

98-0407: Effect of RM Cell Interval on ABR Feedback: A Simulation Study Using OPNET

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- ❑ Effect of Nrm on Video over ABR
- ❑ OPNET ABR Model
- ❑ Simulation Configuration
- ❑ Simulation Results

Video Over ABR

- ❑ Default $N_{rm} = 32$
- ❑ High rate and small $N_{rm} \Rightarrow$ high rate variations due to frequent feedback. May be undesirable for smoothed video.
- ❑ Two methods of reducing variations in feedback
 - Use large $N_{rm} \Rightarrow$ Less frequent feedback
 - Use large averaging interval for feedback control algorithm (ERICA+) \Rightarrow less frequent changes in feedback, since only one feedback value in one interval.

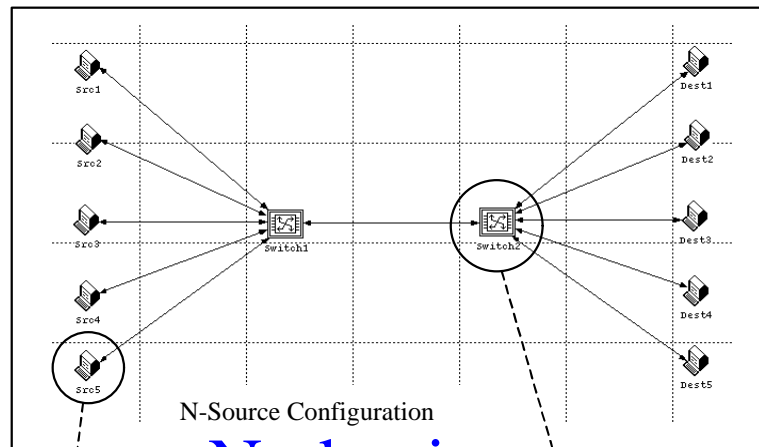
❑ **Goal: To study the effect of N_{rm} on ABR feedback.**

ABR Model in OPNET

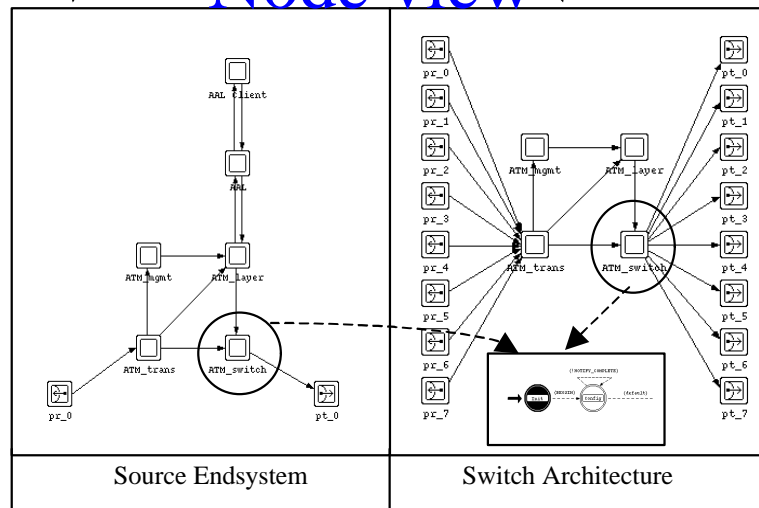
- ❑ New model implemented in OPNET.
- ❑ Supports multiple QoS classes and service categories.
- ❑ Supports ABR with ERICA.
- ❑ Planned support for
 - VS/VD
 - Scheduling
 - Buffer Management
- ❑ Can easily add modules for different schemes/algorithms.

