be met.

4. Throughput[1]

In general terms, throughput is the maximum rate of production or the maximum rate at which something can be processed.

When used in the context of communication networks, such as Ethernet or packet radio, throughput or network throughput is the rate of successful message delivery over a communication channel. The data these messages belong to may be delivered over a physical or logical link, or it can pass through a certain network node. Throughput is usually measured in bits per second (bit/s or bps), and sometimes in data packets per second (p/s or pps) or data packets per time slot.

5. Network Delay[2]

Network delay is an important design and performance characteristic of a computer network or telecommunications network. The delay of a network specifies how long it takes for a bit of data to travel across the network from one node or endpoint to another. It is typically measured in multiples or fractions of seconds. Delay may differ slightly, depending on the location of the specific pair of communicating nodes.

6. Link utilization.

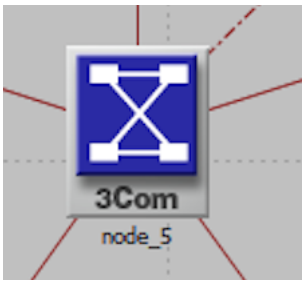
Link utilization represents the percentage of the consumption to date of an available channel bandwidth, where a value if 100.0 would indicate full usage.

[1] https://en.wikipedia.org/wiki/Throughput

[2] https://en.wikipedia.org/wiki/Network_delay

NODES USED

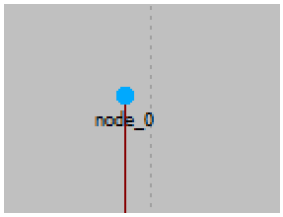
1. Center Node Model - 3C_SSII_1100_3300_4s_ae52_e48_ge3



The 3C_SSII_1100_3300_4s_ae52_e48_ge3 device model represents a stack of:

1. Two SuperStack II Switch 1100 chassis. 1100 series has 12 or 24 10-Mbps ports and two 10/100-Mbps ports.[3]
2. Two SuperStack II Switch 3300 chassis. 3300 series has 12 or 24 12 or 24 10/100-Mbps ports. [4]

2. SM_INT_WRKSTN



The ethernet_wkstn_adv node model represents a workstation with client-server applications running over TCP/IP and UDP/IP. The workstation supports one underlying Ethernet connection at 10 Mbps, 100 Mbps, or 1000 Mbps.

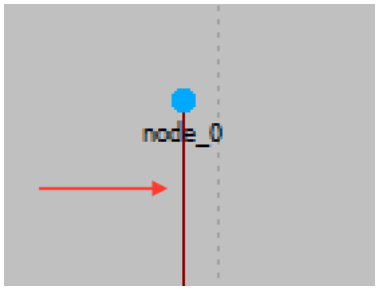
This workstation requires a fixed amount of time to route each packet, as determined by the "IP Forwarding Rate" attribute of the node. Packets are routed

[3] http://www2.blackboxab.se/Datablad/20723.pdf

[4] http://www2.blackboxab.se/Datablad/20723.pdf

on a first-come-first-serve basis and may encounter queuing at the lower protocol layers, depending on the transmission rates of the corresponding output interfaces.

3. 10BASET

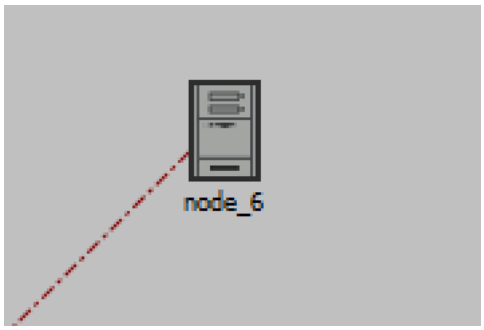


The 10BaseT duplex link represents an Ethernet connection operating at 10 Mbps. It can connect any combination of the following nodes (except Hub-to-Hub, which cannot be connected):

1) Station
2) Hub
3) Bridge
4) Switch
5) LAN nodes

The packet format is ethernet and data rate is 10Mbps.

4. SM_INT_SERVER



The ethernet_server_adv model represents a server node with server applications running over TCP/IP and UDP/IP. This node supports one underlying Ethernet connection at 10 Mbps, 100 Mbps, or 1 Gbps. The operational speed is determined by the connected link's data rate.

