Cell-Level Measurements within the AAI

Luiz A. DaSilva   Victor S. Frost   Joseph B. Evans

Douglas Niehaus   David W. Petr

Technical Report TISL-10980-07

June 13, 1995

Abstract

This technical report presents the results of cell-level measurements performed on various ATM switches within the AAI. Several different virtual circuits (VCs) were monitored. As expected, we observed the strong correlation between the cell counts on the VCs used by the same connections in different switches.

Connection	Switch	Port	VPI	VCI
AFCEA - JPL	AFCEA (199.0.37.23)	A1	7	118
AFCEA - ARL	ARL (aai-pop-ether.arl.aai.net)	B1	8	130
ARL - AFCEA	AFCEA (199.0.37.23)	A1	2	130
	ARL (aai-pop-ether.arl.aai.net)	C1	0	130
AFCEA - CEWES	AFCEA (199.0.37.23)	C4	8	126
	CEWES (aai-pop-ether.arl.aai.net)	B1	5	126

Table 1: Measurement Scenarios

1 Introduction

This report presents the results of cell-level measurements performed on various ATM Fore switches within the AAI during the period from June 7 to June 8, 1995. The measurements were performed by using the Simple Network Management Protocol (SNMP).

Four different connections were monitored, and within each connection, whenever possible, equivalent VCs on different switches were also monitored. The measurement scenarios for the experiment are shown in Table 1. AFCEA, ARL, CEWES and JPL are sites on the AAI; each of these sites is connected to the AAI cloud through and edge switch.

The following section presents the results from these cell measurements and conclusions that we may draw from these results.

2 Results

2.1 AFCEA - JPL

This connection was monitored at the AFCEA Fore switch only. Data was collected from 06/07/95 at 12:23:57 to 06/08/95 at 14:23:55[1]. The cell rate was calculated as a time-average of the number of cells entering a particular VC on a switch during a given interval of time[2]. The variation of the cell rate plotted as a function of time can be seen in Figure 1, and is summarized as follows:

- The cell rate increases steadily from 1500 cells/sec to 2000 cells/sec in the first 7 hours of the experiment.
- The cell rate remains stable at approximately 2800 cells/sec in the next 7.5 hours, suggesting constant bit rate (CBR) traffic.
- For the remainder of the experiment, virtually no traffic is present.

[1] All times reported are Central Standard Time.
[2] Unless otherwise indicated, an interval of approximately 100 seconds was used.

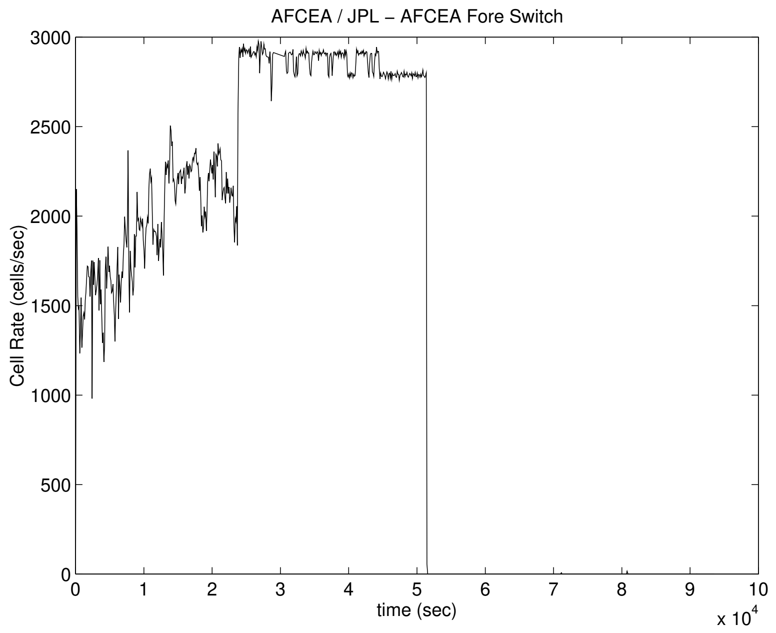

Figure 1: AFCEA - JPL connection.

