

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

Susumu ISHIIHARA

Graduate School of Engineering  
Nagoya University

# Motivation

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## 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.

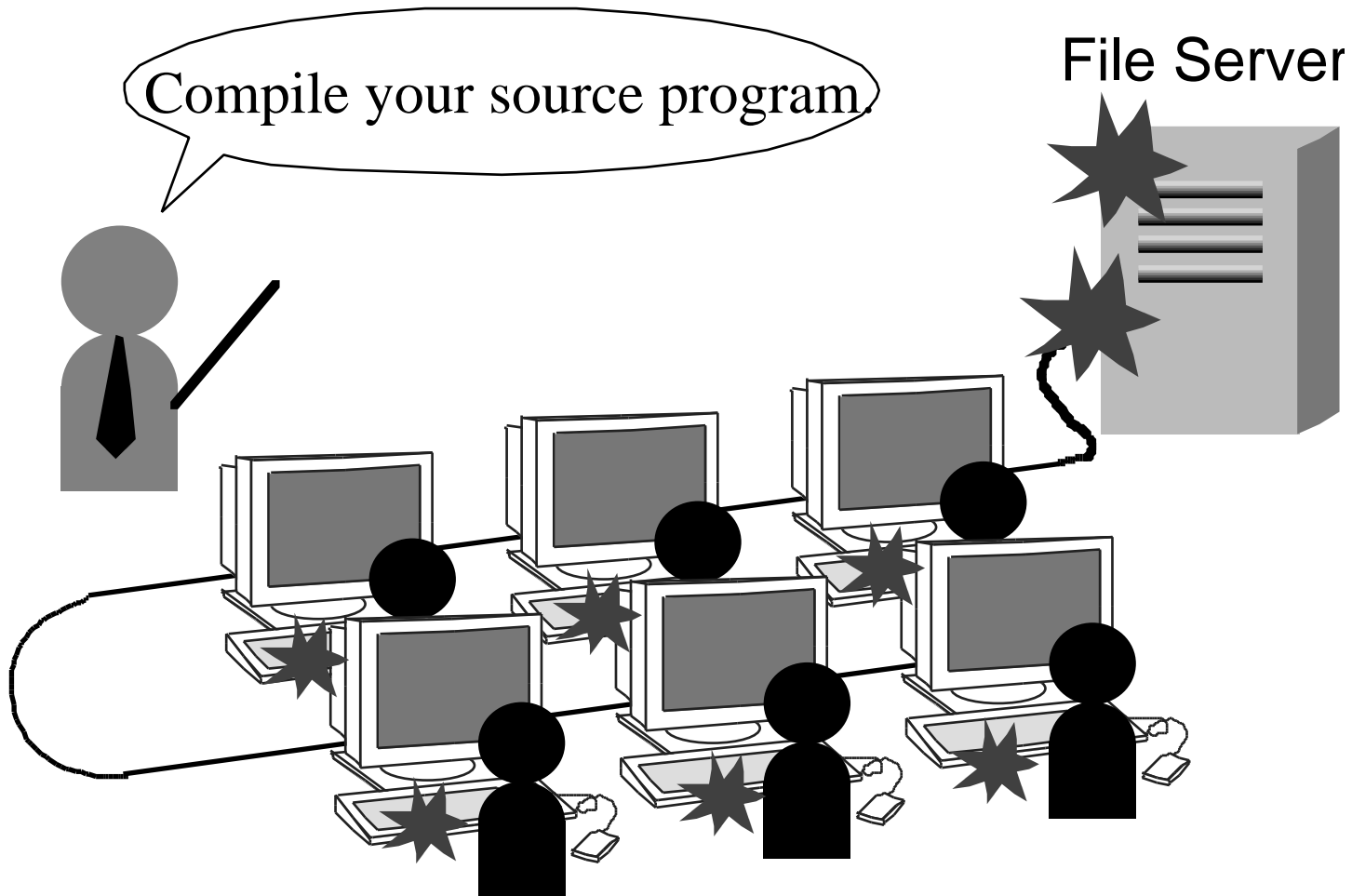
## In This Study...

