The University of Kansas

Information and Telecommunication Technology Center

# DRAFT

A Technical Report of the
Networking and Distributed Systems Laboratory

# ATM Background Traffic Impact on UDP Packet

Michael D. Linhart
Victor S. Frost

ITTC-FY98-TR-10980-23

November 18, 1997

Project Sponsor:
Sprint Corporation
Under prime contract to
Defense Advanced research Projects Agency
Contract number DABT 63-94-C-0068

# DRAFT

## ATM BACKGROUND TRAFFIC IMPACT ON UDP PACKETS

*Michael D. Linhart, Victor S. Frost*

*Information and Telecommunications Technology Center*
*The University of Kansas*
*2291 Irving Hill Road*
*Lawrence, KS 66045-2228*
*Email: frost@ittc.ukans.edu*
*http://www.ittc.ukans.edu*
November 18, 1997

## 1.0: Introduction

The goals of these experiments were to evaluate the impact of the change to an edge-core ATM network architecture on network performance. These ATM experiments examine the impact of background traffic on a UDP target traffic flow in terms of throughput, segment interarrival time, jitter and segment loss. In addition, the effects on Cell Level Pacing on network performance were evaluated.

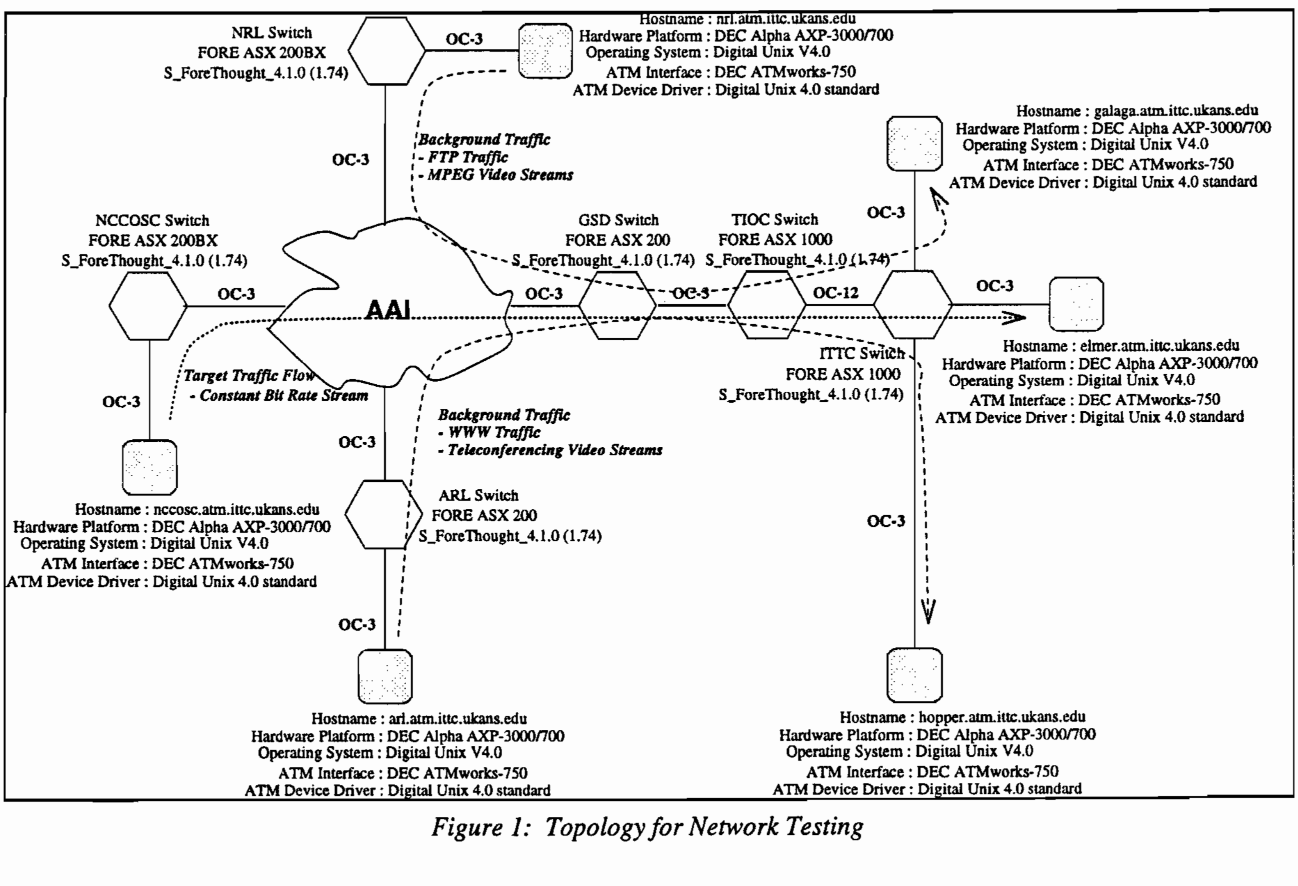


*Figure 1: Topology for Network Testing*

## 1.1: Network Changes

Several network changes have occurred between the test dates of 7/20, 8/4, 8/10, 8/21/97 and 10/12, 10/13/97. Figure 1 shows the topology for the first set of tests. The second set of tests were run with the following changes:

- Nortel Vector ATM Switches were added as edge switches.
- KU ATM Traffic was changed from CBR to UBR.
- Early Packet Discard (EPD) was enabled where possible.

