Packet Bursting

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- **The following people have indicated support for this proposal**
  - **Moti Weizman**
  - **Dave Fifield**
  - **Steve Haddock**

Overview

- **Carrier Extension & Packet Packing**
- **Packet Bursting Overview**
- **Simulation Results**
- **Summary and Observations**

Objective

- **Improve shared 1000 Mbps performance to make it an attractive option to enable inexpensive gigabit networks**
- **Minimize transmitter and receiver complexity to enable this**
- **Requires only a minimal change to original Carrier Extension proposal**

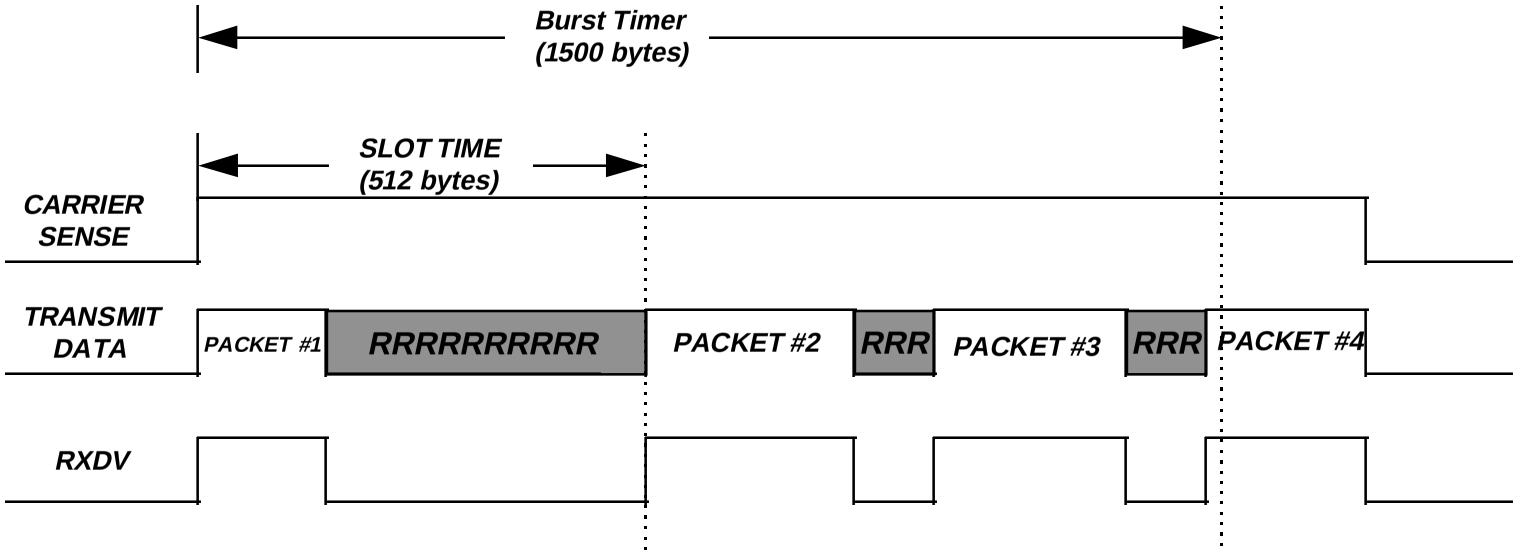
Current Situation

- **Carrier Extension "*wastes*" up to 448 bytes for small packets resulting in low throughput performance**
  - **Only marginally better than shared 100Mbps for small packet sizes**
- **Packet Packing improves performance significantly for 64 byte packets at all offered loads and at high offered loads for the workgroup distribution**
  - **Requires receiver to discard multiple packets after a collision**
  - **Increases complexity of statistics collection since both transmitter and receiver must delay updates until end of slot time**

Solution: Packet Bursting

- **Packet Bursting is carrier extension plus a burst of packets**
- **Station transmissions are padded to slot time if necessary using carrier extension**
- **Subsequent to slot time, stations transmit packets with minimum IPG spacing until burst timer (1500 bytes) expires**
  - **Collision window has passed, so stations are guaranteed there are no collisions**