2.2 AFCEA - ARL

This connection was monitored at the ARL Fore switch only. Data collection occured from 06/07/95 at 12:23:26 to 06/08/95 at 17:19:10. The results are shown in Figure 2, summarized as follows:

- Cell rate was very low throughout the measurement interval.
- Slightly higher traffic was observed during the first 7 hours of the experiment and from the 22nd to the 26th hour of the experiment. During these intervals, traffic remained approximately constant at 15 cells/sec,

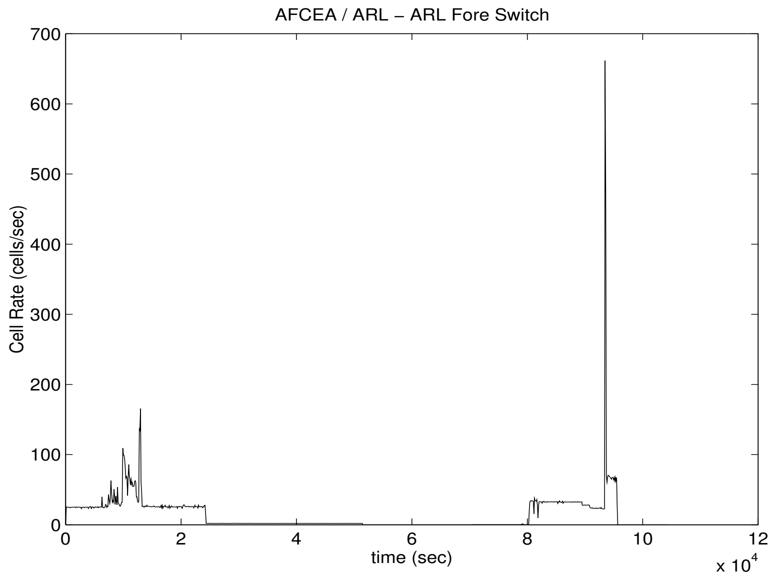

Figure 2: AFCEA - ARL connection.

with occasional peaks of 100 to 600 cells/sec.

2.3 ARL - AFCEA

Both ends of the connection were monitored, at the ARL and the AFCEA Fore switches. The data collection intervals were:

- At the AFCEA switch - from 06/07/95 at 12:23:50 to 06/08/95 at 14:23:54
- At the ARL switch - from 06/07/95 at 12:23:33 to 06/08/95 at 17:15:57

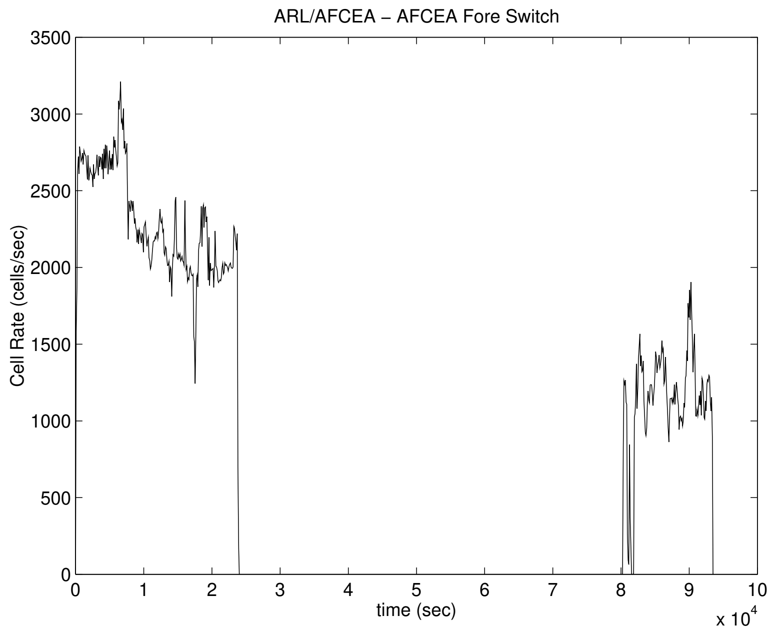

Figure 3: ARL - AFCEA connection. Monitoring at the AFCEA switch.

As expected, the cell counts at both locations were strongly correlated, with the results shown in Figures 3 and 4, and summarized as:

- The cell rate decreased from about 2700 cells/sec to about 2000 cells/sec in the first 7 hours of the experiment.
- Another burst of traffic, with the cell rate varying around 1300 cells/sec, occured from the 22nd to the 26th hours of the experiment.
- At all other times, traffic was negligible.