## 2.0: Description

Figure 1 shows the network configuration of the following experiments. A DEC Alpha AXP-3000/700 workstation (nrl.atm) at Naval Research Laboratory (NRL-DC), Washington, D.C. is configured to generate emulated FTP traffic and multiple MPEG video streams specified in Table 1 to a similar workstation (galaga.atm) at the Information & Telecommunication Technology Center (ITTC) at Lawrence, Kansas. Another DEC Alpha AXP-3000/700 workstation (arl.atm) at Army Research Laboratory at Washington, D.C. is also configured to generate emulated WWW traffic and multiple teleconferencing video streams to a similar workstation (hopper.atm) at ITTC. These two pairs of configuration (NRL-DC to galaga at ITTC, ARL to hopper at ITTC) are responsible to generate multi-type background traffic using the TCP protocol.

A DEC Alpha AXP-3000/700 workstation (nccosc.atm) at Naval Command Control and Ocean Surveillance Center (NCCOSC), San Diego, California, generates the target flows at controlled rates to a similar workstation (elmer.atm) at ITTC using the UDP protocol defined in each experiment under the contention of the background traffic mentioned above. The target traffic flow's throughput and packet interarrival time jitter caused by cross traffic were measured and compared to those without the background traffic. The contention traffic occurs inside the AAI cloud. The target flow is a constant bit rate stream (CBR) at user level from 5Mbps to 30Mbps in an increment of 5Mbps (i.e. 5, 10, 15, 20, 25, 30). This allows us to study how the CBR target flows are affected as a function of rate.

Cell Level Pacing is used to study its effect on the traffic. The background traffic is paced at a cell level rate slower than the link rate. Two cases were selected to evaluate the impact of the change in network architecture. Specifically, the cases with no cell level pacing and cell level pacing used on background traffic with a high aggregate load of background traffic.

The experiments were run with the following data:

| **Source** | **Sink** | **Rate** |
|---|---|---|
| NRL-DC | Galaga at ITTC | 20 Mbps (FTP + Video Conference) |
| ARL | Hopper at ITTC | 40 Mbps (WWW + MPEG) |
| NCCOSC | Elmer at ITTC | 5 to 30 Mbps (5 Mbps increments) CBR |
| **Aggregate Throughput** | | **65 to 90 Mbps from the AAI cloud to ITTC** |

## 3.0: Results for No Cell Level Paced Traffic

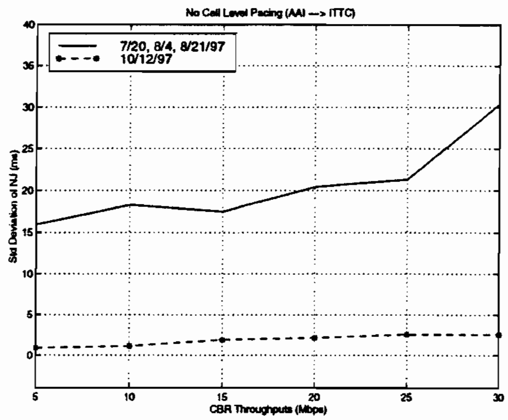


*Figure 2: Packet Std Deviation vs Throughput for No Cell Level Pacing*

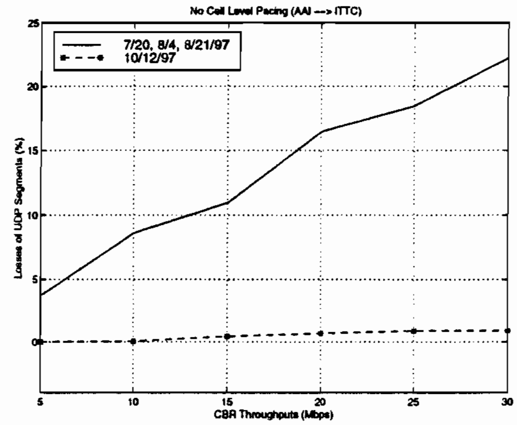


*Figure 3: Losses of UDP Segments vs Throughput for No Cell Level Pacing*

The graphs shown in figure 2 and figure 3 show the comparison of network jitter and losses of UDP segments for non-cell level paced background traffic vs. throughput.

## 4.0: Results for Cell Level Paced Traffic

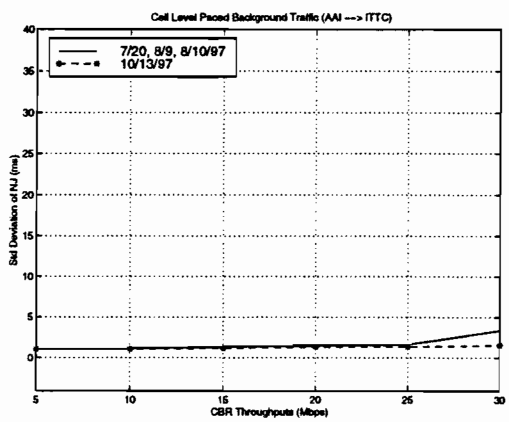


*Figure 4: Packet Std Deviation vs Throughput for Cell Level Pacing*

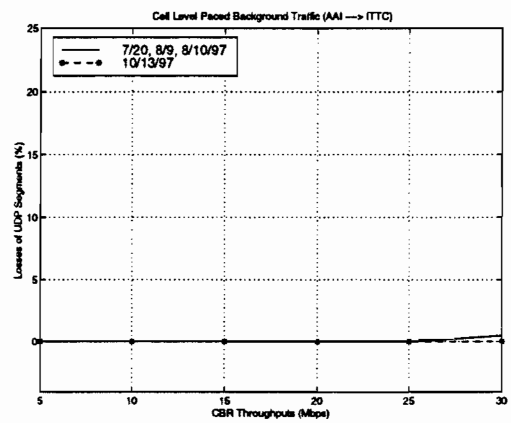


*Figure 5: Losses of UDP Segments vs Throughput for Cell Level Pacing*

The graphs show in figure 4 and figure 5 show the comparison of network jitter and losses of UDP segments for cell level paced background traffic vs. throughput. Table 1 lists the background traffic paced rates.