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

# Transiently High Load on Educational LAN

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*“Ready, Go!” Situation*



# Related Works

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## **Performance Metrics for CSMA/CD LAN**

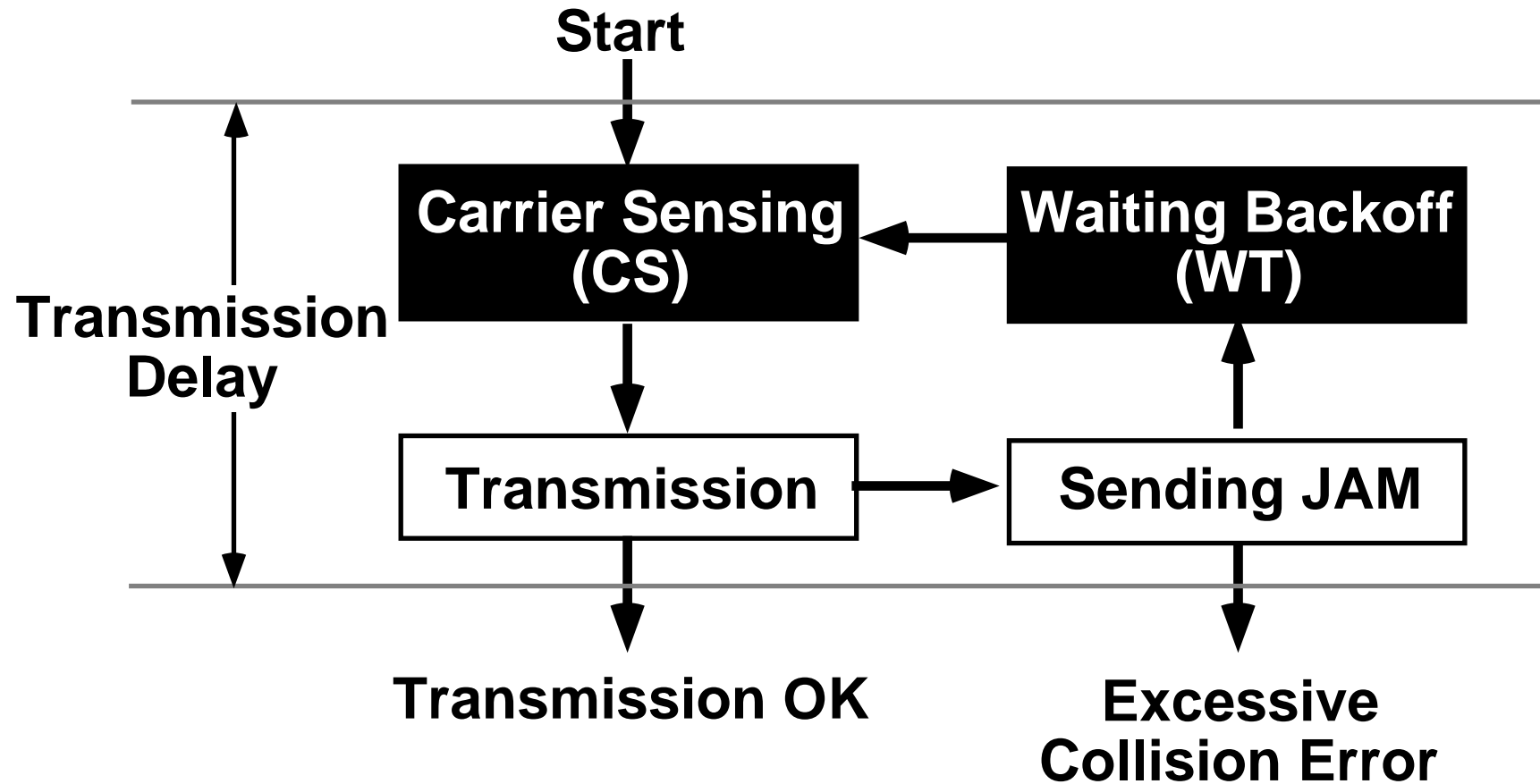
- Band utilization
- Collision rate
- Transmission delay
- Run length, Packet starvation rate
  - Packet capture effect [Molle 94]