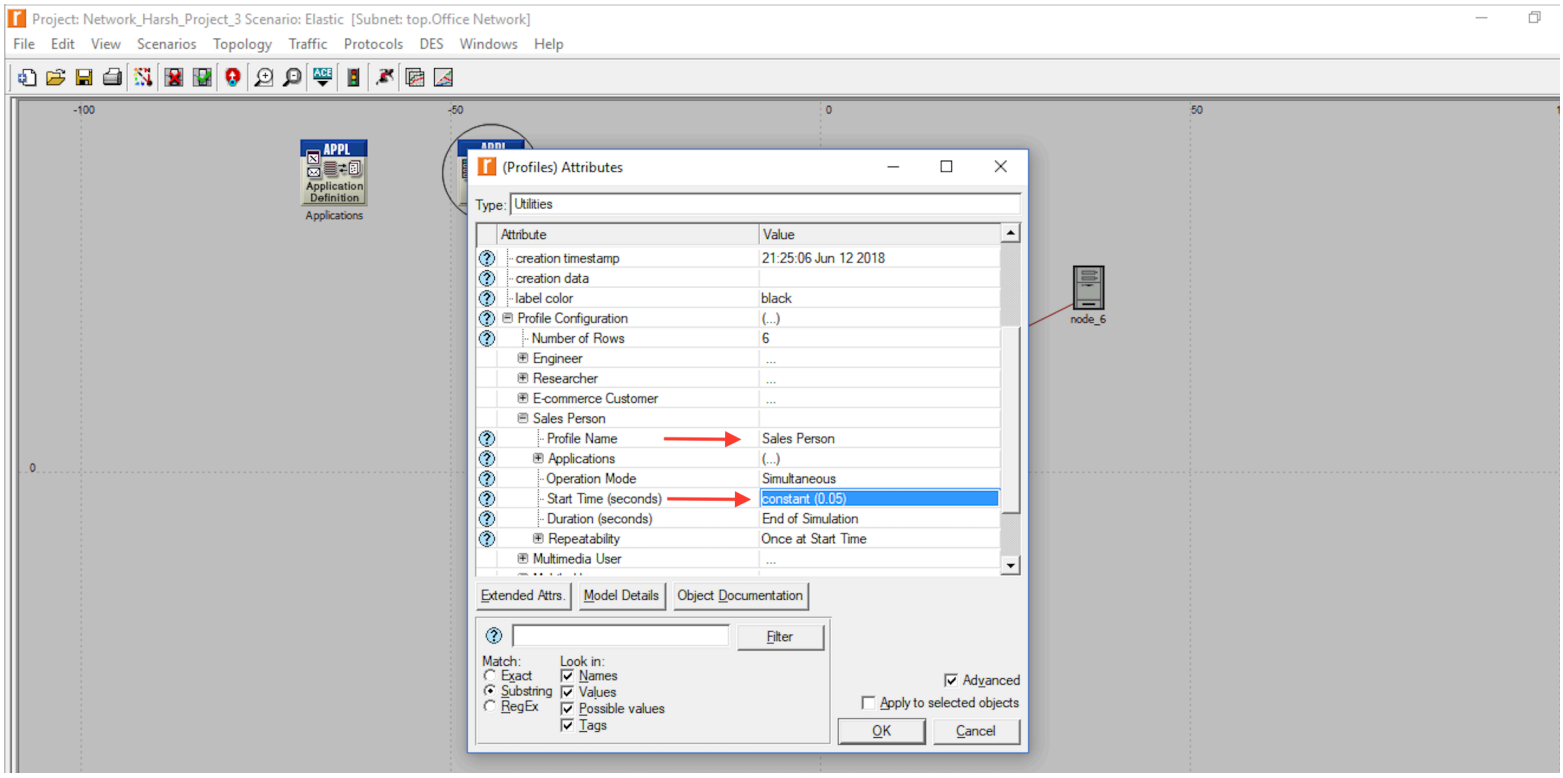
The Ethernet MAC in this node can be made to operate either in full-duplex or half-duplex mode. Note that when connected to a Hub, it should always be set to "Half Duplex". A fixed amount of time is required to route each packet, as determined by the "IP Forwarding Rate" attribute of the node. Packets are routed on a FCFS basis and may encounter queuing at the lower protocol layers, depending on the transmission rates of the corresponding output interface.

