

**96-0519:**  
**General Considerations for  
Frame-Level Performance  
Measurement of ATM Switches**

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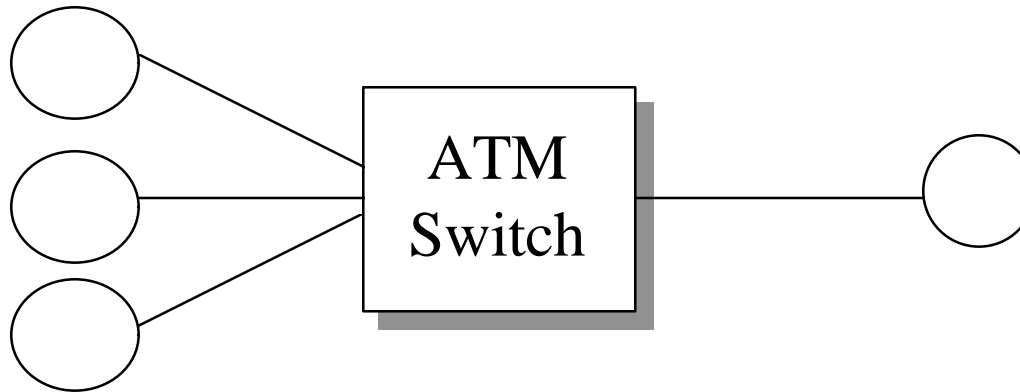
- ❑ Traffic Pattern
- ❑ Configurations
- ❑ Protocol Layers
- ❑ Performance Metrics

# Traffic Patterns

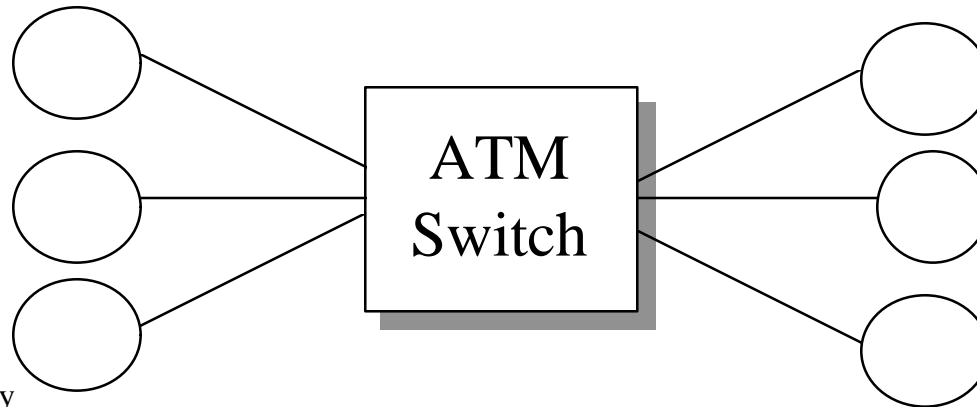
- ❑ Open loop traffic:  
Loss does not result in load reduction, e.g., UDP
- ❑ Closed loop traffic:  
Has built in congestion control.  
Loss results in load reduction, e.g., TCP
- ❑ Frame loss rate is low for closed loop traffic

# Test Configurations

- N-to-1:

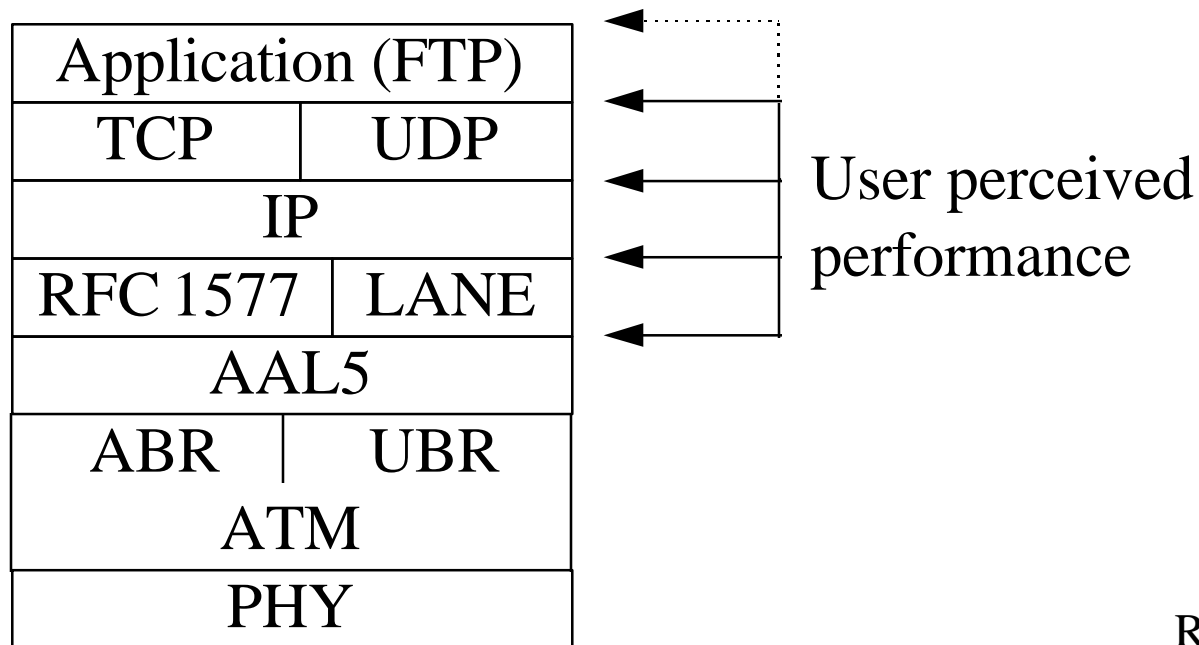


- N-by-N: N-to-1 or N-to-N flows;  
Unidirectional or bi-directional



# 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



# Which Layer?

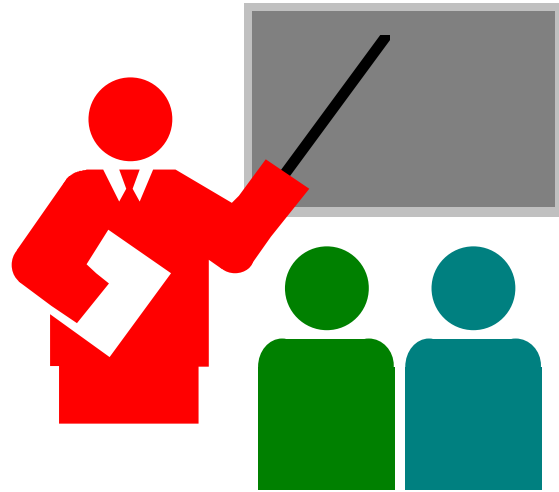
- ❑ Goal: To minimize the number of measurement points.
- ❑ For TCP Applications:  
Lower TCP throughput  $\Rightarrow$  Lower application throughput and vice versa. There is one-to-one correspondence.
- ❑ For UDP applications:  
UDP performance is a good indicator.  
UDP = IP + header. No protocol messages (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