## **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

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## CS Stall Rate

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

## WT Stall Rate

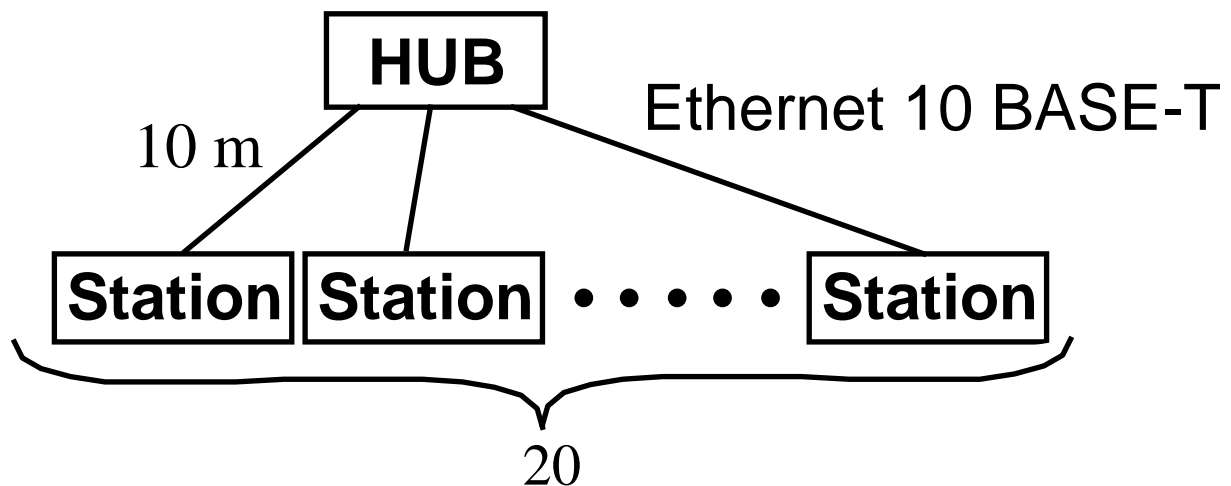
$$R_{WT} = \frac{\text{(Waiting Time caused by Collision)}}{\text{(Transmitting Delay)}}$$

