

95-1662R1

Performance Benchmarking of ATM Switches

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- ❑ Summary of October 1995 discussion
- ❑ Goals and Nongoals
- ❑ Performance Metrics
- ❑ Traffic Management Metrics

Ref: RFC 1242 “Benchmarking Terminology for Network Interconnection Devices” July 1991, <http://ds.internic.net/>

Summary of October Meeting

- Performance benchmarking
= Performance seen at higher layers
≠ Cell level QoS
For example,
CLR = 0.1% may mean a frame loss rate of 0.1% in one switch or 0.001% in another.
- We need to standardize the performance metrics, configurations, and benchmarks.

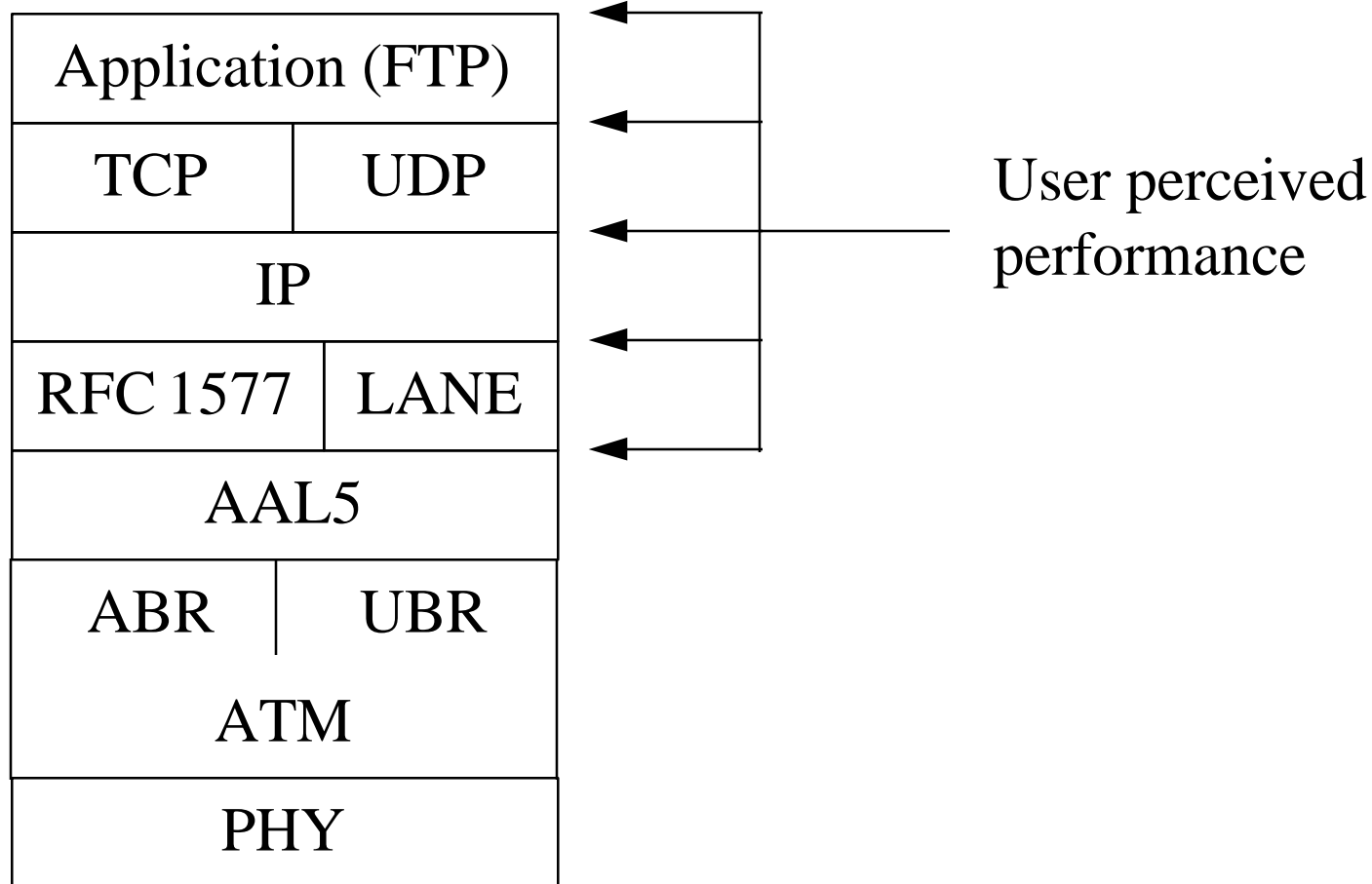
Goals

- ❑ Eventually extend benchmarking to all classes of service CBR, Real-time VBR, Non-realtime VBR, ABR, UBR. Begin with ABR and UBR.
