

A Stall Rate Analysis of Heavy and Transient Traffic LAN by Simulation on Multi-layer Protocols

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Motivation

Educational Computer Systems

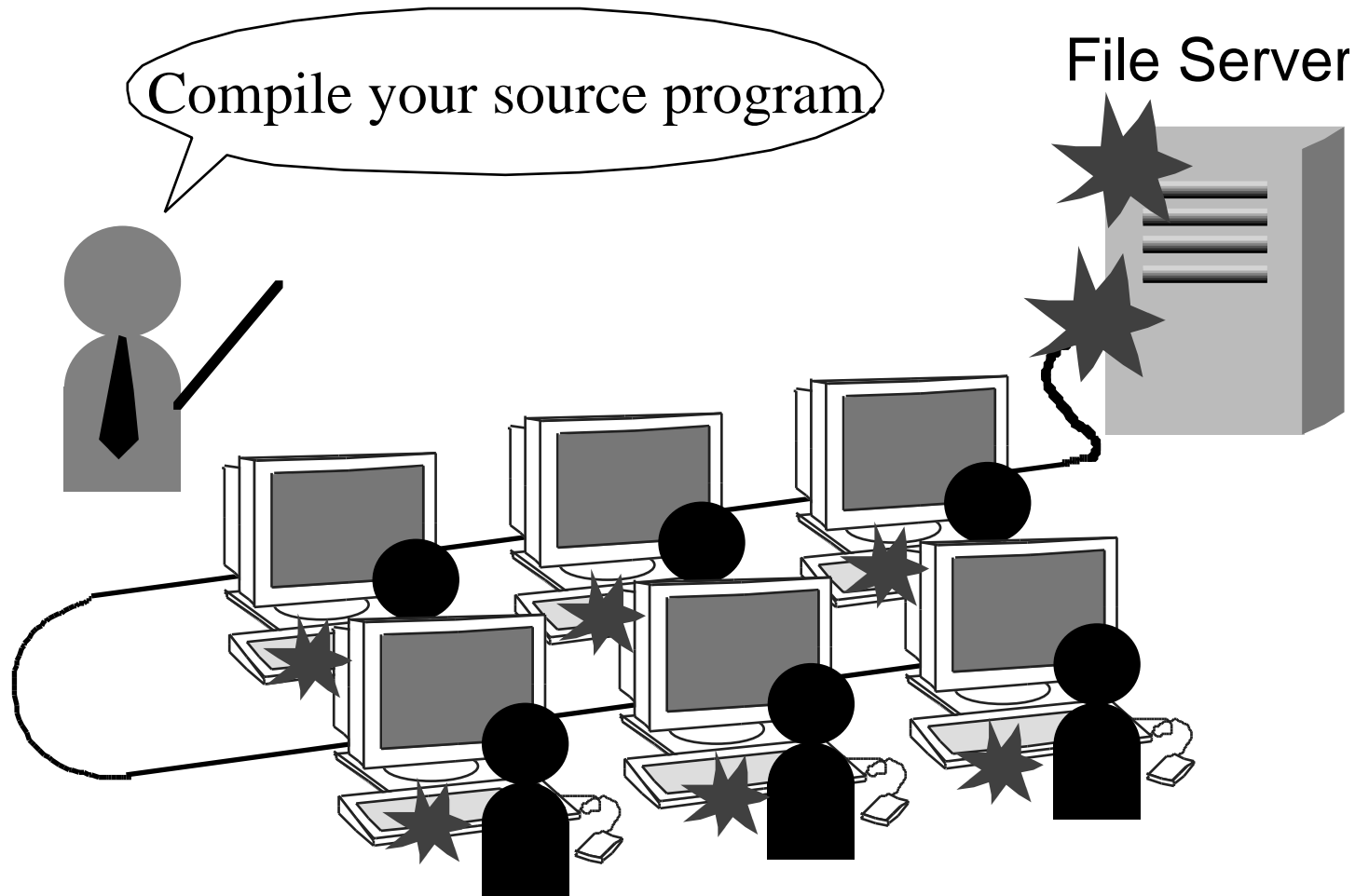
- Many users (>200) .
- High load and high transient traffic.
- Efficient design and analysis of LAN are required.
- Intelligible Performance Metrics are required.