Protocols: RIP, UDP, IP, TCP, Ethernet, Fast Ethernet, Gigabit Ethernet, OSPF

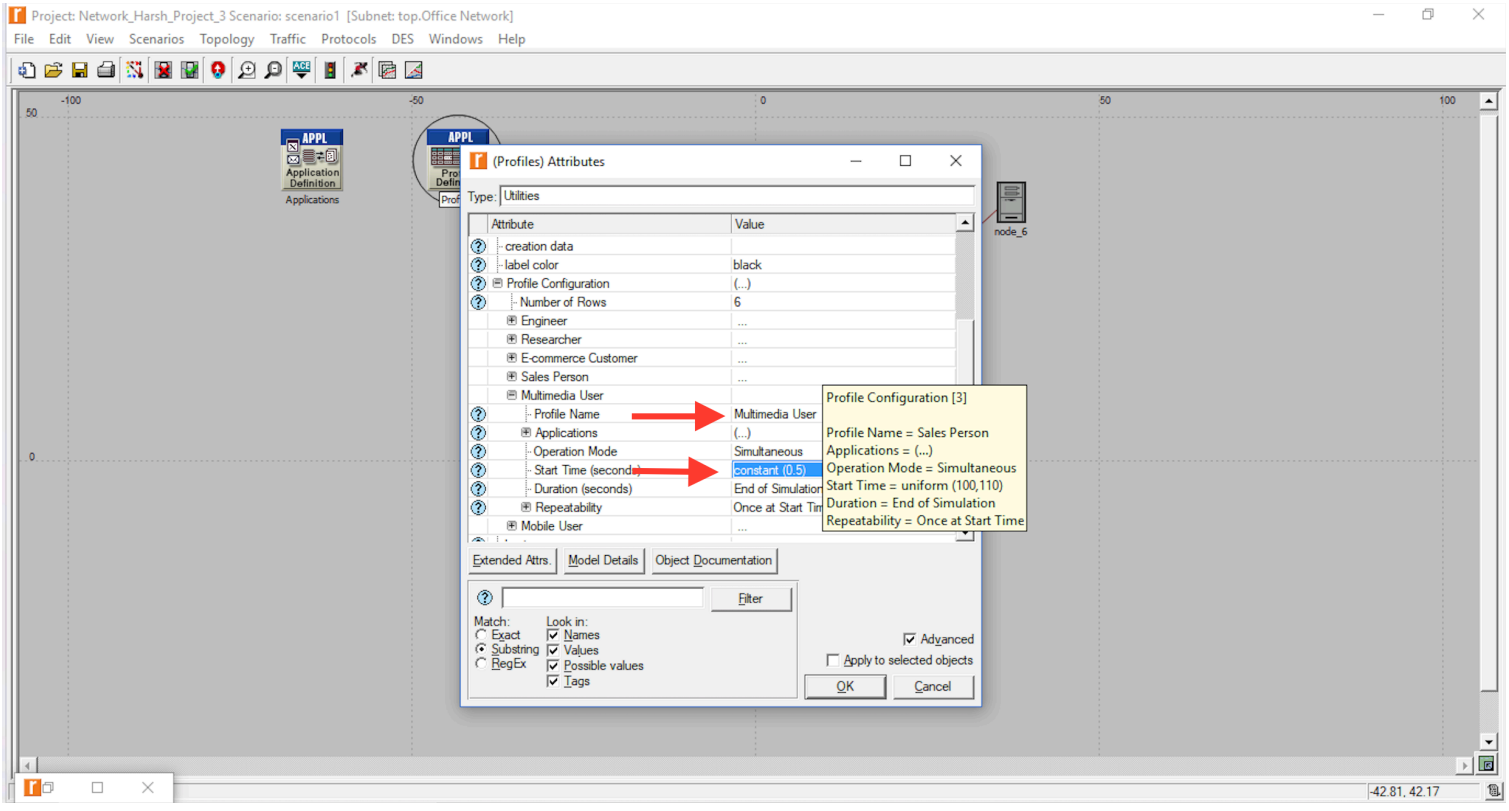
Interconnections:1 Ethernet connection at 10 Mbps, 100 Mbps, or 1000 Mbps