Packet Burst Timing



Packet Bursting

- As with baseline carrier extension, receiver is guaranteed to see only one packet during collision window.
- Subsequently, RXDV will delimit further packets
  - All these packets are guaranteed not to collide
- The de-assertion of CRS ends reception
- Maximum duration of carrier event is two 1500 byte packets

Simulation Environment

- 1000 Mbps network
- 15 stations
- 512 byte slot times
- 200 m network diameter
- Packet size distributions
  - All 64 bytes
  - All 1500 bytes
  - Workgroup Average

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 or discard**

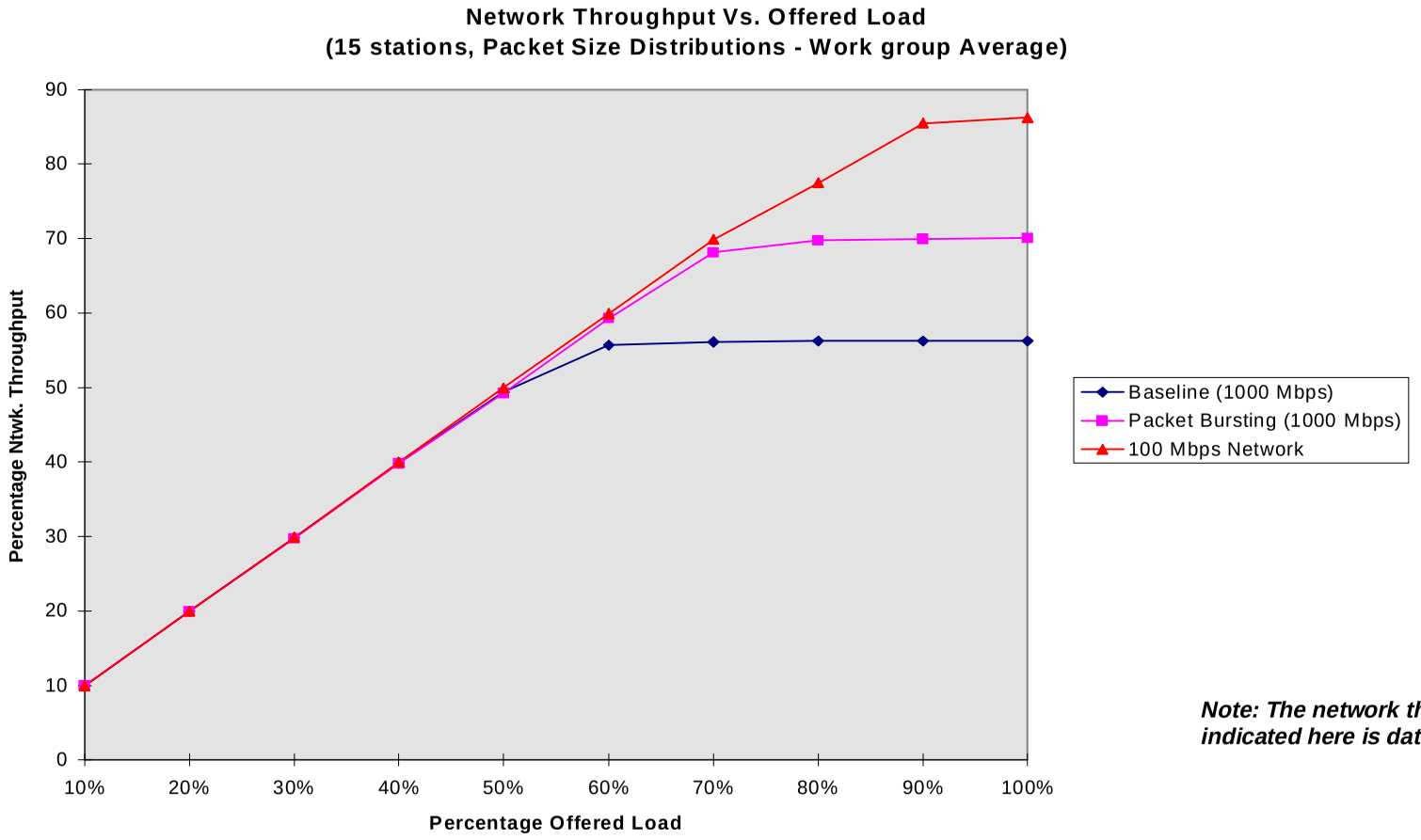
Simulation Results

15 Stations, 100% offered load, Total Network Throughput (Data Utilization)

Packet Size	*Reference*	*Packet Packing*	*Packet Bursting*
64 bytes	*90.68 Mbps*	*339.84 Mbps*	*286.75 Mbps*
1500 bytes	*853.20 Mbps*	*853.20 Mbps*	*853.20 Mbps*
Workgroup Distribution[1]	*562.19 Mbps*	*740.80 Mbps*	*700.32 Mbps*