In This Study...

- Performance analysis of educational computer systems
- New metric for analysis of CSMA/CD LAN
 - *Stall Rate*

Transiently High Load on Educational LAN

“Ready, Go!” Situation



Related Works

Performance Metrics for CSMA/CD LAN

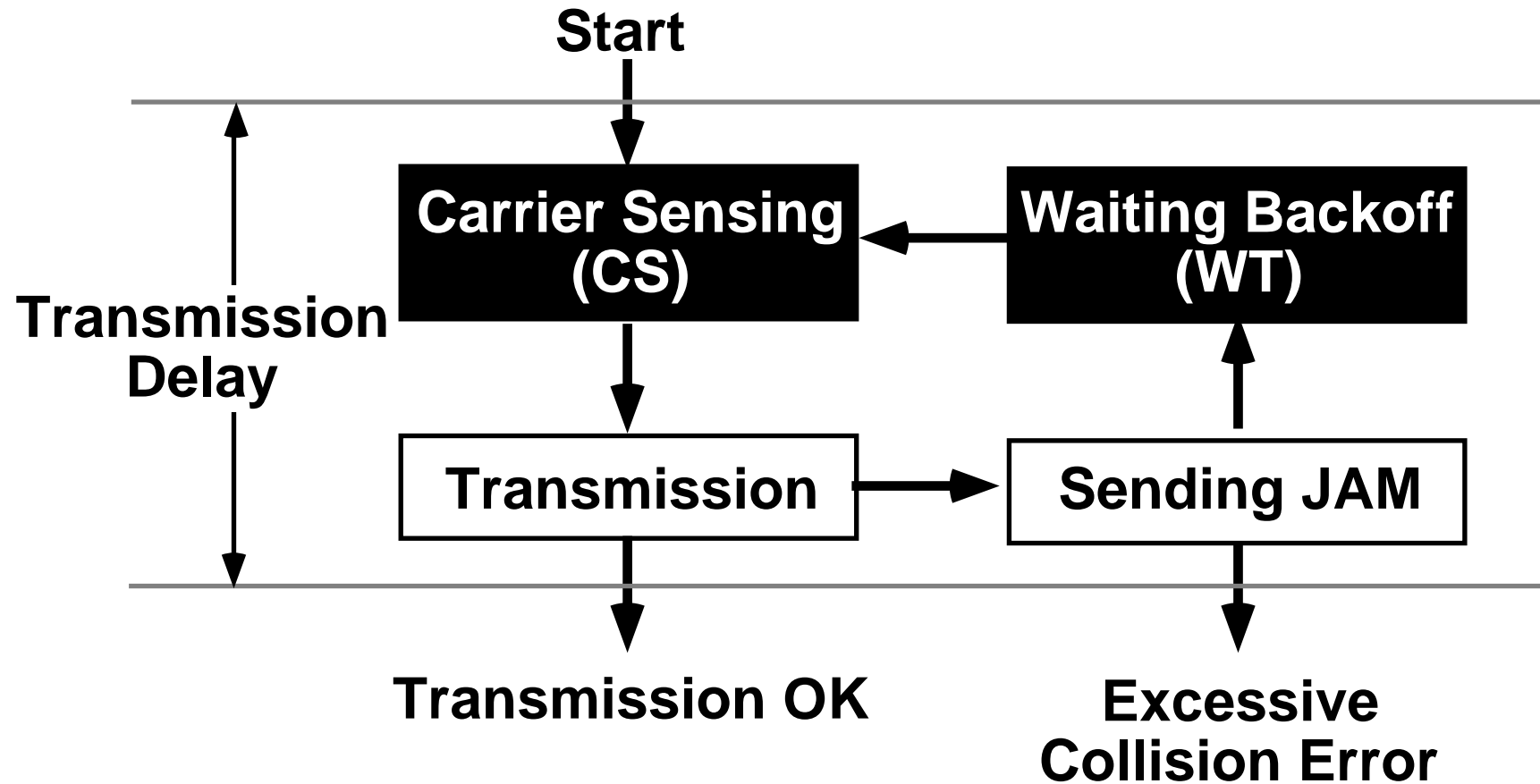
- Band utilization
- Collision rate
- Transmission delay
- Run length, Packet starvation rate
 - Packet capture effect [Molle 94]