ATM Model Views

Network view



Node view



Network view

- Topology of network

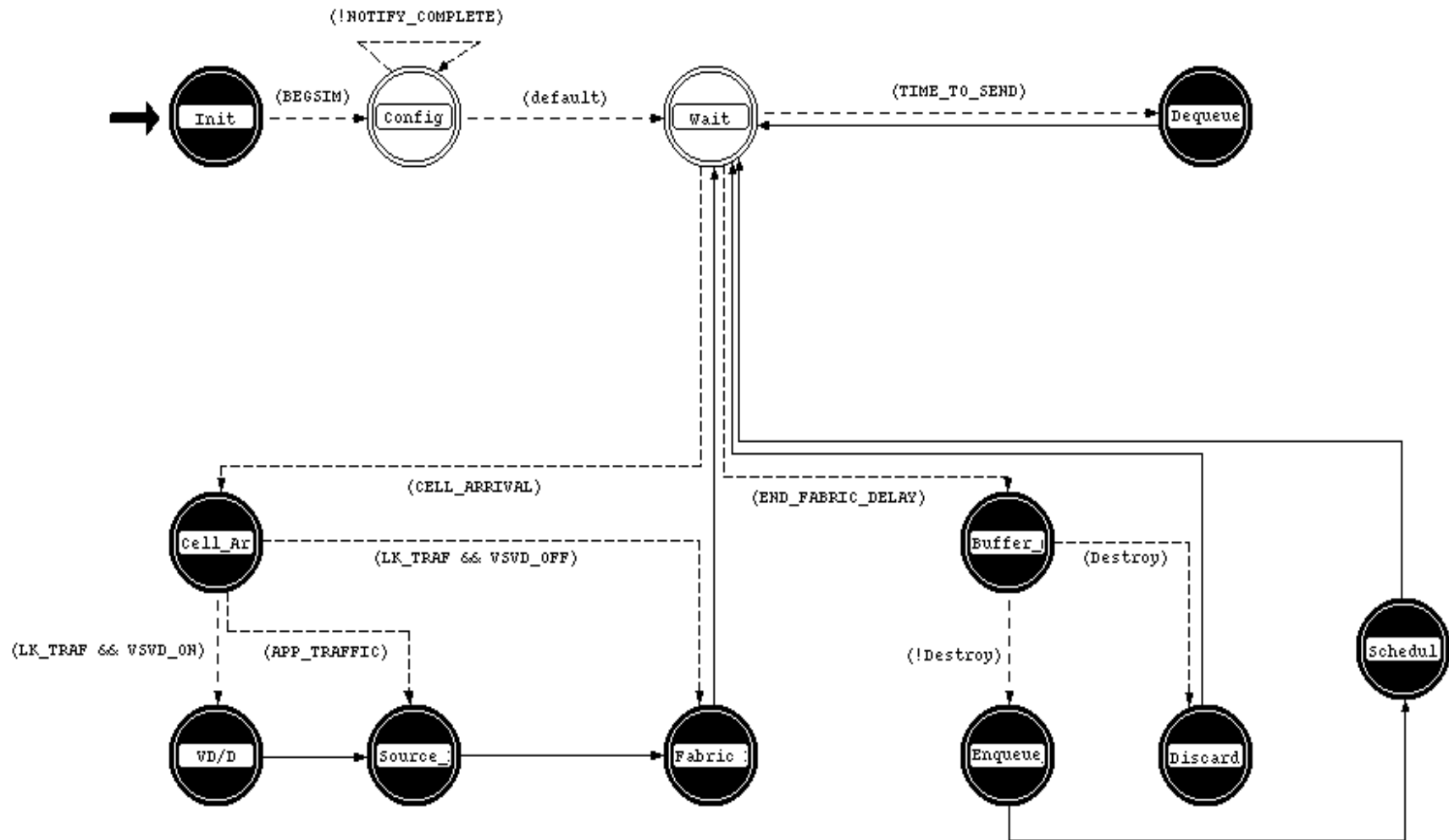
Node view

- Components of each network node (e.g., protocol layers within a node)

Process view

- State diagram of each process, (e.g. ATM traffic management, TCP state diagram)