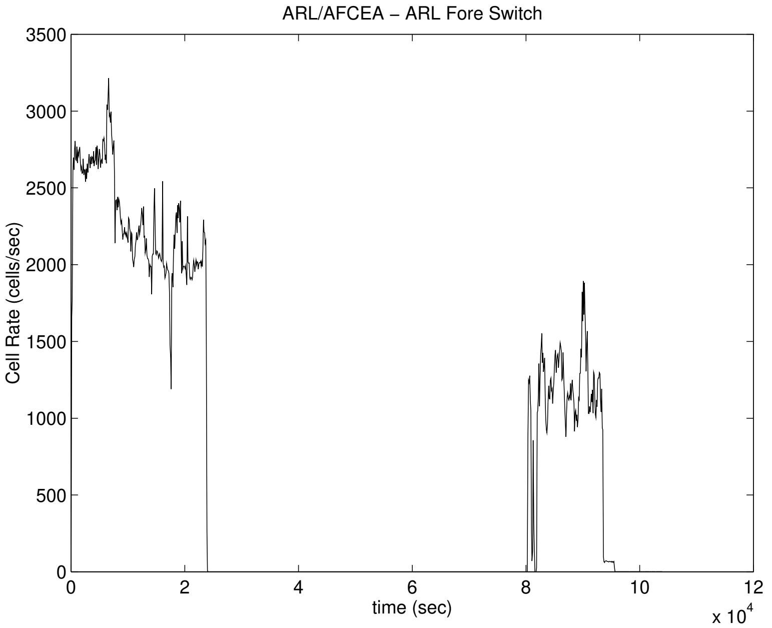

Figure 4: ARL - AFCEA connection. Monitoring at the ARL switch.

Inspection of Figures 3 and 4 seems to indicate that the cell rate patterns are almost identical for both switches. We can also look at a close-up of the results above, considering just the first 45 minutes of data collection, and calculating the cell rate every 5 seconds. These are shown in Figures 5 and 6.

From this "close-up", it is clear that the results at the AFCEA and ARL switches do follow the same general pattern, varying around the same values. However, they are not identical, which is also to be expected. The major factors that may cause differences are:

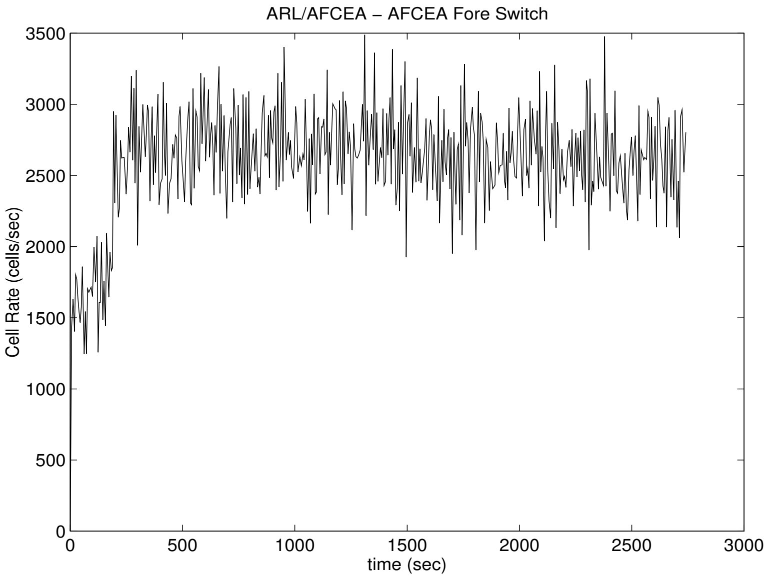

Figure 5: ARL - AFCEA connection. Monitoring at the AFCEA switch. Cell rate calculated every 5 seconds.

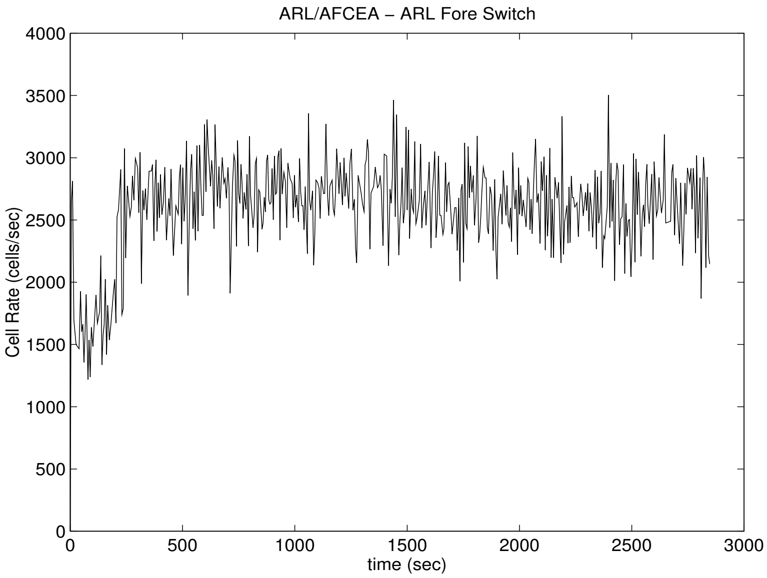

Figure 6: ARL - AFCEA connection. Monitoring at the ARL switch. Cell rate calculated every 5 seconds.