Performance Evaluation of Practical LAN

- Examination of packet length on practical LAN and simulation [Ishida 95]

Stall Rate : Introduction

CSMA/CD of Ethernet



Stall Rate : Definition

CS Stall Rate

$$R_{CS} = \frac{\text{(Carrier Sensing Time)}}{\text{(Transmitting Delay)}}$$

WT Stall Rate

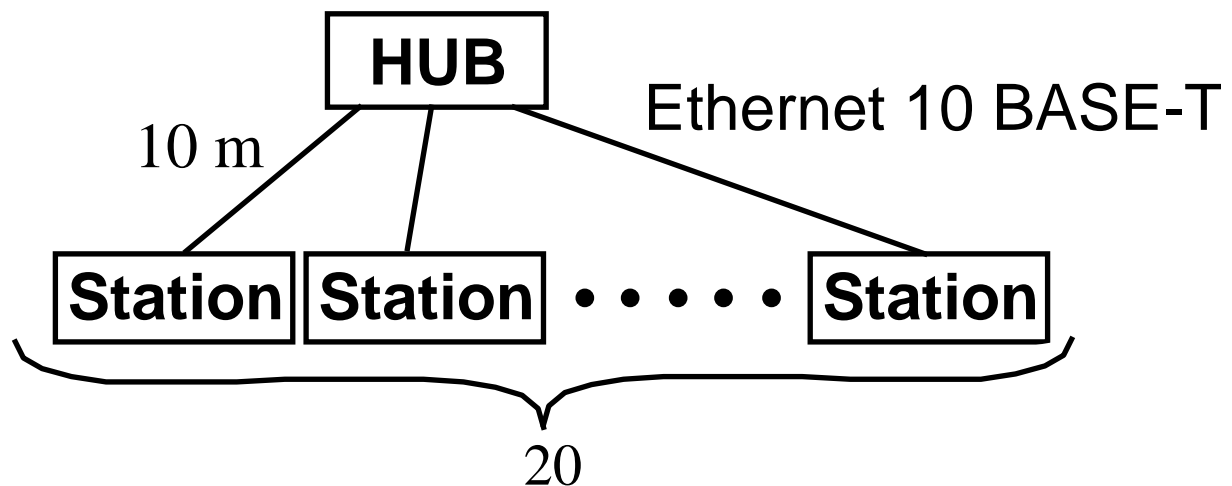
$$R_{WT} = \frac{\text{(Waiting Time caused by Collision)}}{\text{(Transmitting Delay)}}$$