## Total Stall Rate

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

# Stall Rate of Ethernet under General Data Traffic

## Simulated Network

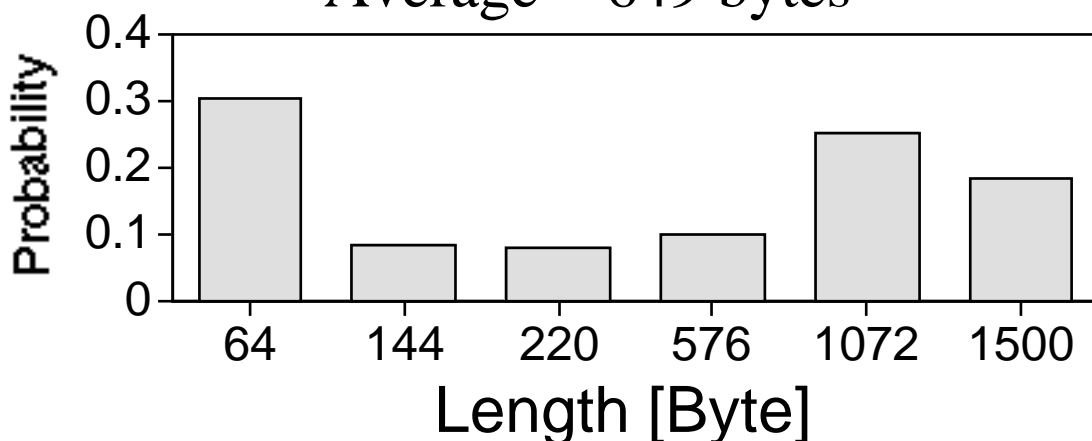


## Inter-Packet Arrival Times

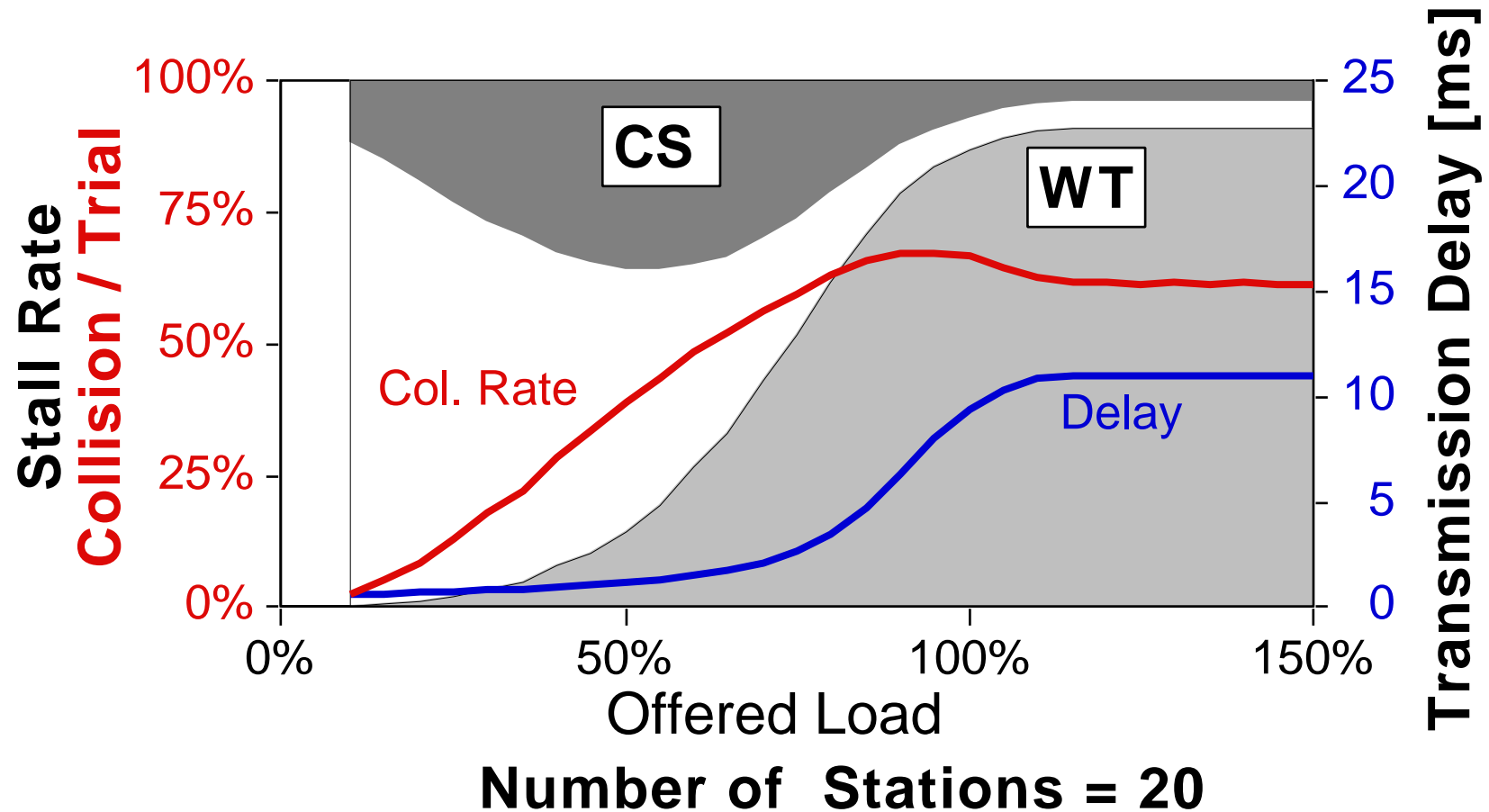
Exponential Distribution