TRAFFIC USED

1. ELASTIC - For elastic the Sales Person default profile is used.

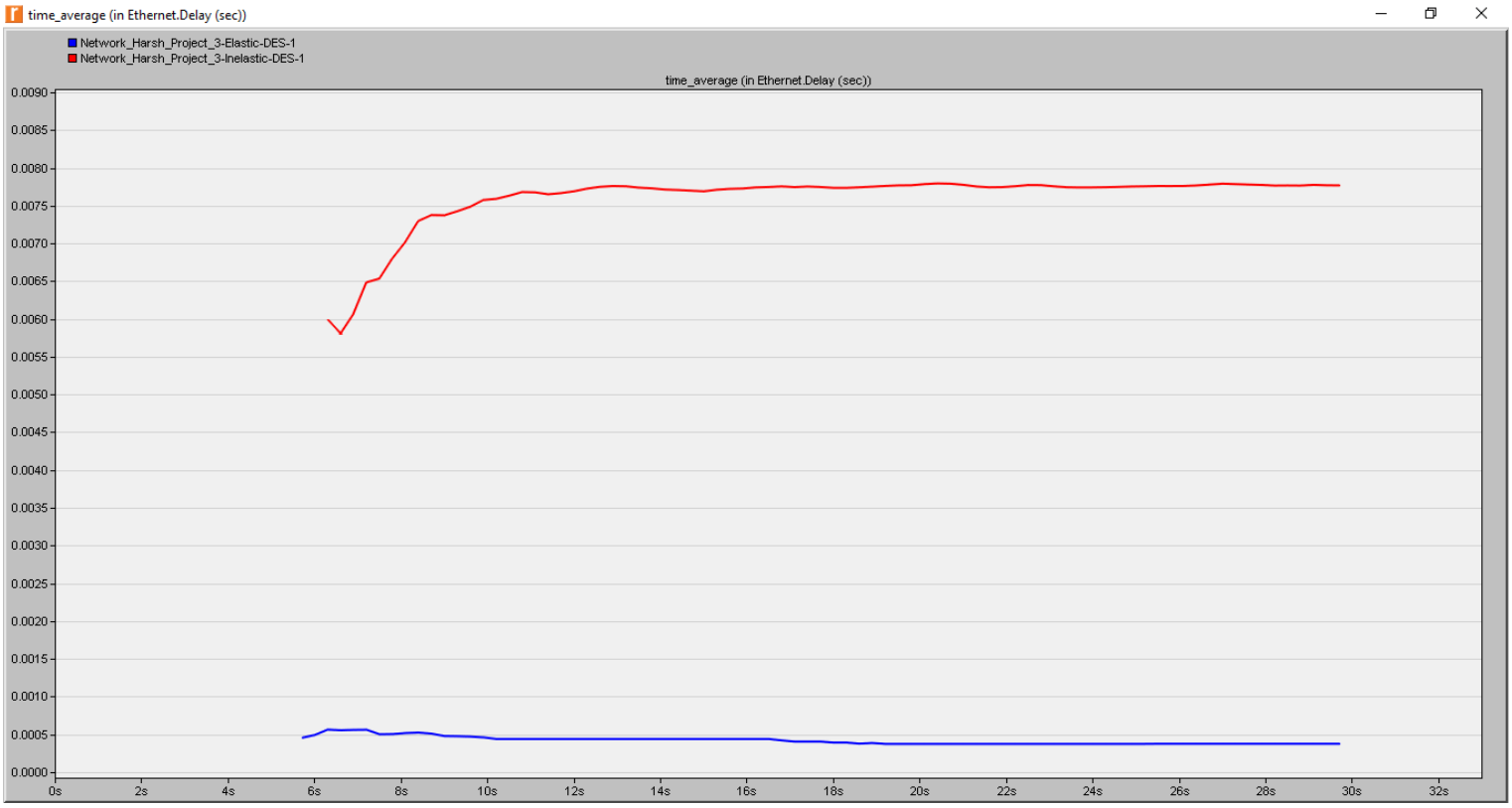