- ❑ Emphasize end-user view point where-ever possible. For example, TCP performance over UBR or ABR? User is interested in higher throughput rather than the mechanism.
- ❑ Performance may need to be measured on different protocol stacks
- ❑ Emphasize frame-level metrics rather than cell-level metrics
- ❑ Include performance of network management, connection setup along with normal data transfer, traffic management

Restrictions of This Contribution

- ❑ Concentrates on data traffic: ABR and UBR classes
- ❑ Only performance metrics
- ❑ Test configurations, traffic patterns, and applications will be addressed later.

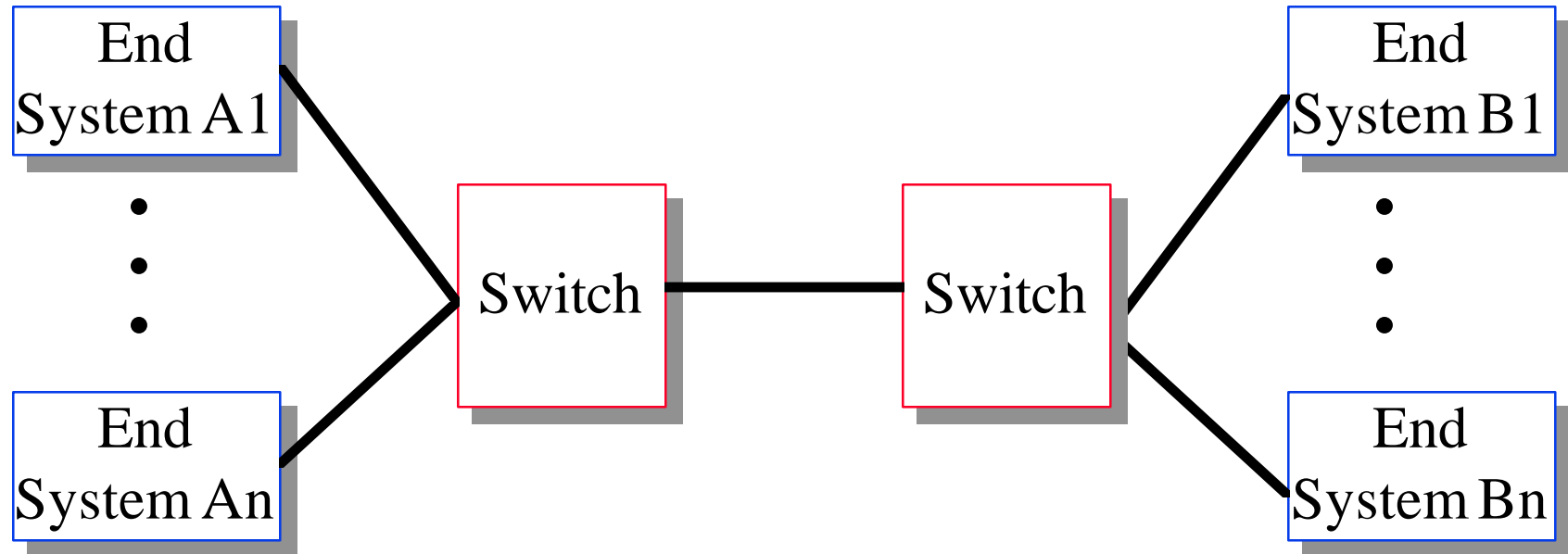
User Perceived Performance



Performance Metrics

- ❑ General Metrics
- ❑ Traffic management metrics
- ❑ Protocol specific metrics
- ❑ Network management metrics