## Packet Length

Average = 649 bytes

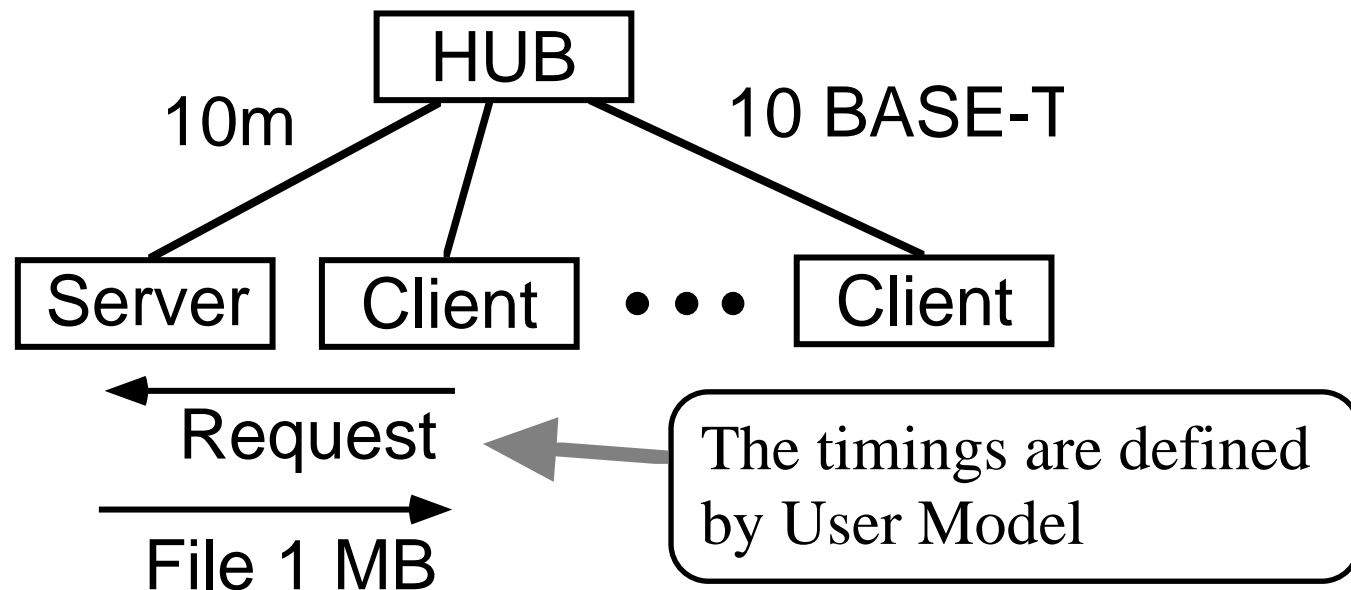


# Stall Rate under General Data Traffic



# Performance Evaluation of Practical LAN

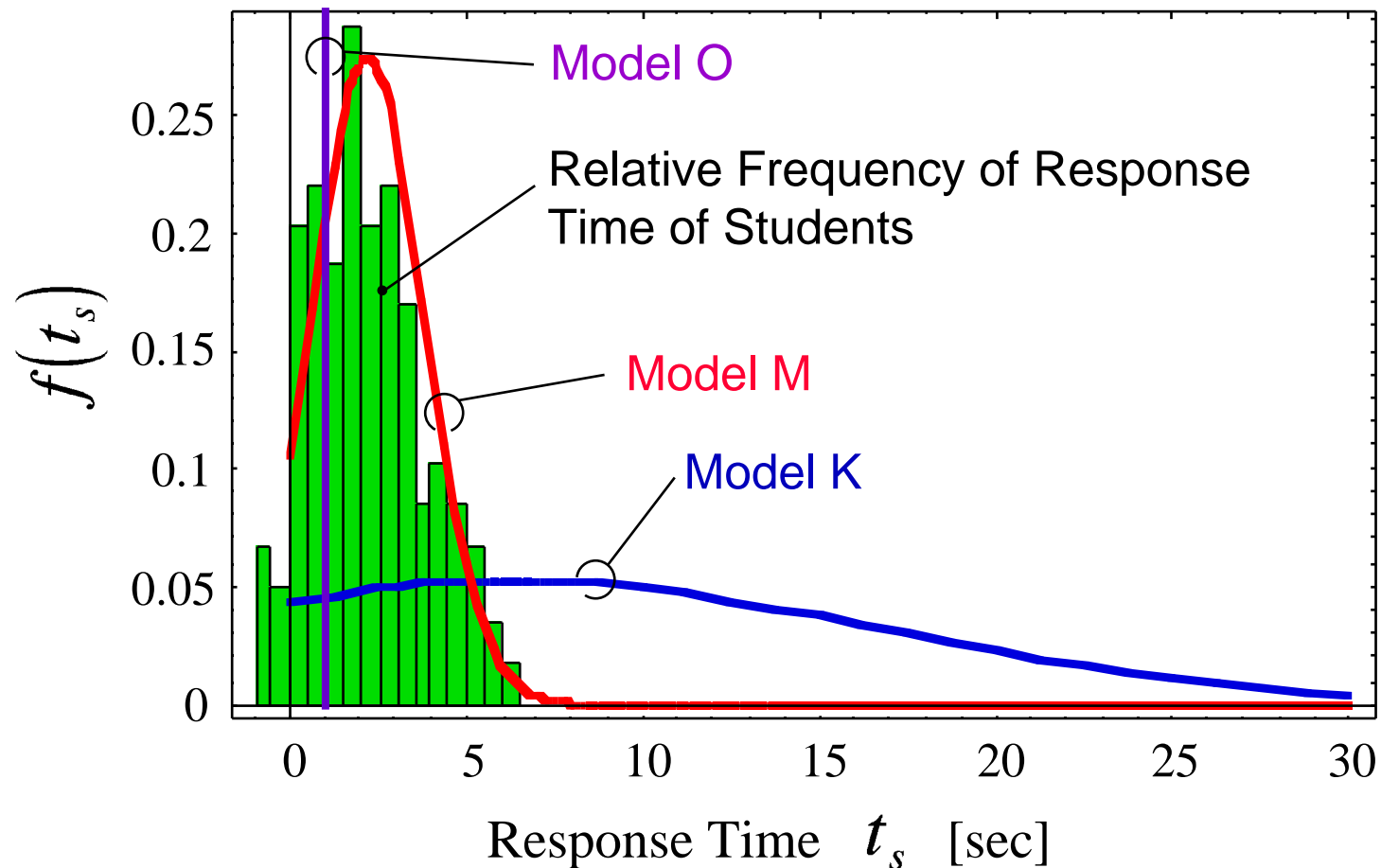
## *“Ready, Go!” Situation of Educational Computer System*