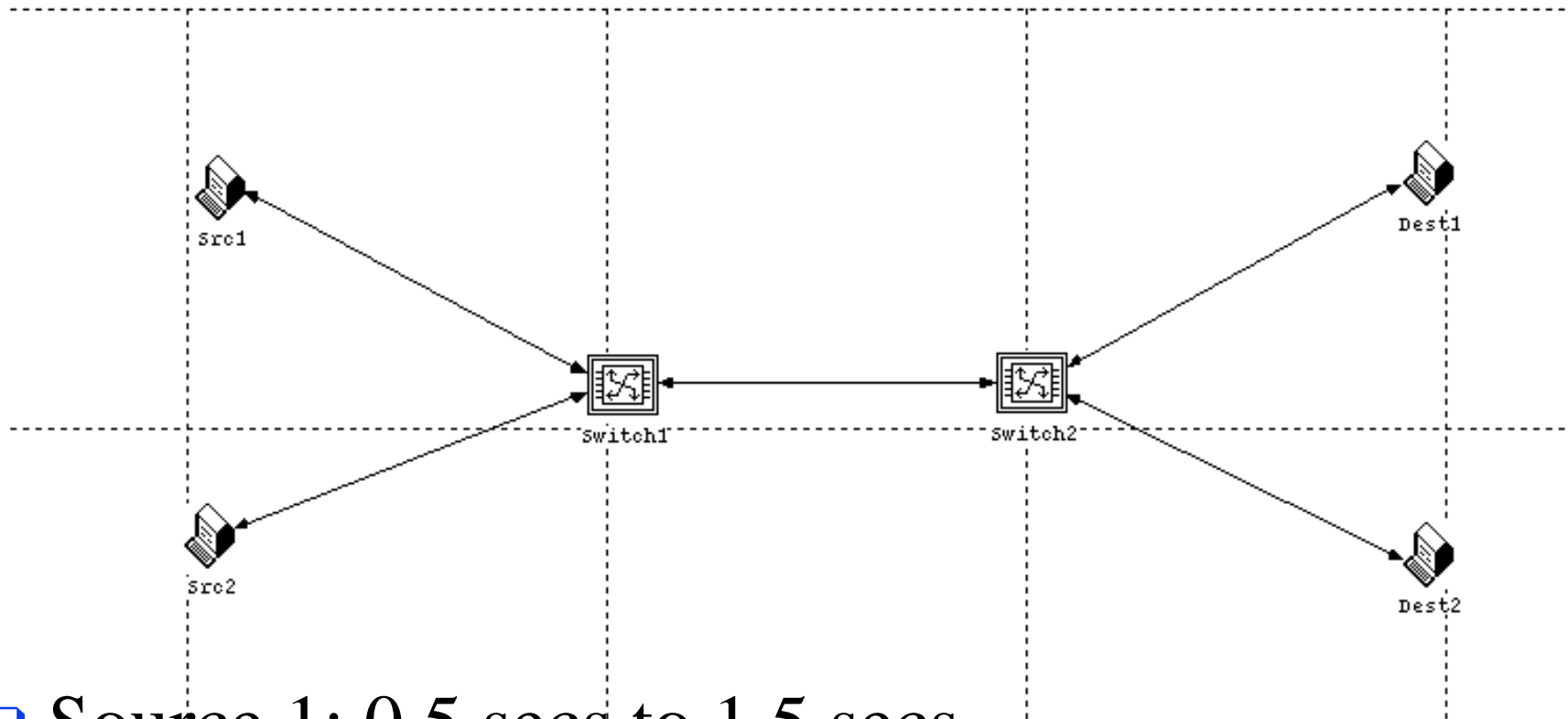
ABR Process Model



Simulation Experiment

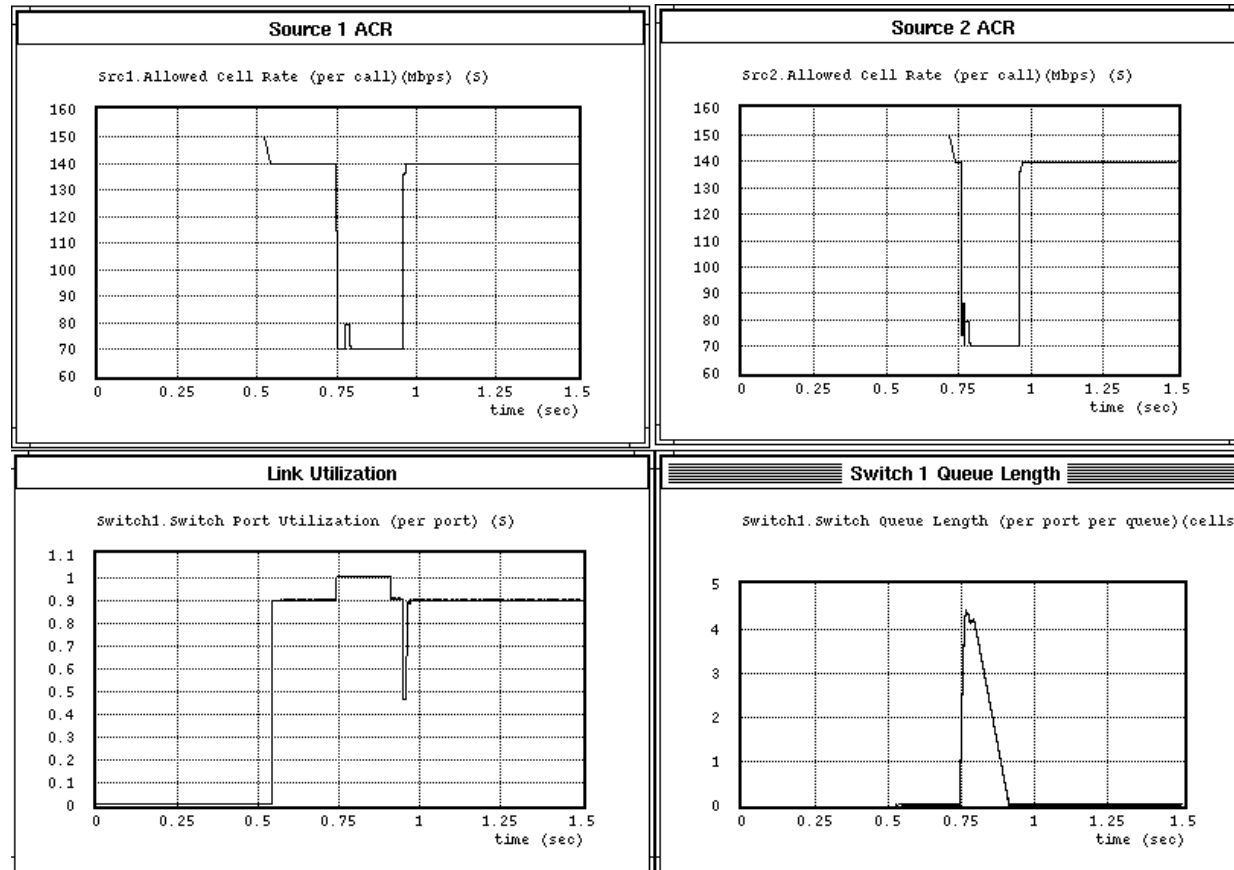
- ❑ $N_{rm} = 8, 32, \text{ and } 256$
- ❑ All links = 155.52 Mbps
- ❑ ICR = 150 Mbps
- ❑ ERICA Averaging Interval = 5 ms
- ❑ ERICA Target Utilization = 0.9
- ❑ RIF = 1/16
- ❑ All other ABR parameters are set to default values
- ❑ All sources are persistent sources

Two Source Transient Config.