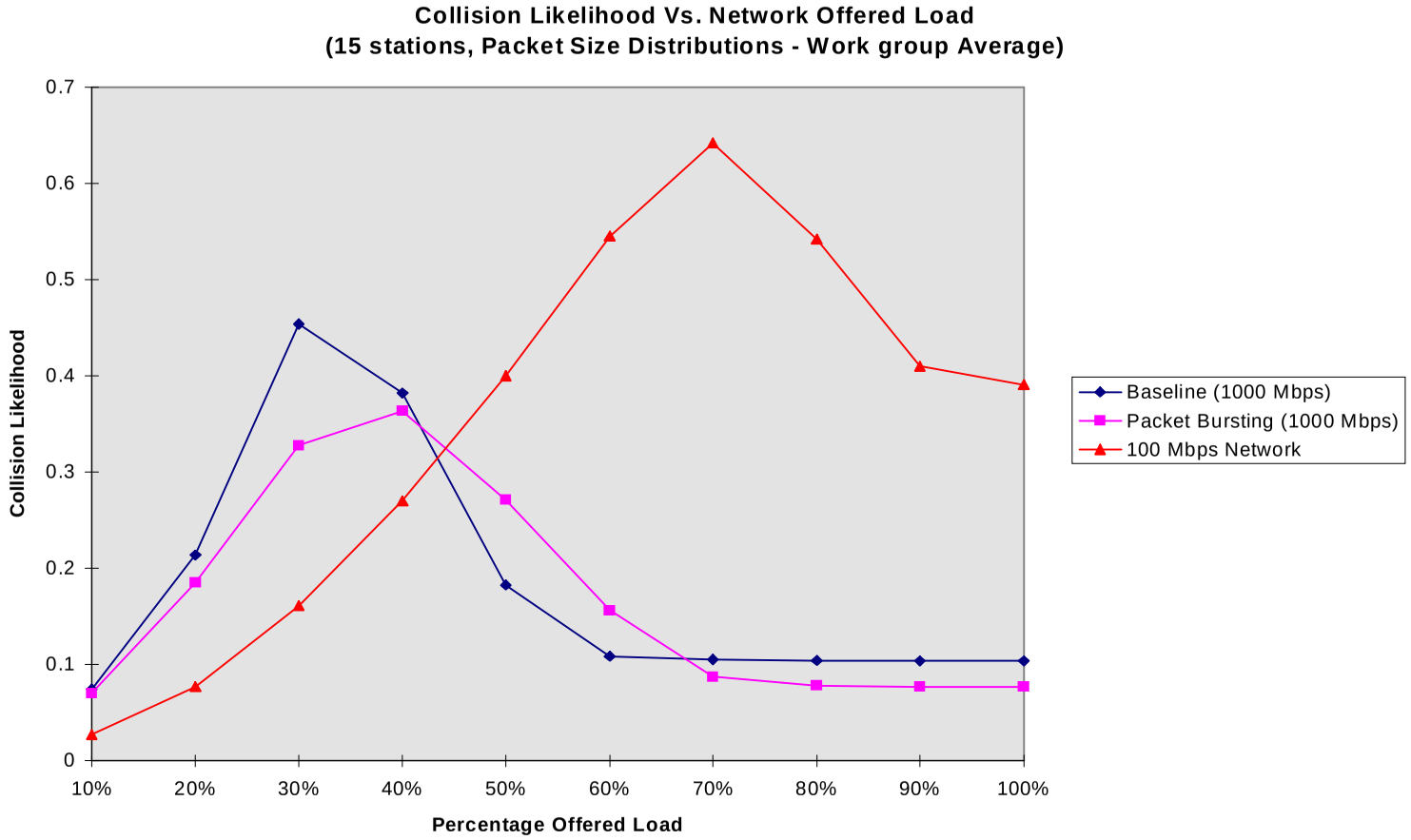
1. Distribution data collected by Howard Frazier that averaged workgroup traffic across 10Mbps and 100Mbps networks