Reference Configuration

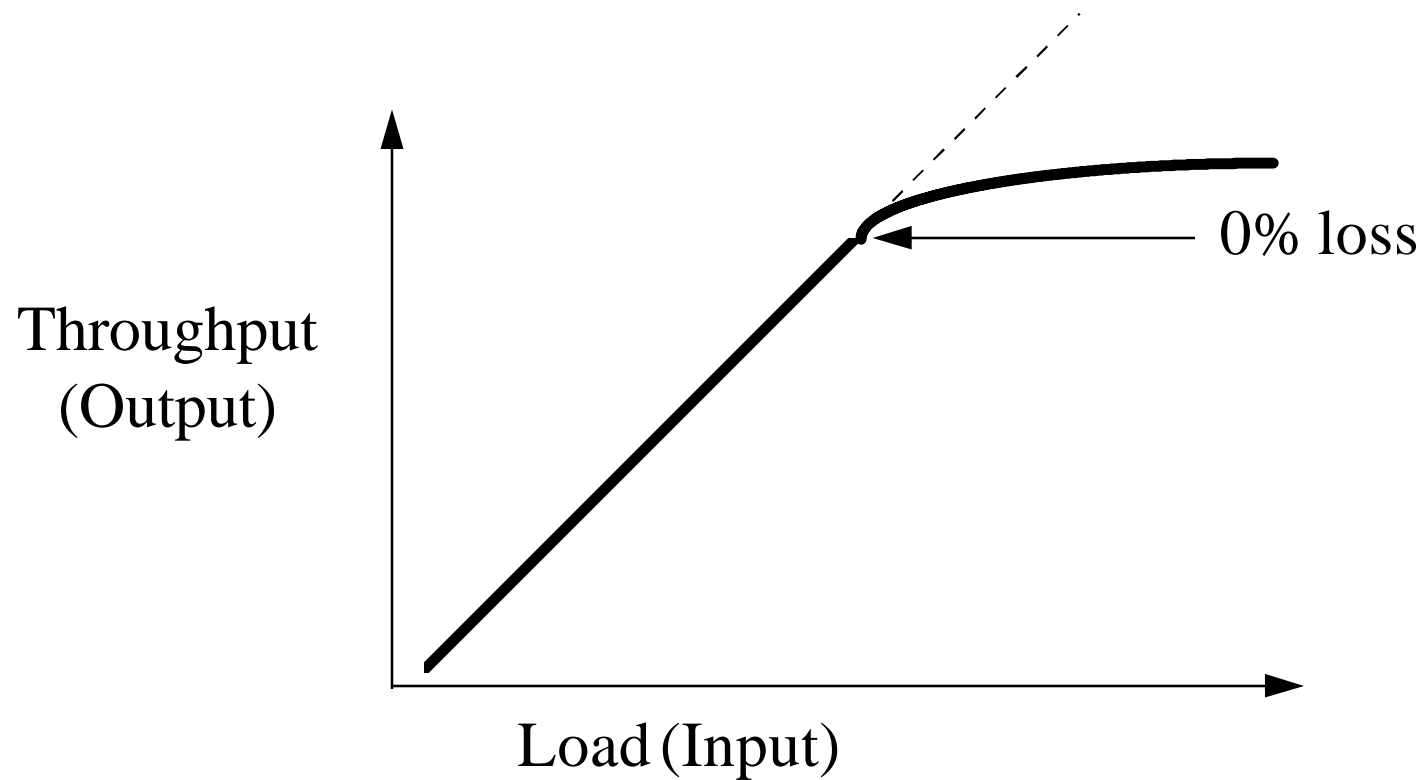


General Performance Metrics

- ❑ Throughput
- ❑ Frame loss rate
- ❑ Back-to-back burst size
- ❑ Latency
- ❑ Call establishment time

Throughput

- Maximum bit rate when the frame loss is zero
Increase load as long as input count = output count



Frame Loss Rate

- ❑ Frame loss rate = $(\text{Input count} - \text{Output count}) / \text{input count}$
- ❑ Report throughput as a function of load

Back-to-Back Burst Size

- ❑ Burst of frames sent by applications
- ❑ Burst size increased until some frame lost

