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Performance Simulations of 1 Gb/s Networks

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Objective

- **Analyze the impact of increased slot time on performance**

	100BASET	1000BASET
min. packet size	64	64
slot time	64	512

Ref: Howard Frazier's Presentation, "Scaling CSMA/CD to 1000 Mbps, January 11, 1996

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Packet Size Distribution

- Collected by Howard Frazier

  – Distribution of packet sizes using "etherfind"
     program on the following networks

    » SUN 100 Workgroup

    » AMD 10 Workgroup

    » 3COm FDDI Backbone

- Averaged workgroup traffic across the networks and
  used as input distribution to the model

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Experiment 1

- 100 Mbps Network

- 15 stations

- 64 byte slot times

- 200 m network diameter

- Packet Size Distributions - Work group Average

- Load varying from 10% to 100% with same packet size distributions

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Experiment 2

- 1000 Mbps Network

- 15 stations

- 512 byte slot times

- 200m network diameter

- Packet Size Distributions - Work group Average

- Load varying from 10% to 100% with same packet size distributions

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Experiment 3

- 1000 Mbps Network

- 15 stations

- 512 byte slot times

- 200 m network diameter

- Background load 100 Mbps (10%) with packet size distributions according to workgroup average

- Bursty traffic injected every 25 ms with a burst of 200 frames (size = 1024 bytes), adding 65 Mbps of load

- Stations adding bursty traffic varying from 1 to 13

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Performance Measures

- **Performance characterized in terms of**

  – **Network Throughput**

    » Amount of traffic the network can carry under the given offered load

  – **Collision Likelihood**

    » Probability that a packet experiences one or more collisions

  – **Deference Likelihood**

    » Probability that a packet waits upon arrival at the MAC

  – **Number of consecutive packets**

    » The number of consecutive packets a station transmits on the network until there is a receive on the wire

  – **Access Latency**

    » Waiting time of a frame when it is the head of the MAC queue until successful transmission

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Packet Access Latency: Comparison

	100Mbps	1000Mbps	100Mbps w/ Bursty Traffic
95th Percentile µs	218.0	12.5	14.7
99th Percentile µs	2040.10	25.8	165.8

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Observations

- **Network throughput**

  – Network Throughput levels at a lower % offered load for 1000 Mbps compared to 100 Mbps because of packet size distributions and increased slot times

  – As frame size increases, throughput increases for same offered load

- **Collision Likelihood**

  – Peaks at lower % offered load for 1000 Mbps compared to 100 Mbps

  – Then decreases due to increased number of packet discards (resulting in an increase in capture effect)

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Observations (contd.)

- **Due to increased slot time; throughput, collision likelihood and deference likelihood peak at lower % offered load**

- **Access Latency**

  – **Mean access latency scales down by a factor of 10 for 1000 Mbps**