Total Stall Rate

$$R_T = R_{CS} + R_{WT}$$

Stall Rate of Ethernet under General Data Traffic

Simulated Network

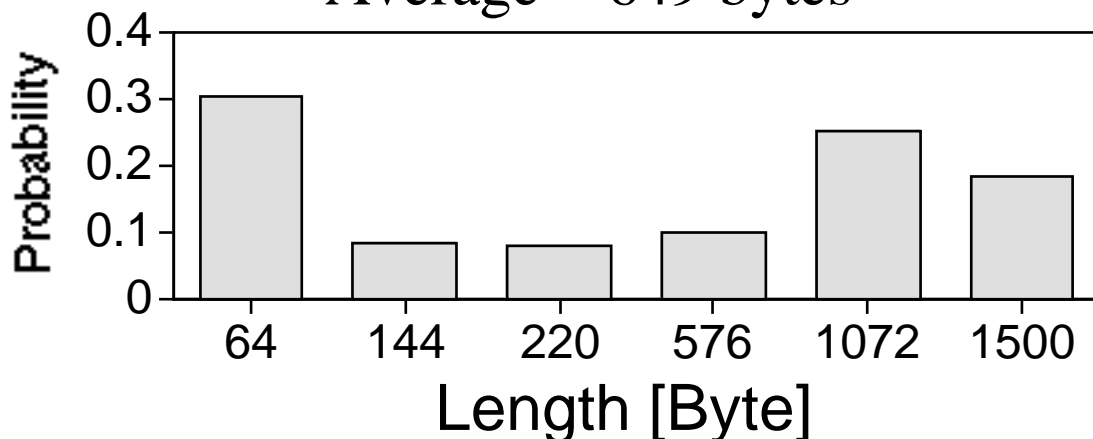