Latency

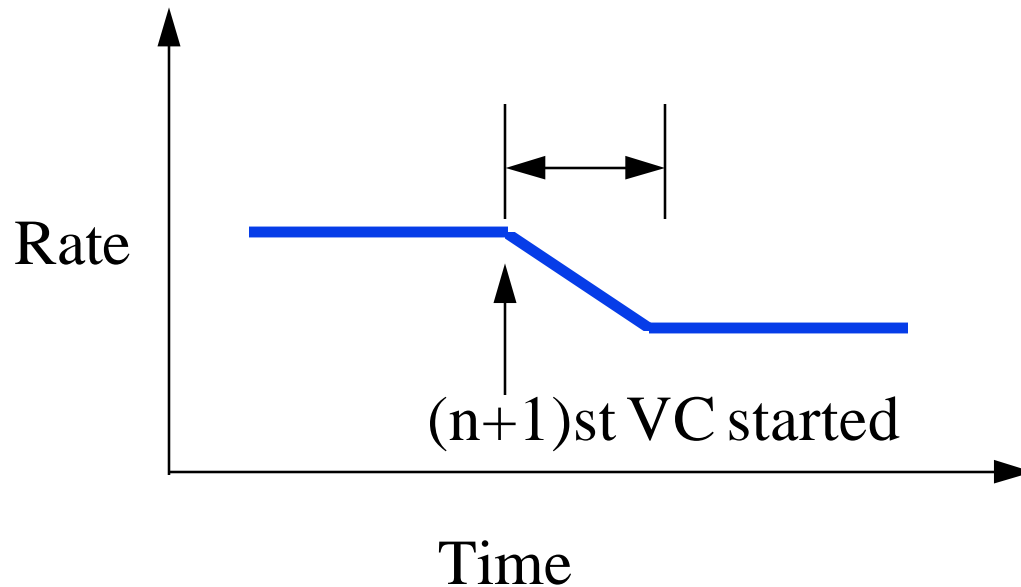
- ❑ Last-bit in to first-bit out
- ❑ Issues:
 - ❑ Cut-through devices: negative
 - ❑ Other factors that affect latency

Call Establishment Time

- ❑ Time taken to setup a connection
- ❑ Important for short duration VCs
- ❑ Issues: Component of delay caused by NICs

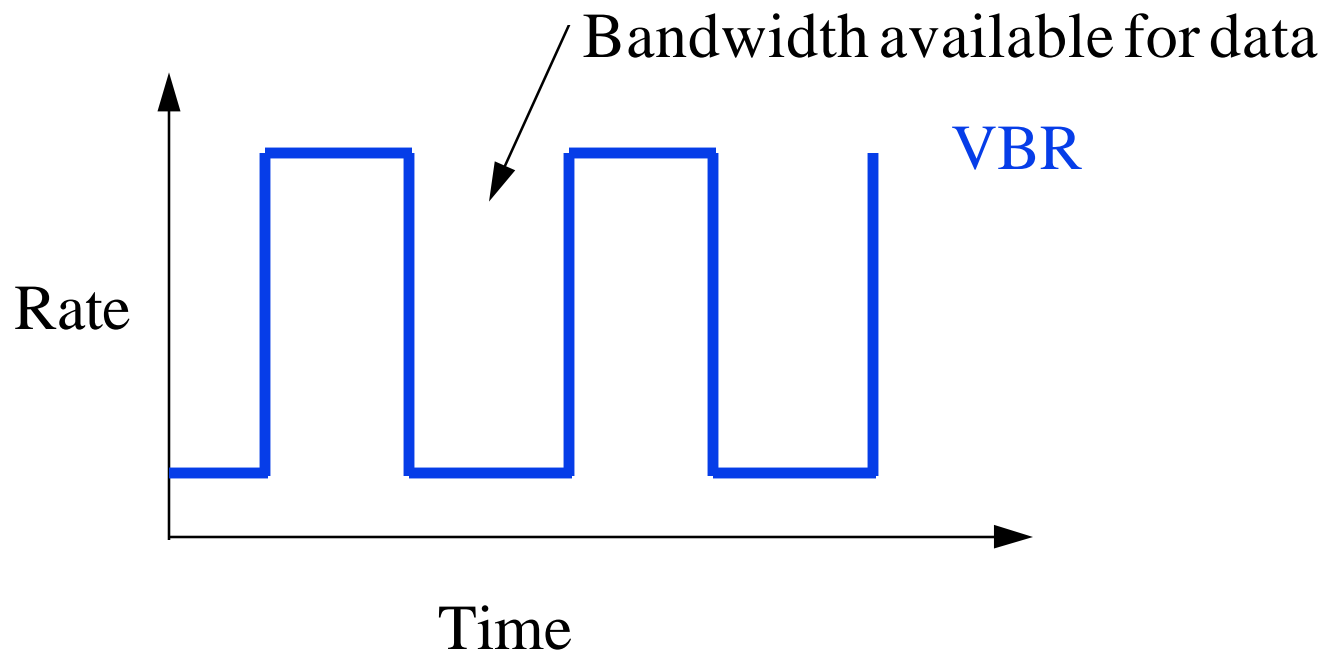
Traffic Management Metrics

- Load Control Latency:
 - Set up n VCs and let the system reach steady state
 - Set up $(n+1)$ st VC and measure the time to settle to steady state