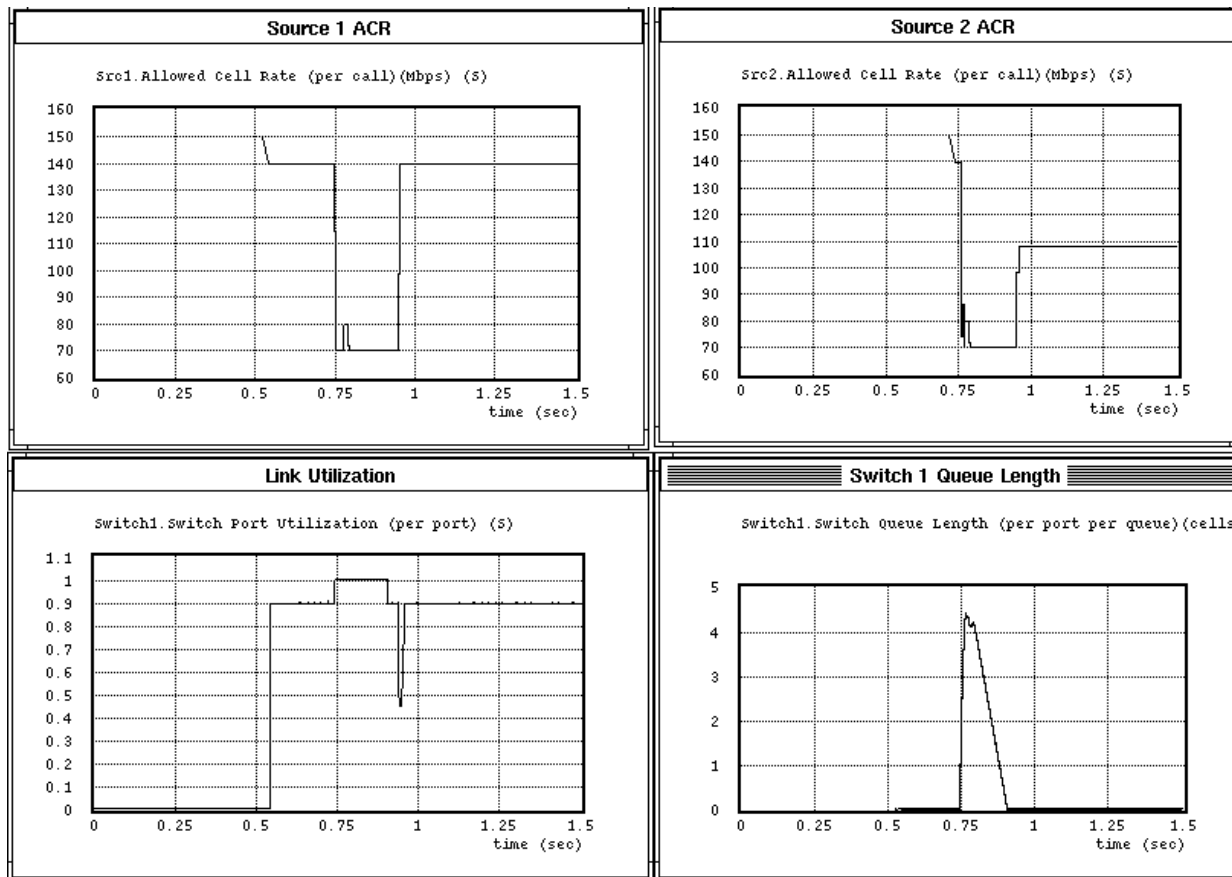


- ❑ Source 1: 0.5 secs to 1.5 secs
- ❑ Source 2: 0.7 secs to 0.9 secs
- ❑ RTT \approx 23 ms.