Inter-Packet Arrival Times

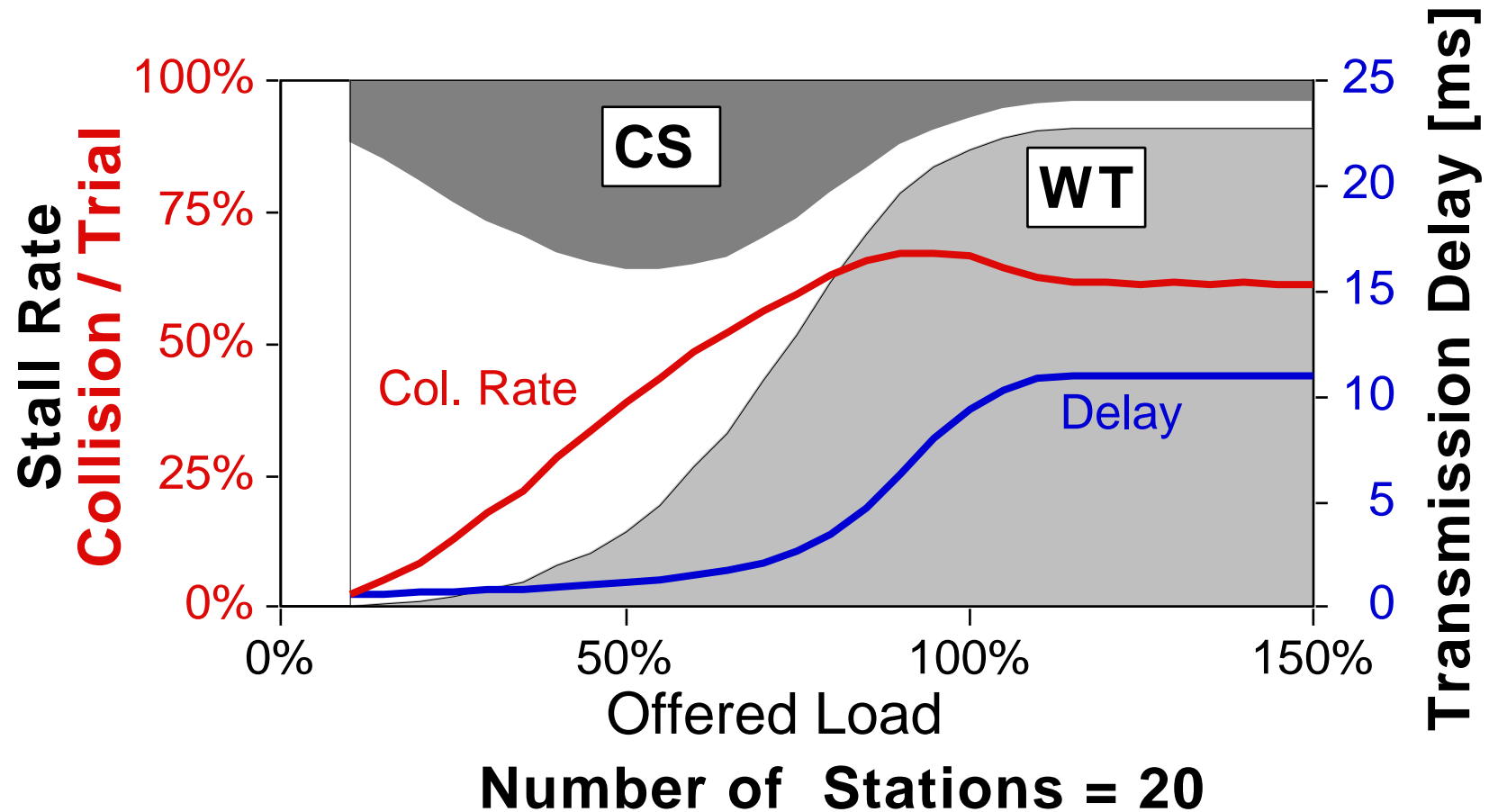
Exponential Distribution

Packet Length

Average = 649 bytes

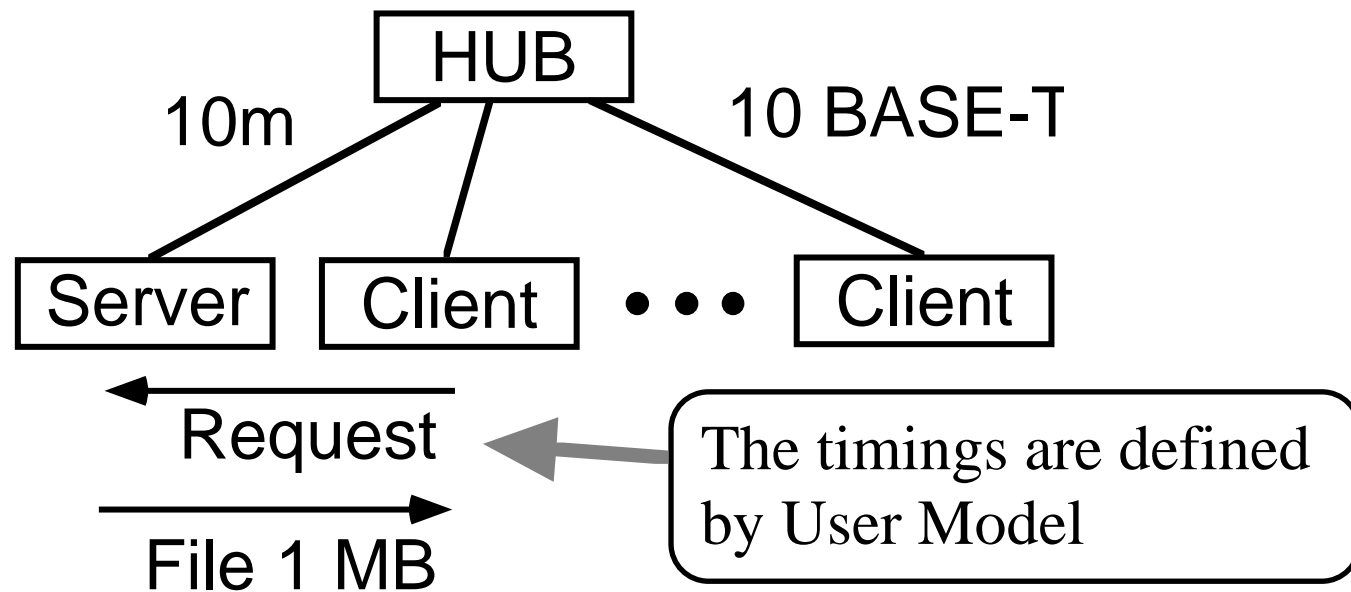