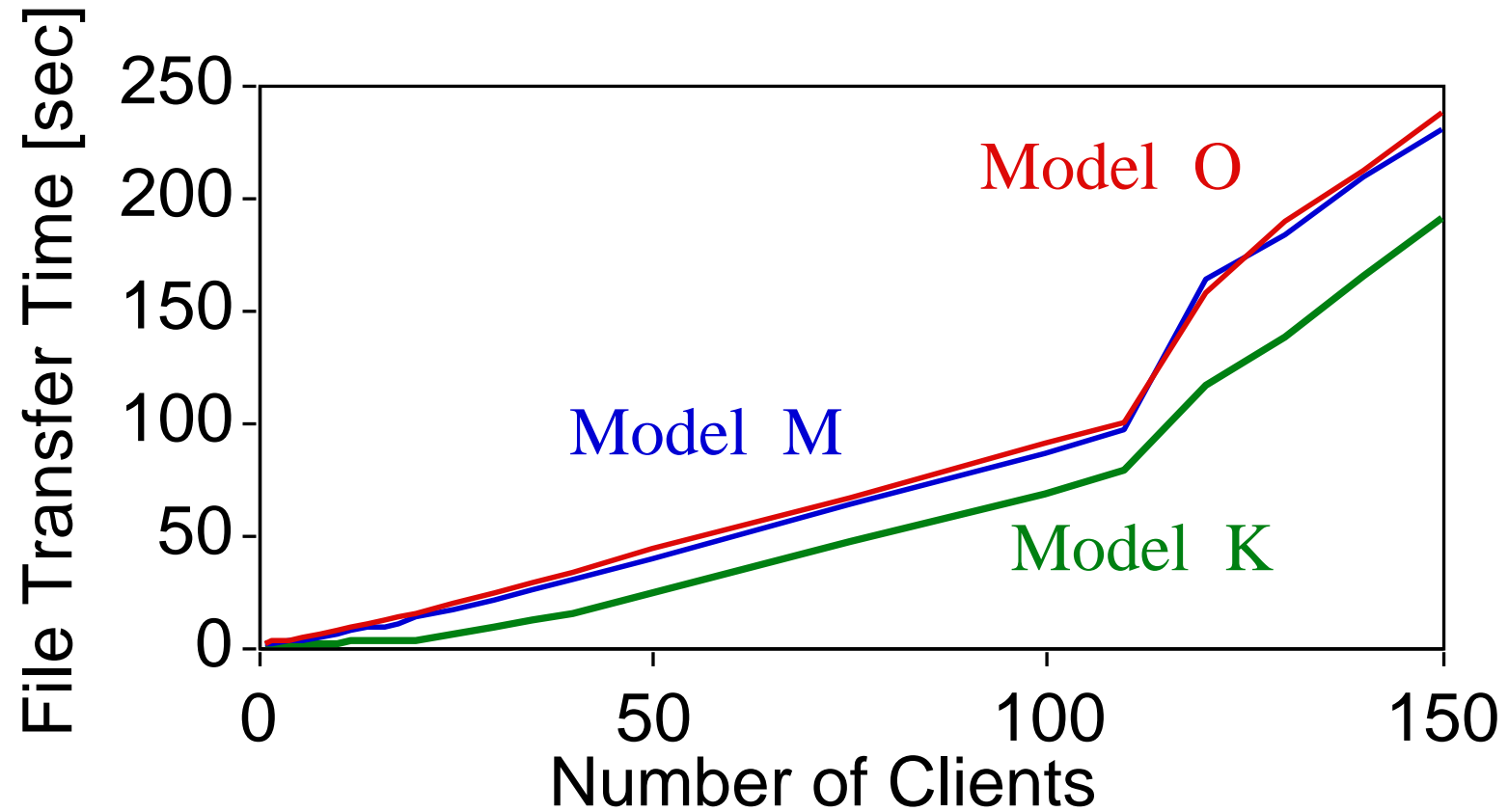
**NFS:** Works on RPC and UDP/IP  
Simple Time-out and Retry