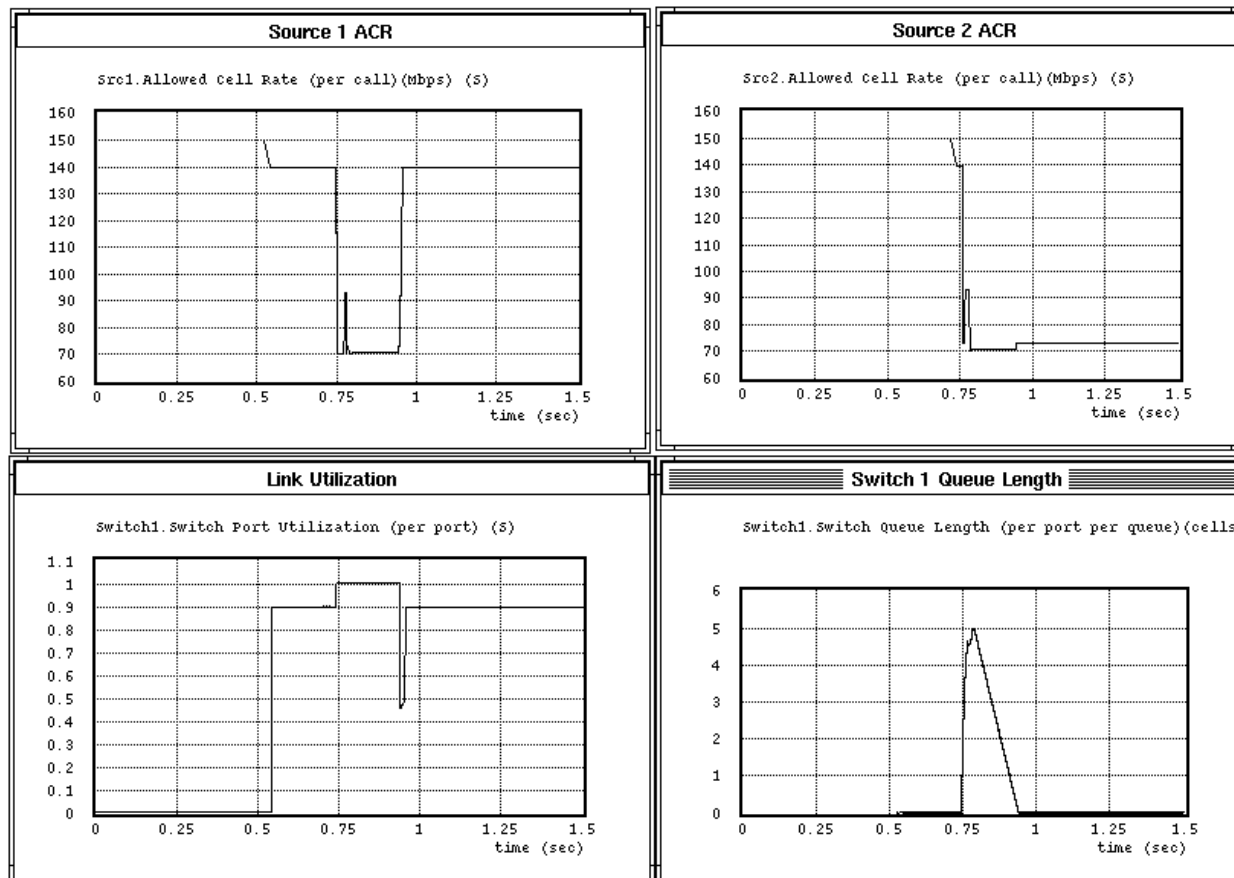
Simulation Results: Transient



$$N_{rm} = 8$$

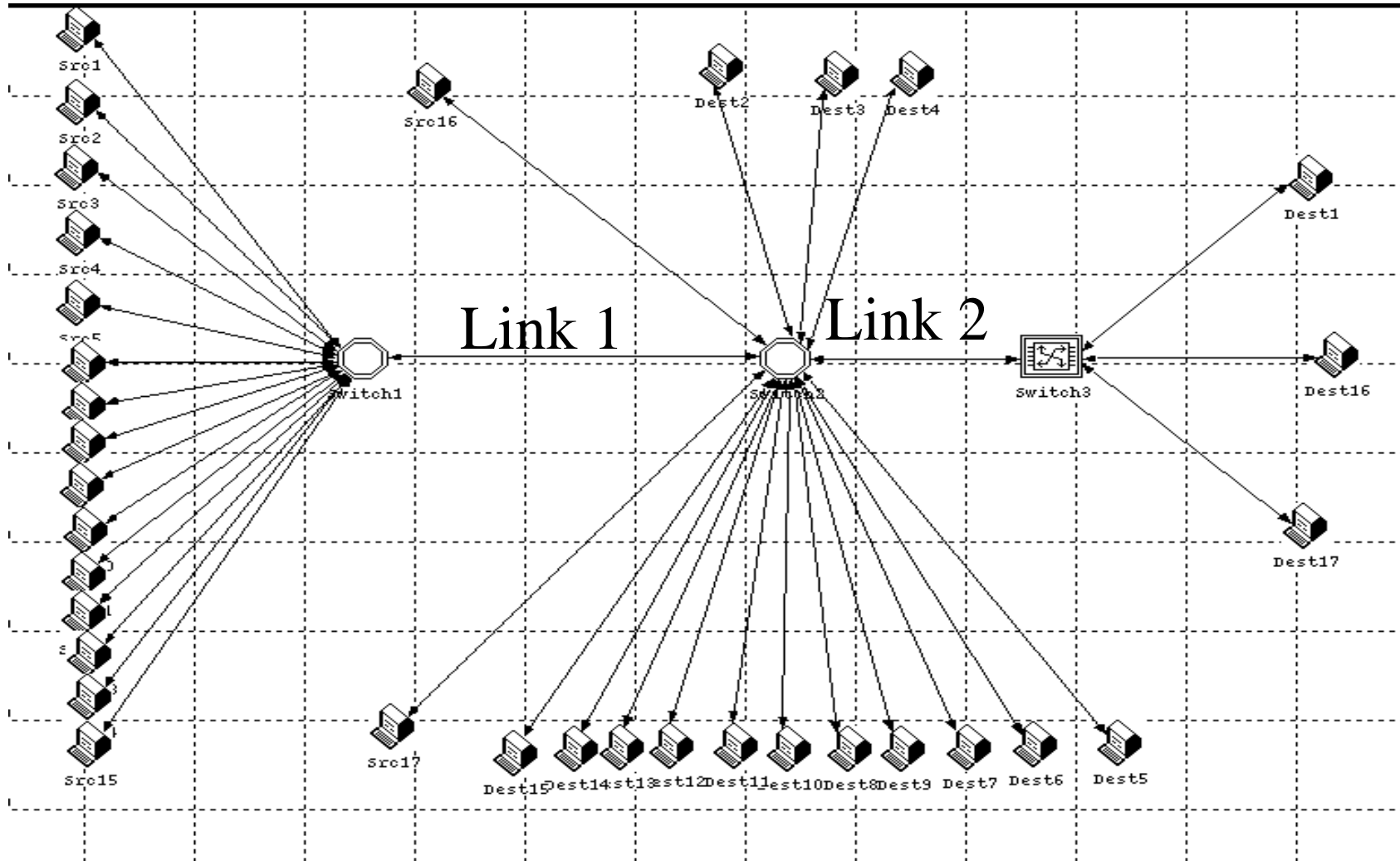


$$N_{rm} = 32$$



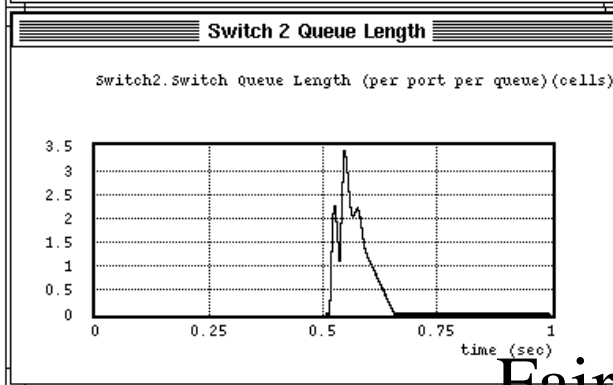