Stall Rate under General Data Traffic



Performance Evaluation of Practical LAN

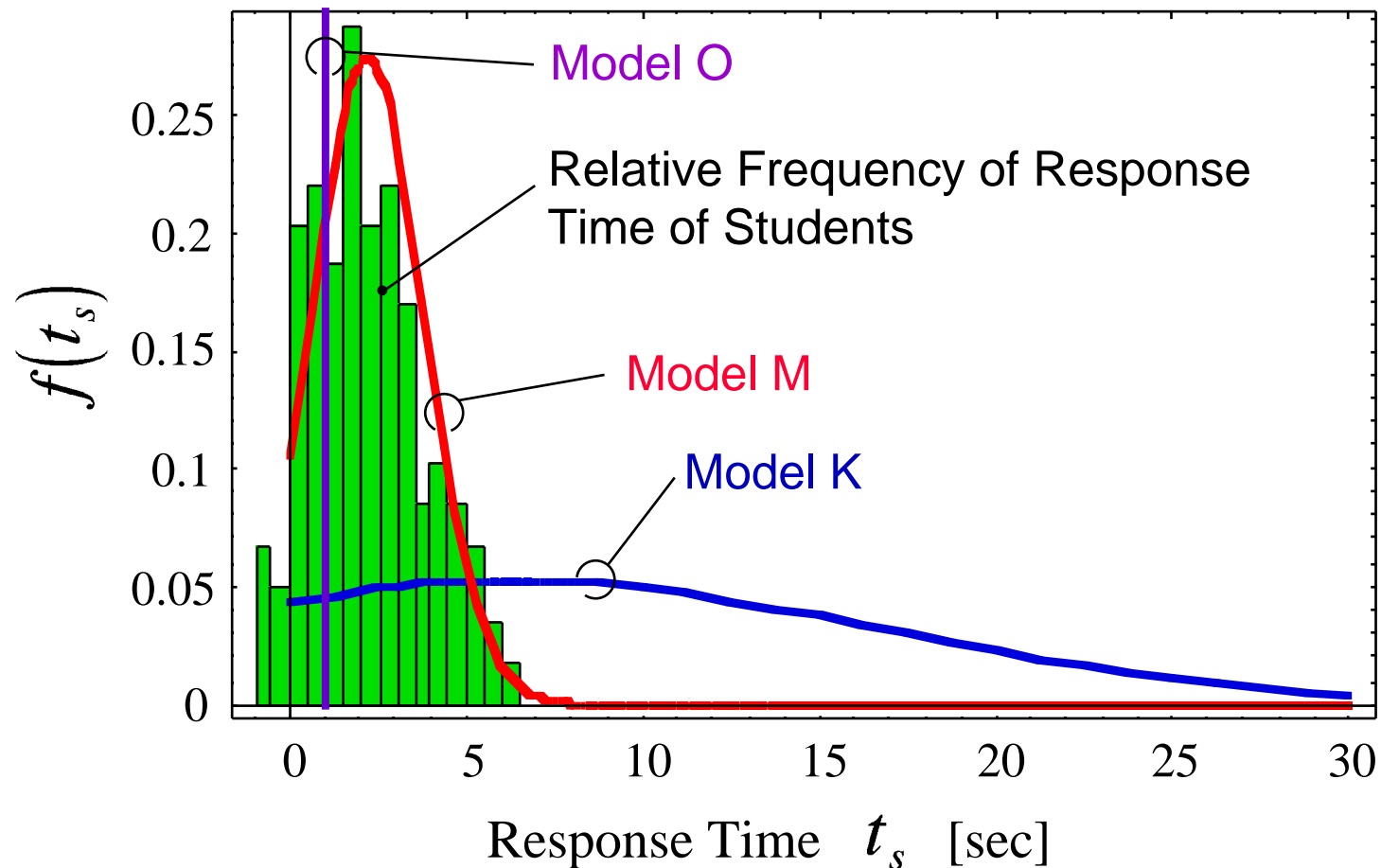
“Ready, Go!” Situation of Educational Computer System