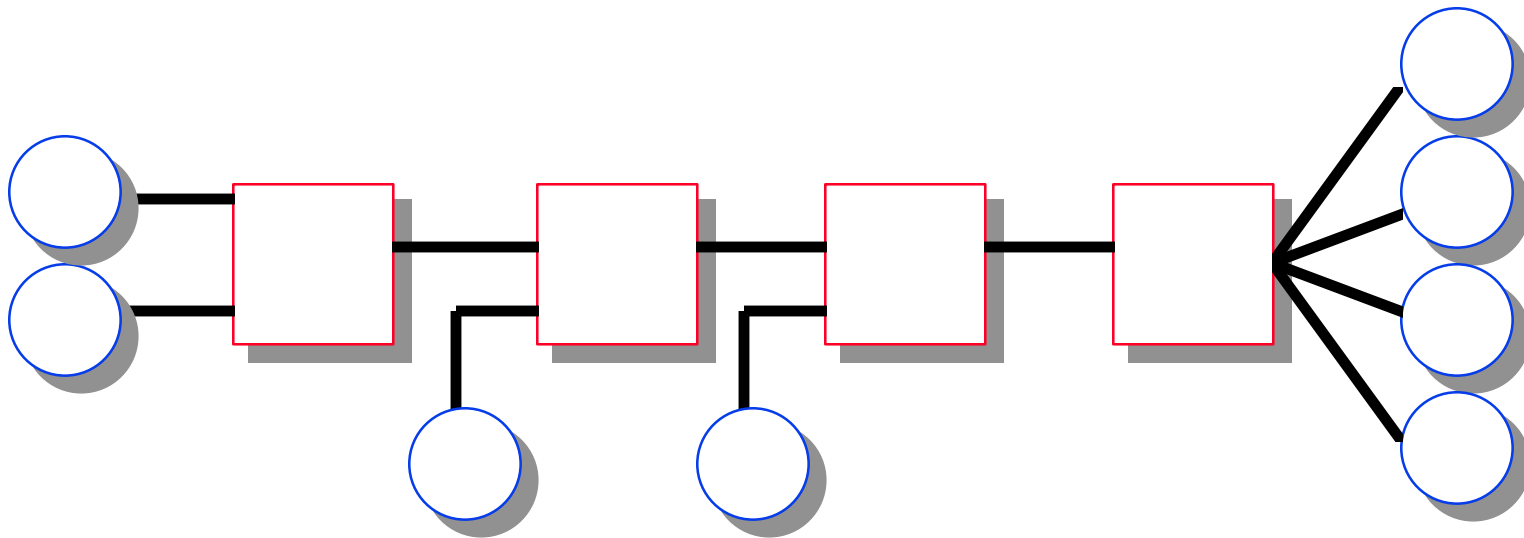
Throughput in Presence of VBR

- ❑ VBR traffic has higher priority than data
- ❑ Study data throughput when VBR takes precedence possibly upto overloading conditions

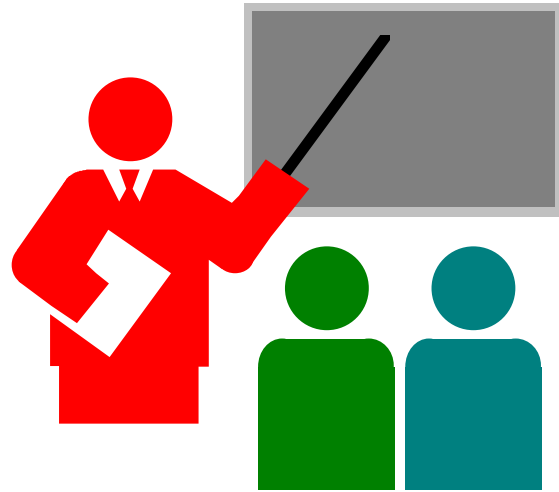


Fairness

- A parking lot configuration can be used to measure the fairness of the ATM switches



Summary



- ❑ Frame-level benchmarking
- ❑ Throughput, Frame loss rate, burst performance, latency, call establishment time
- ❑ Load control latency, throughput in presence of VBR, fairness