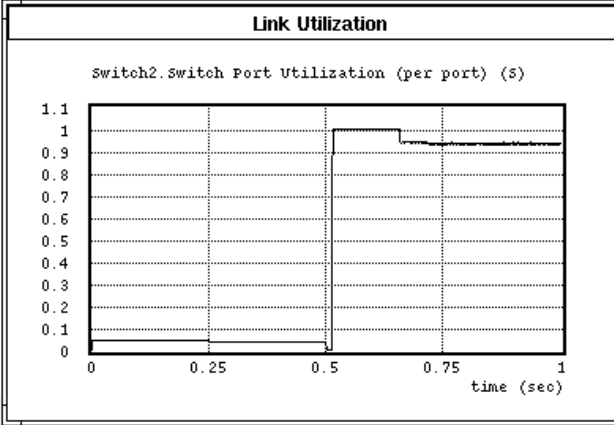
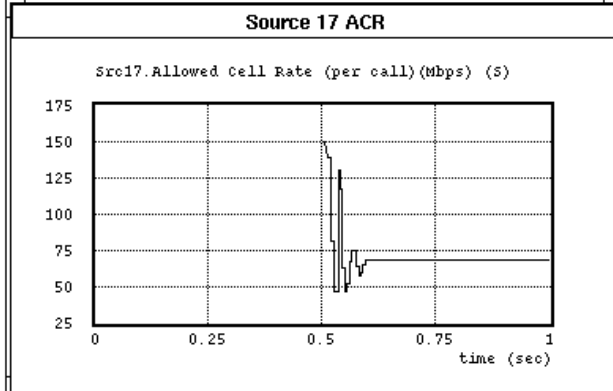
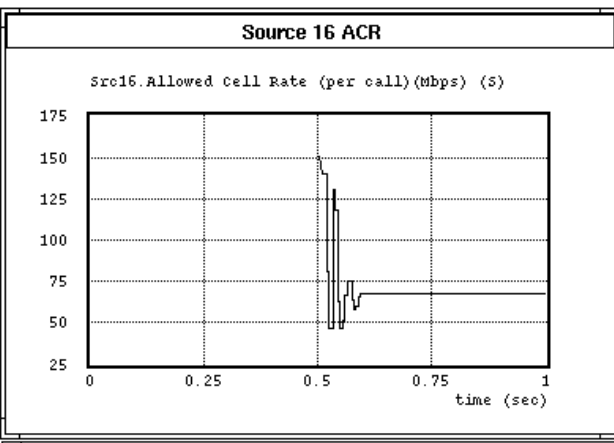
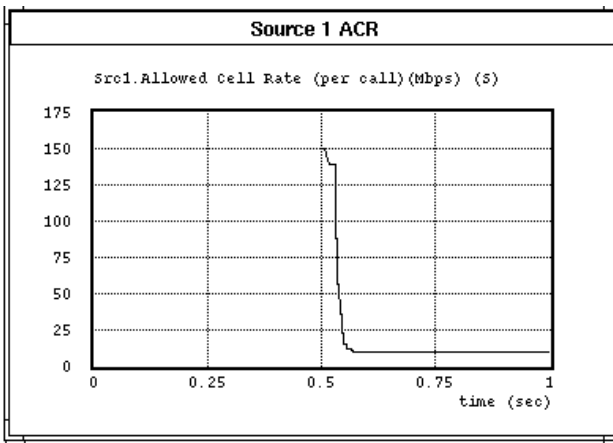
$$N_{rm} = 256$$