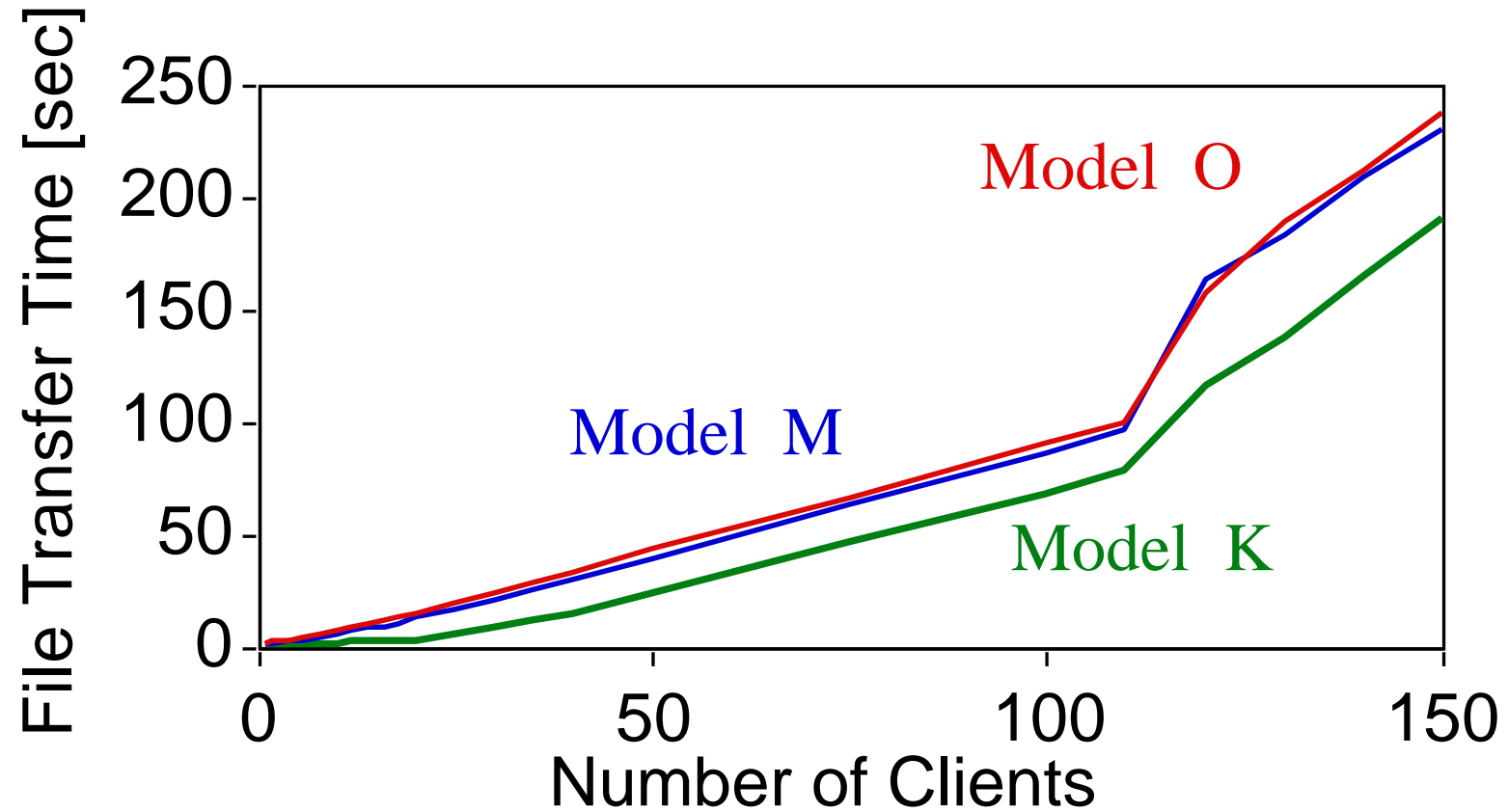
NFS: Works on RPC and UDP/IP
Simple Time-out and Retry