- Synchronization - the measurements at each switch are not taken at exactly the same instant of time, and therefore the intervals taken into account for the calculation of the cell rate are not the same;
- Delay variation - queueing delay at each of the switches is not the same, since it depends on the amount of traffic competing for a given port. Therefore, although the same number of cells flows through the VC at each switch, there is no guarantee that they will flow at the same rate.

2.4 AFCEA - CEWES

The AFCEA-CEWES connection was also monitored at both edge switches (the AFCEA and the CEWES Fore switches). Results are shown in Figures 7 and 8 and summarized as follows:

- During the 20th hour of the experiment, we observed traffic in the order of 600 cells/sec on both switches.
- For the remainder of the experiment, traffic remained very low, in the neighborhood of 4 cells/sec.

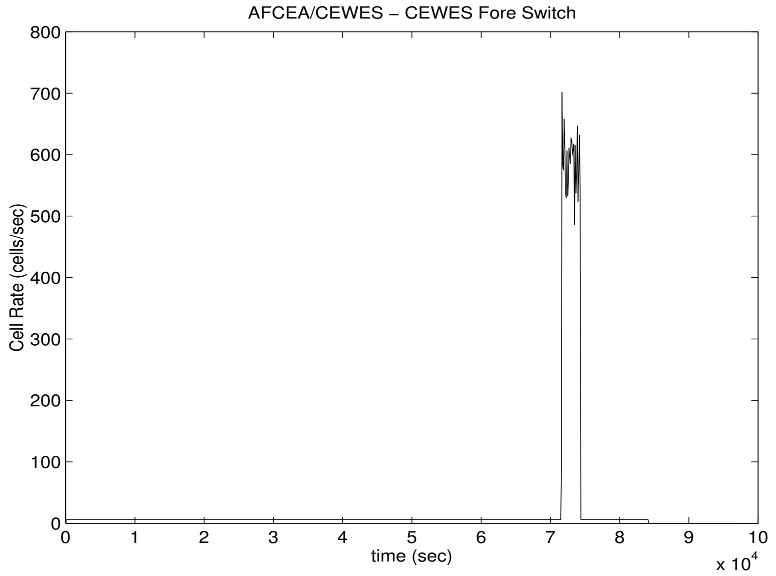

Figure 7: AFCEA-CEWES connection. Monitoring at the AFCEA switch.

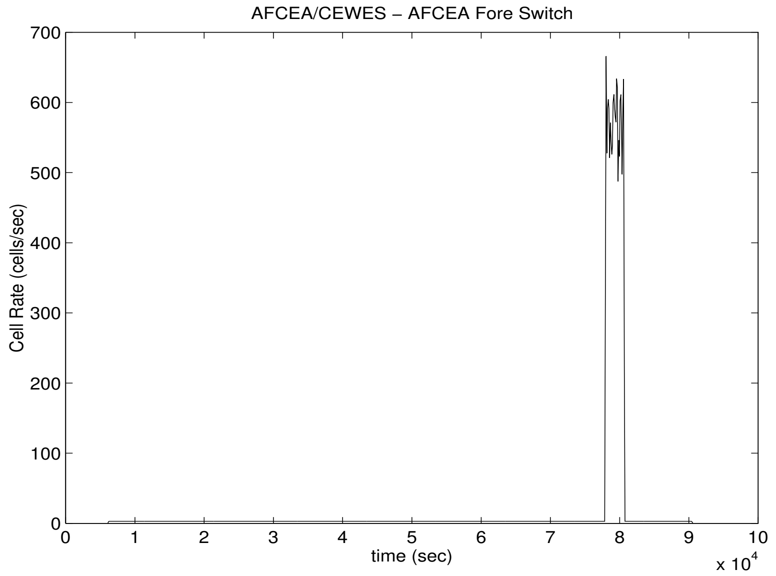

Figure 8: AFCEA-CEWES connection. Monitoring at the CEWES switch.

- As expected, the results observed at the AFCEA and CEWES switches are in close agreement.