The Fairness Configuration

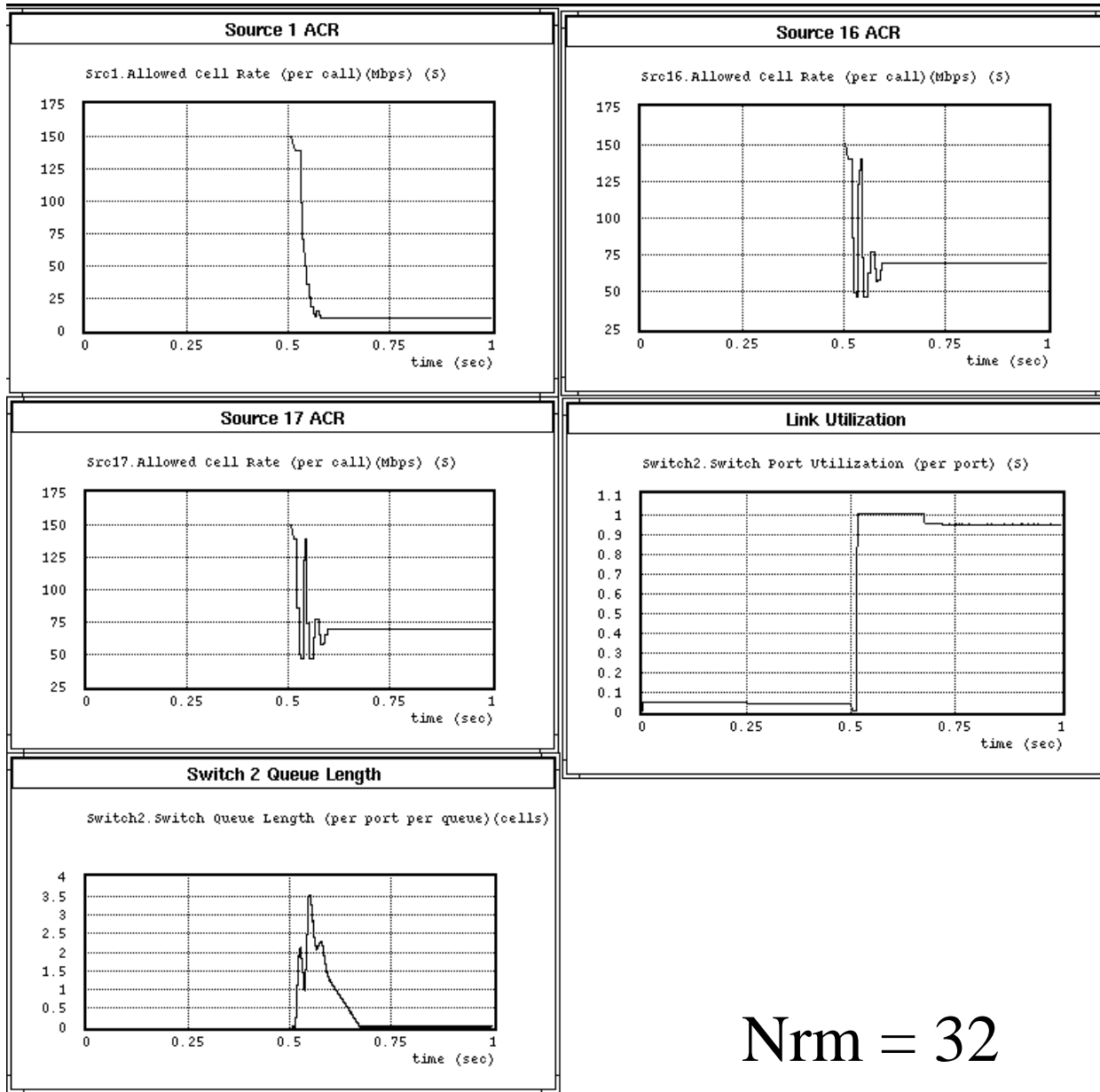


Fairness Configuration

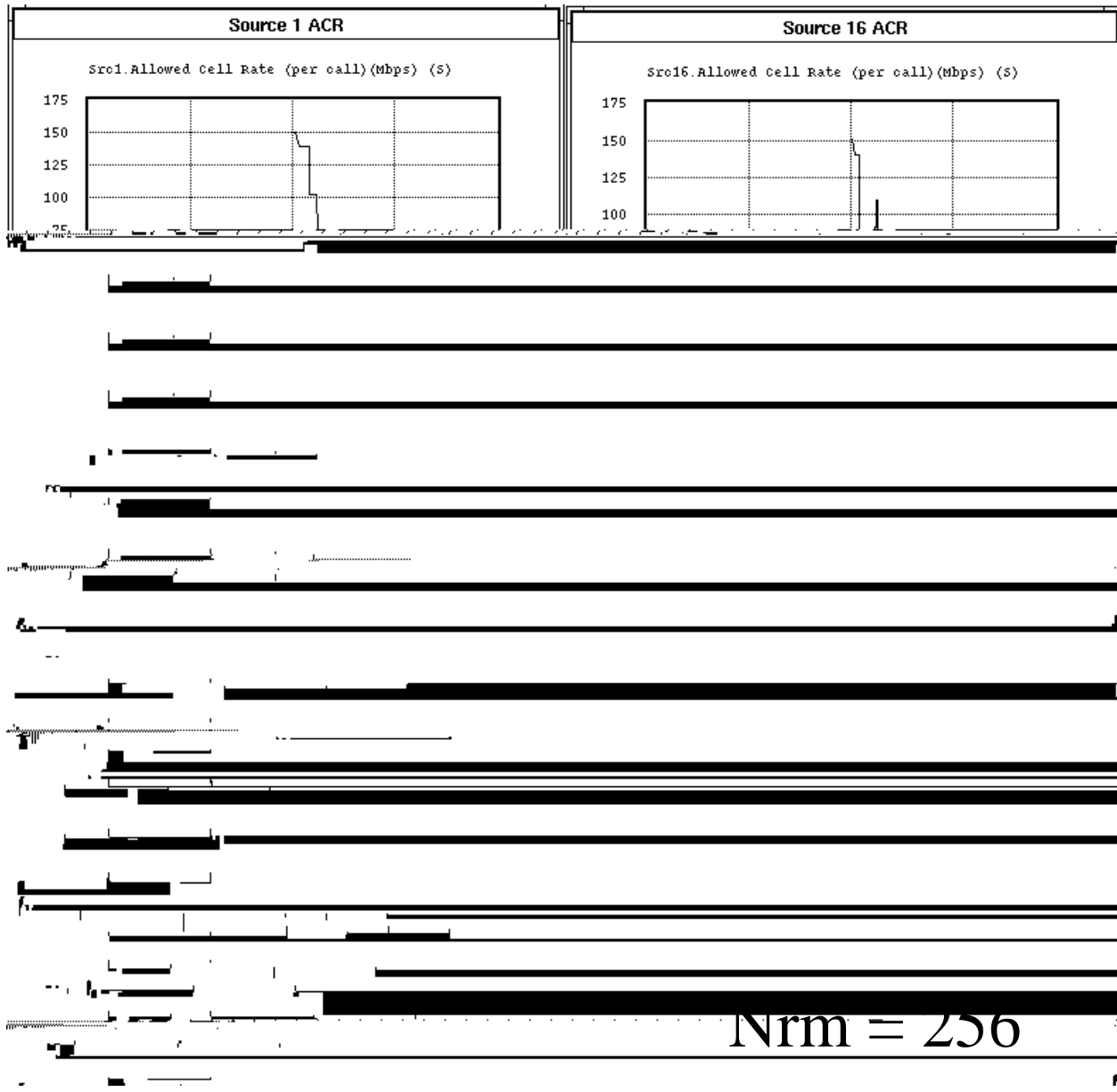
- ❑ Upstream bottleneck
- ❑ Link 1 shared by 15 connections
- ❑ Link 2 shared by 3 connections
- ❑ Sources 1 ... 15 bottlenecked at 10 Mbps
- ❑ Sources 16, 17 sending at 100 Mbps load
- ❑ All sources send from $t=0.5$ sec to $t=1.5$ sec.



Fairness Configuration: $N_{rm} = 8$



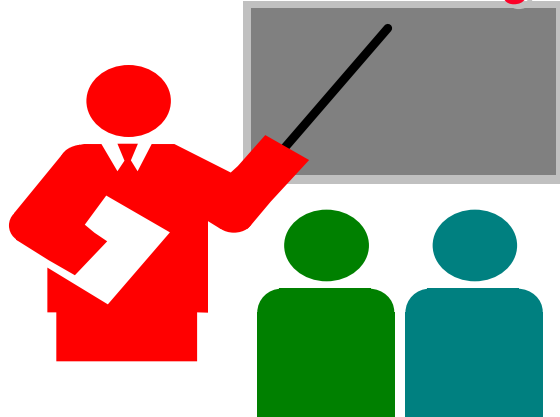
$$N_{rm} = 32$$



Simulation Results

- Transient configuration
 - When source 2 finishes transmission, with $N_{rm}=8$, source 1 reaches the optimal rate in a shorter time than with $N_{rm}=256$, especially when $RIF=1/16$
 - Lower $N_{rm} \Rightarrow$ Large RM overhead
 - \Rightarrow Lower application throughput
 - \Rightarrow Source 2 finishes transmission in a longer time
- Fairness configuration
 - Faster convergence for lower N_{rm}

Summary



- ❑ New OPNET ABR model
- ❑ Simulation study of effect of Nrm on ABR feedback
- ❑ Lower Nrm results in faster convergence
- ❑ Lower Nrm results in higher RM cell overhead
- ❑ Varying ABR capacity not studied yet