2. INELASTIC - For inelastic the Multimedia default profile is used.



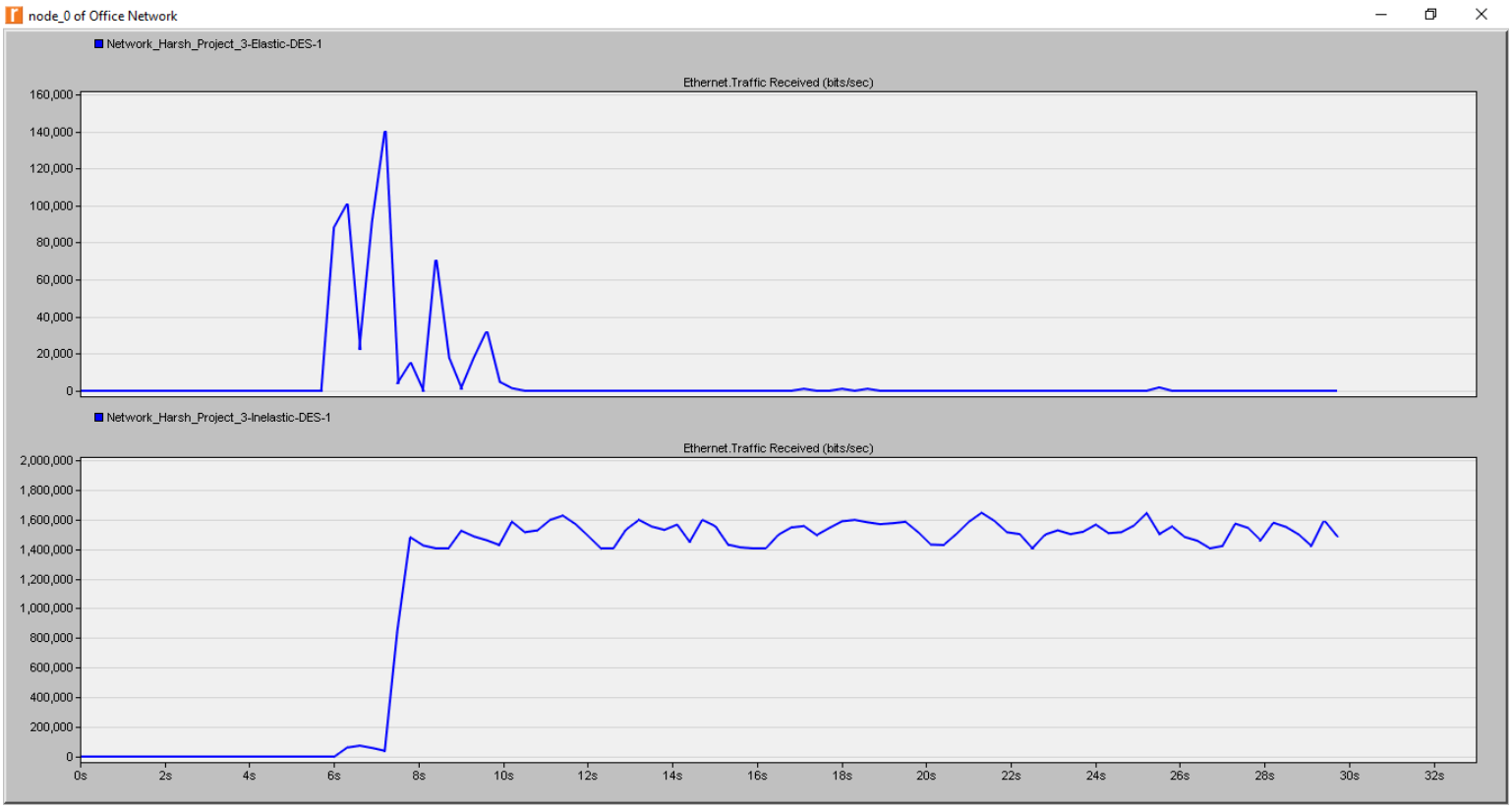
Results

1. Delay(sec)

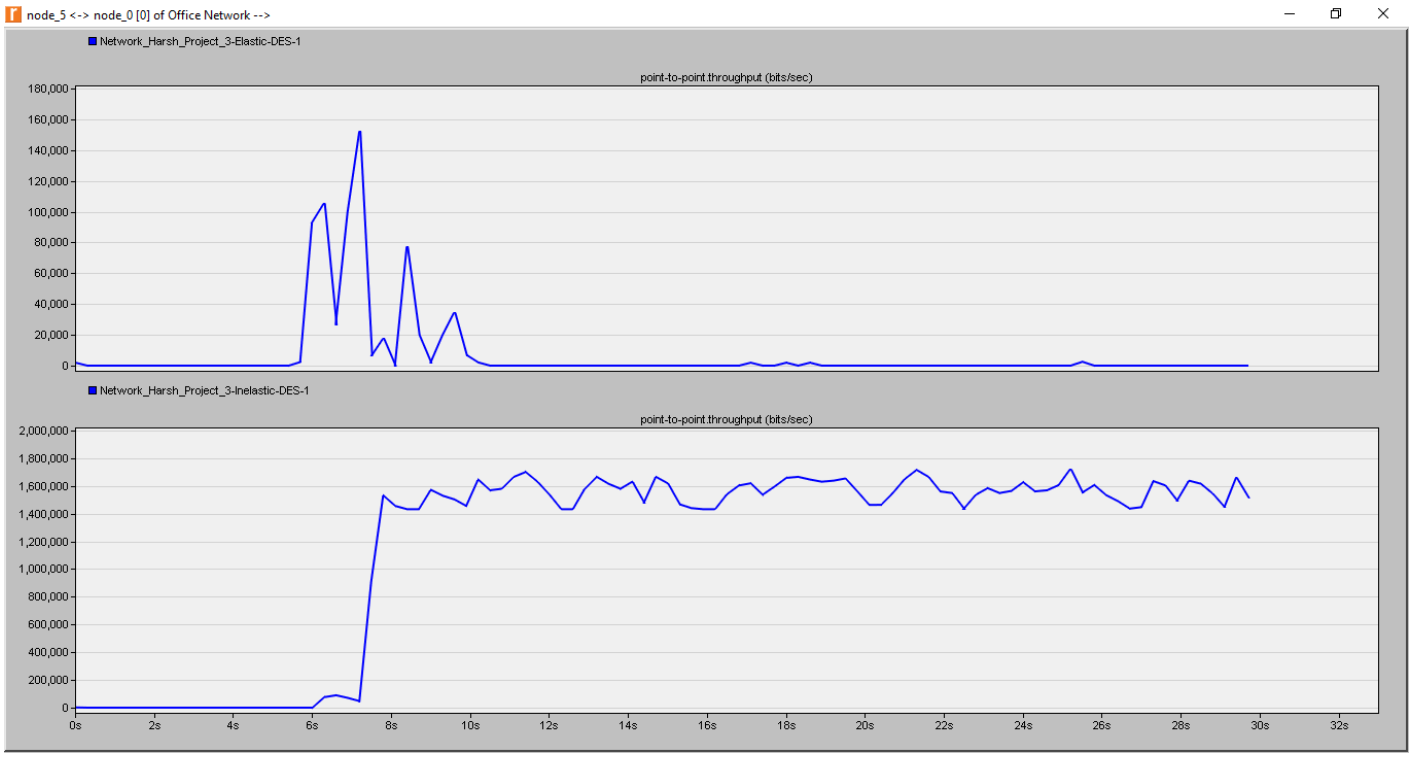