# User Model

Defines the timings that users send a request to the server



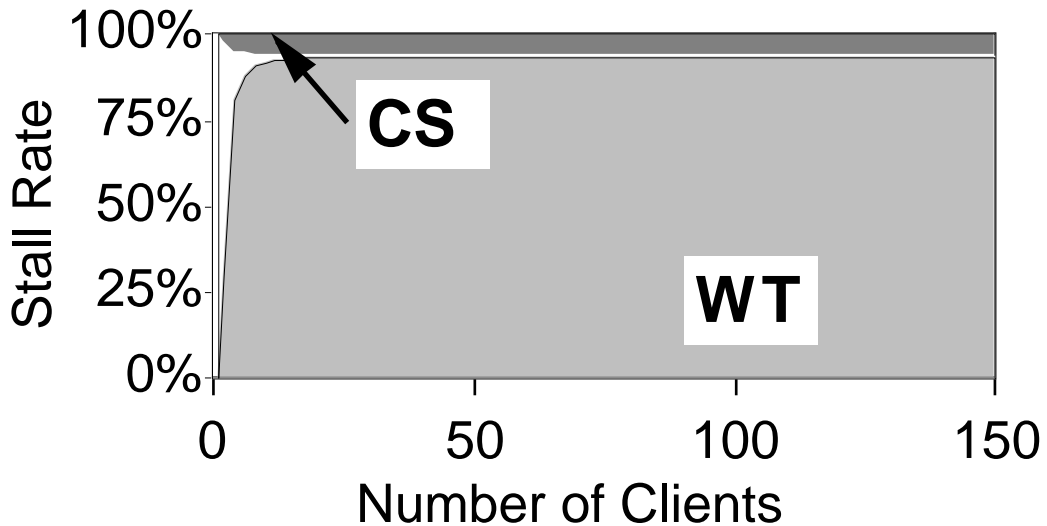
# File Transfer Time



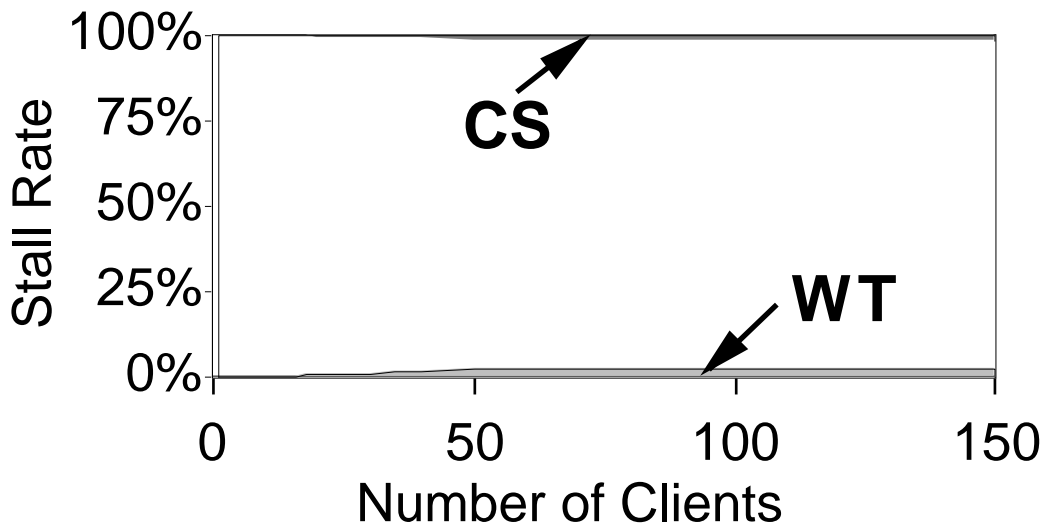
# Stall Rate Analysis

## *Model M*

### Clients



### Server



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

# Stall Rate : Characteristics

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## 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

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## Stall Rate is

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

## Future Studies

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