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General Considerations for Frame-Level Performance Measurement of ATM Switches

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Overview

- ❏ Traffic Pattern
- ❏ Configurations
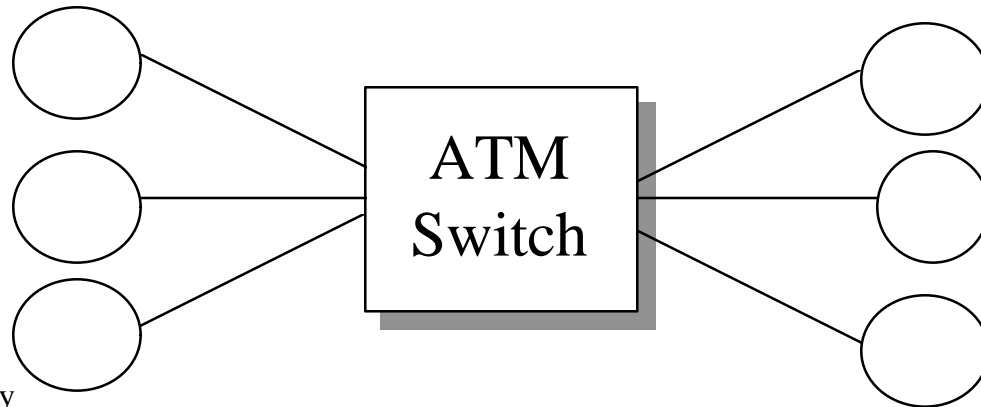- ❏ Protocol Layers
- ❏ Performance Metrics

Traffic Patterns

❑ Open loop traffic:
Loss does not result in load reduction, e.g., UDP

❑ Closed loop traffic:
Has built in congestion control.
Loss results in load reduction, e.g., TCP

❑ Frame loss rate is low for closed loop traffic
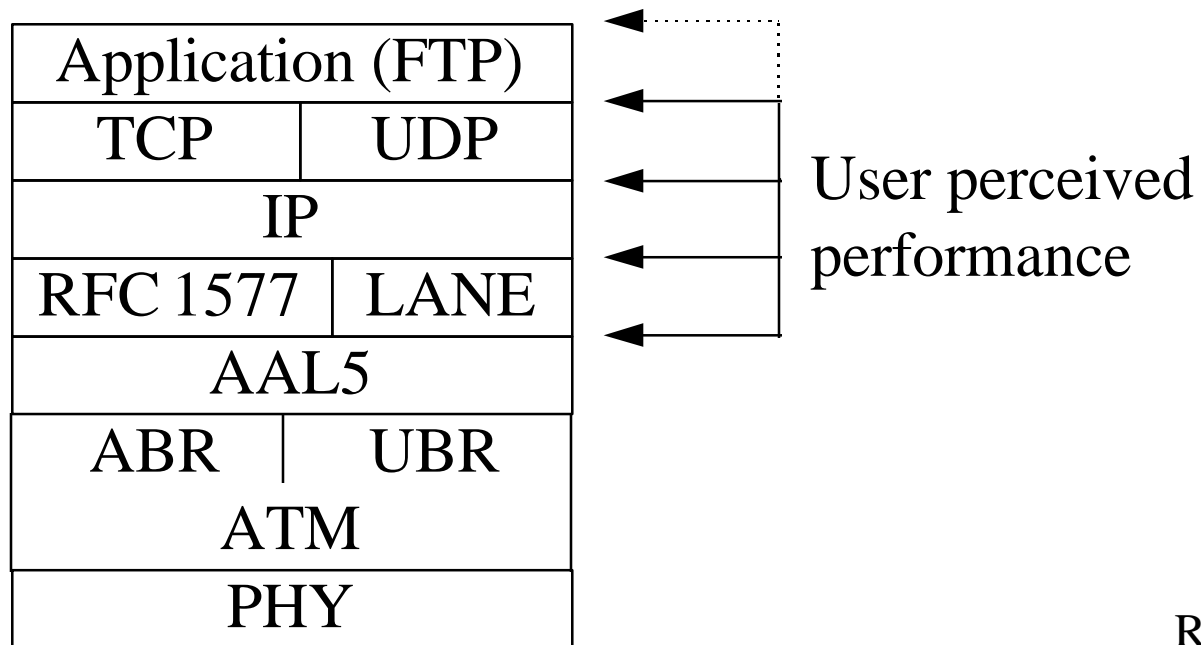
Test Configurations
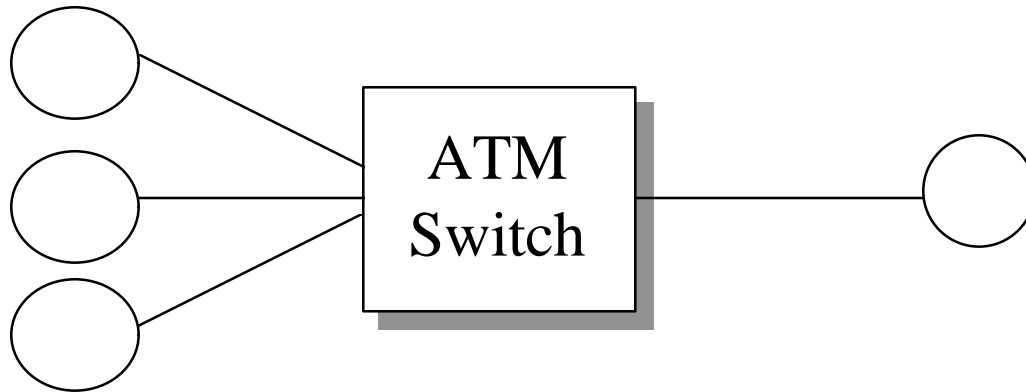
❑ N-to-1:

❑ N-by-N: N-to-1 or N-to-N flows;
Unidirectional or bi-directional

Protocol Layer

❑ AAL5 Layer: Can't compare with non-ATM technologies

❑ IP over LANE vs IP over Ethernet vs IP over RFC1577

❑ Data application over TCP or UDP

| Application (FTP)	
TCP	UDP
IP	
RFC 1577	LANE
AAL5	
ABR	UBR
ATM	
PHY	

User perceived performance

Which Layer?

❑ Goal: To minimize the number of measurement points.

❑ For TCP Applications:
Lower TCP throughput $\Rightarrow$ Lower application throughput and vice versa. There is one-to-one correspondence.

❑ For UDP applications:
UDP performance is a good indicator.
UDP = IP + header. No protocol messages (such as acks).
$\Rightarrow$ IP performance is an equally good indicator.

❑ LANE performance allows ATM to be compared with legacy LANs.

❑ AAL5 is the lowest layer where frame level performance can be studied.

Performance Metrics

Output	AAL5	TCP	IP/ LANE	IP/ RFC1577
Peak Throughput	X	Note 1	X	X
Zero-loss Throughput	X	X	X	X
Latency	X	X	X	X
Frame Loss Rate	X	Note 2	X	X
Call Establishment Latency	X	Note 3	Note 3	Note 3
Max Call Establishment Rate	X	Note 3	Note 3	Note 3

1. For TCP, Peak throughput = zero-loss throughput

2. For TCP, frame loss rate = 0

3. Call establishment relates to VCs and is meaningful only at AAL5.

Summary
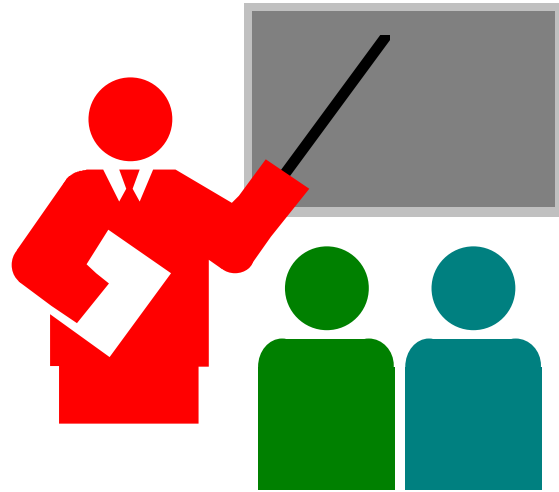
- ❑ Test configurations: n to 1, n to n

- ❑ Traffic Patterns: n to 1, n to n. Closed loop, open loop.

- ❑ Protocol Layers: TCP, IP over RFC1577, IP over LANE, AAL5

- ❑ Performance Metrics: Throughput, latency, frame loss rate, connection setup time