User Model

Defines the timings that users send a request to the server



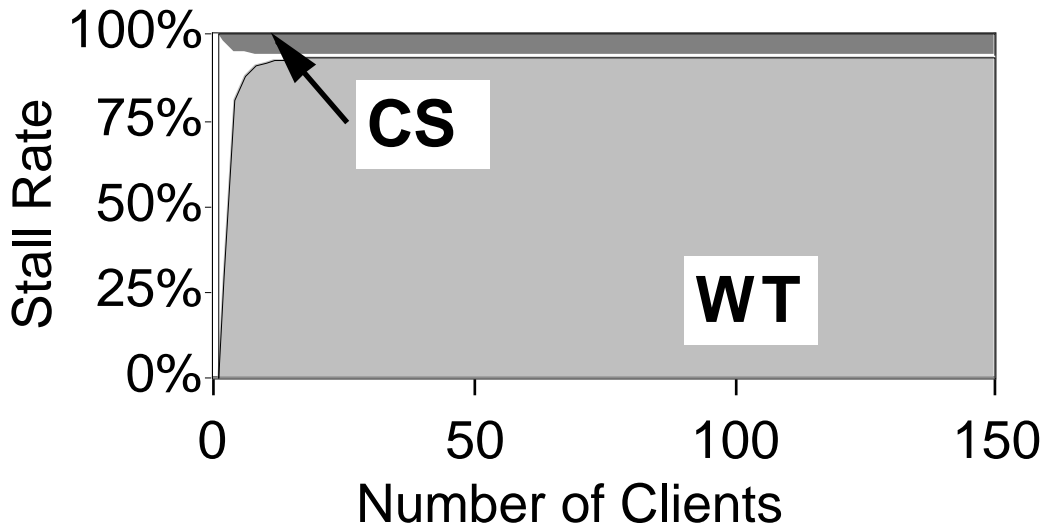
File Transfer Time



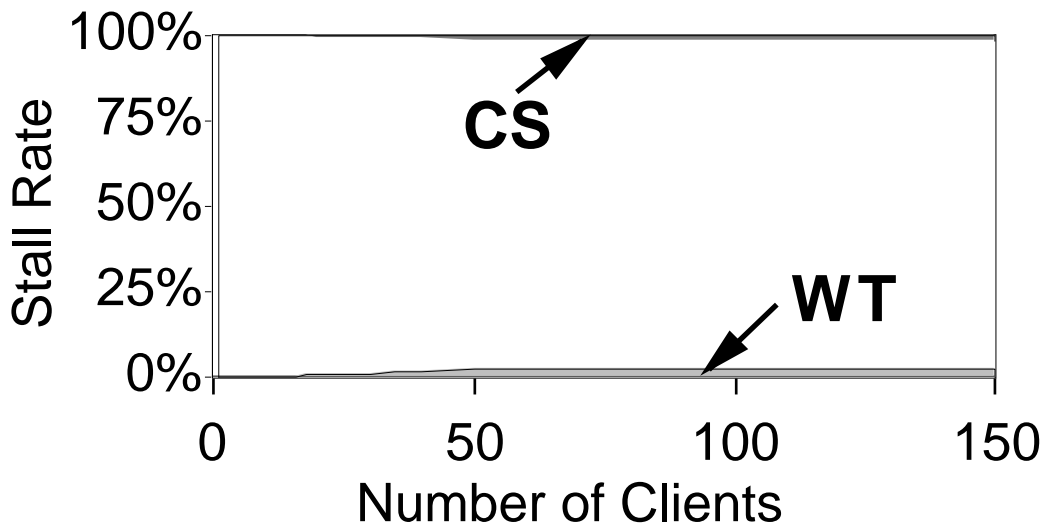
Stall Rate Analysis

Model M

Clients



Server



Packets from clients collide each other.
Packets from the server rarely collide.

Stall Rate : Characteristics

Merits

- Visual and Intuitive
 - Transmission Delay
 - Collisions
- Useful for network designers of higher layer protocols

Demerits

- Sensitive to packet length
- Not practical for quantitative evaluation

Conclusion

Stall Rate is

- A new performance metric for CSMA/CD LAN
- Easy to understand phenomena on Ethernet
- Visual and intuitive

Future Studies

- Performance analysis of layered and distributed file systems
- Applying the stall rate analysis to other CSMA/CD LANs