Time Average Delay(Elastic vs Inelastic)

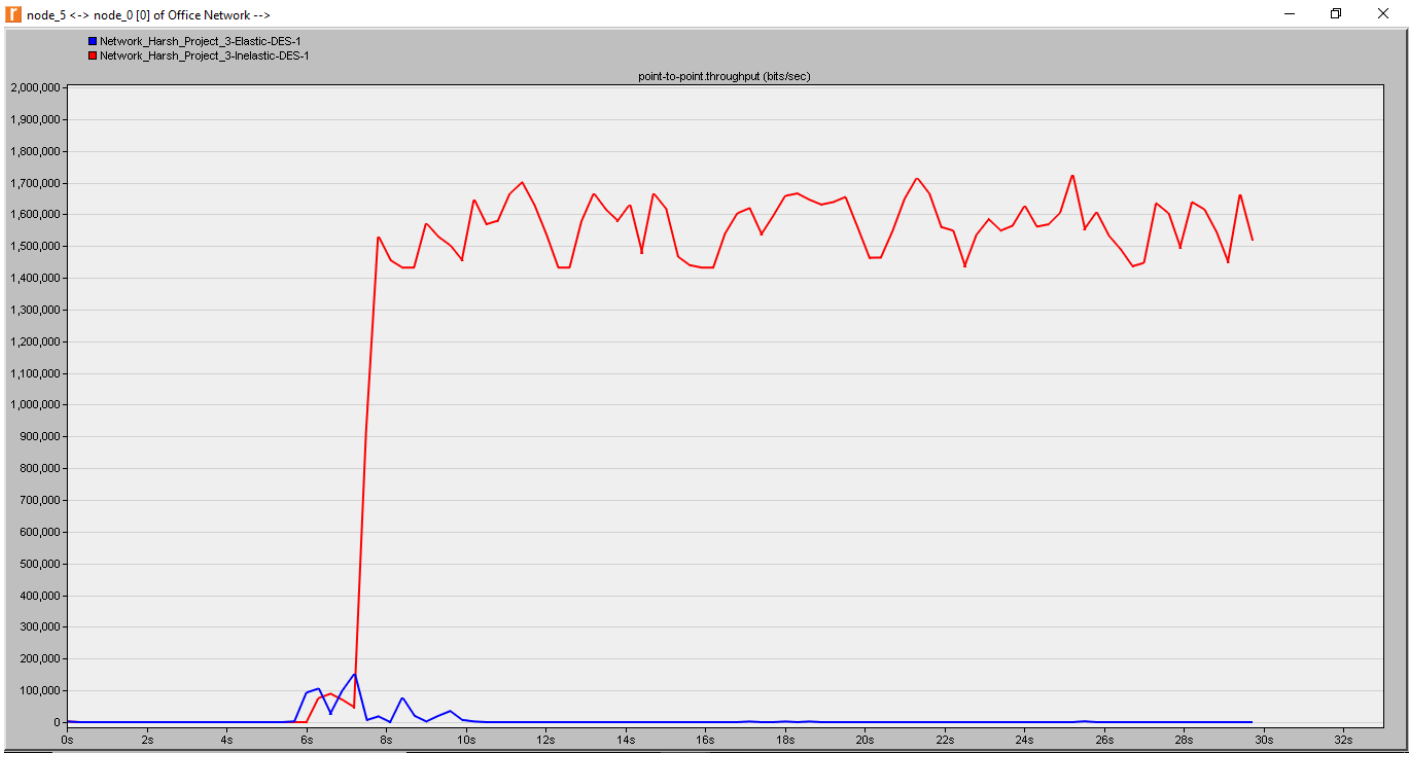
2. Ethernet Traffic Received(bits/sec)



3. Point to Point Throughput

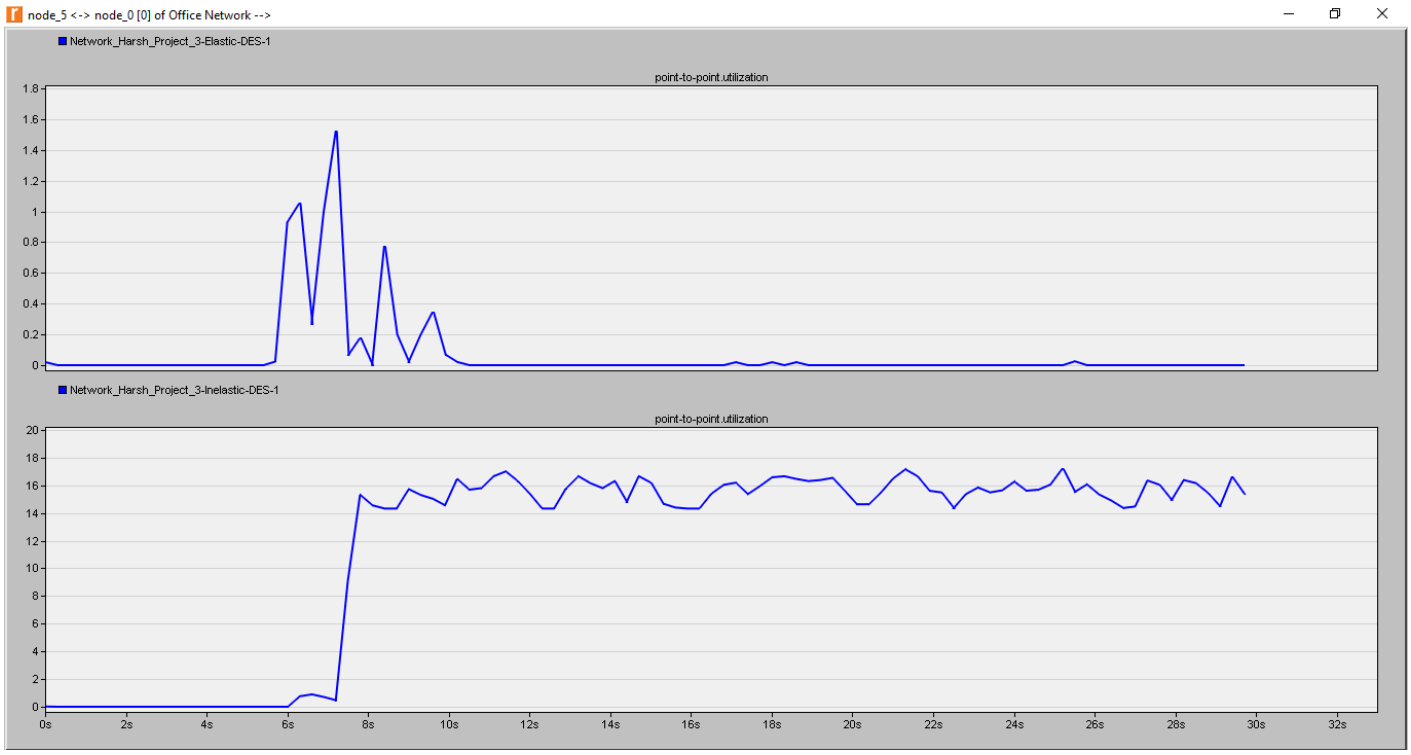


Stacked



Overlay

4. Point to Point utilization.



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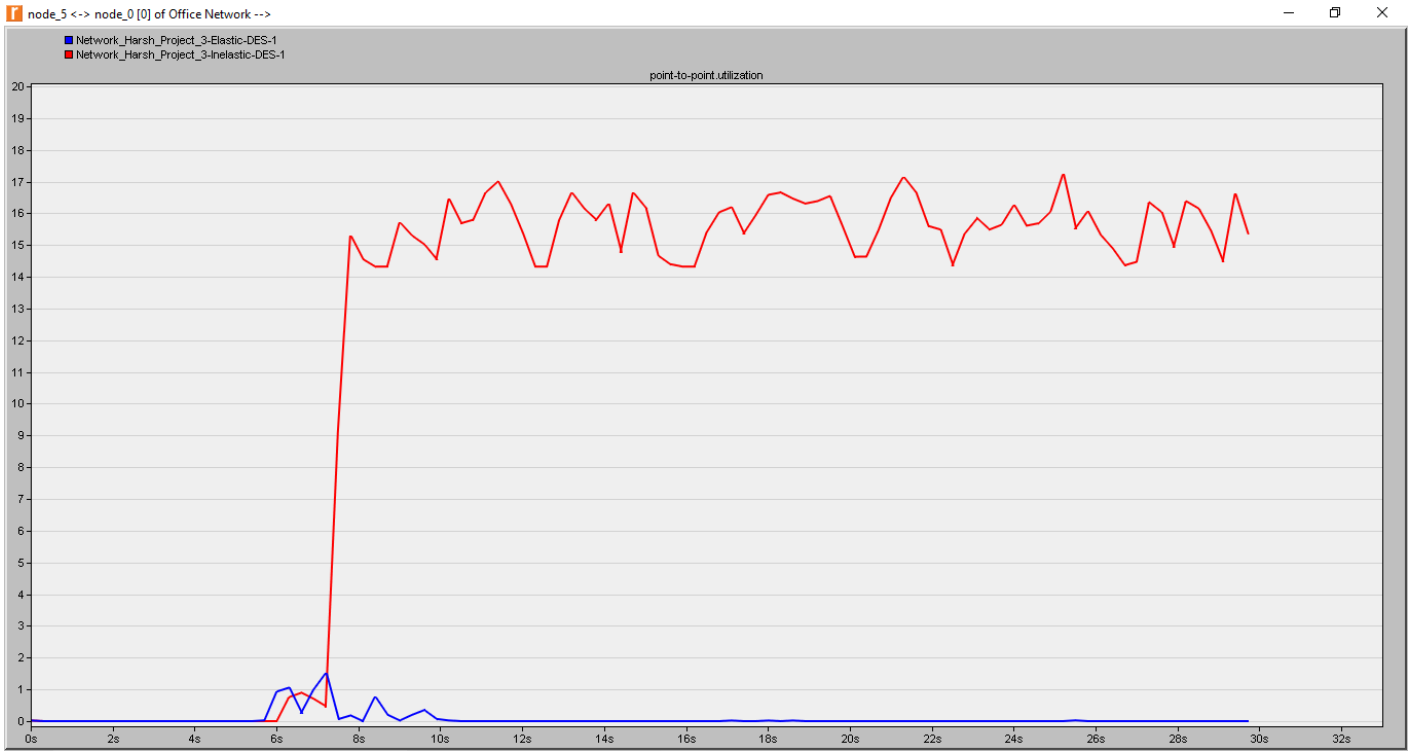

Overlay

OBSERVATIONS

1. In case of delay, the delay is inelastic traffic is much more as compared to an elastic traffic type and is about 15 times more.
2. In case of Ethernet Traffic throughput the traffic peaks between 5 and 10 seconds for elastic traffic.(at about 140,000 bits/sec). For inelastic traffic the traffic peaks around 7th second and remains fairly constant for the remaining duration of the simulation.(at about 1,600,000 bits/sec). This is consistent with the fact that inelastic traffic will have high throughput compared to inelastic traffic and in this simulation the inelastic throughput is 11 times the elastic throughput.
3. In case of point to point utilization (link utilization) the inelastic traffic consistently uses 20 percent of the link after the 8th second. However since elastic traffic will be small as compared to the inelastic one it only peaks at about 1.6 percent link utilization.