Simulation Results



Note: The network throughput indicated here is data throughput

Simulation Results



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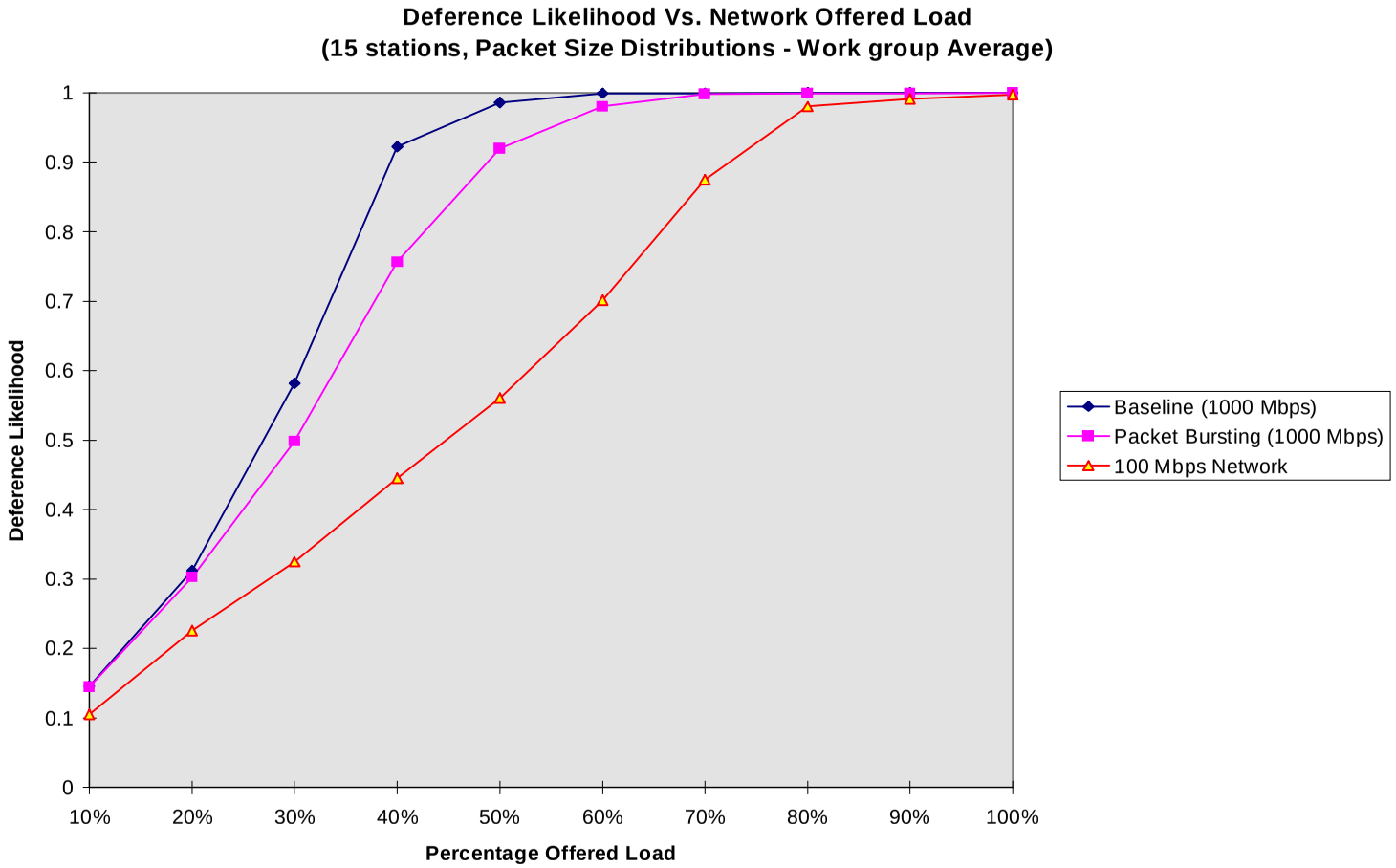

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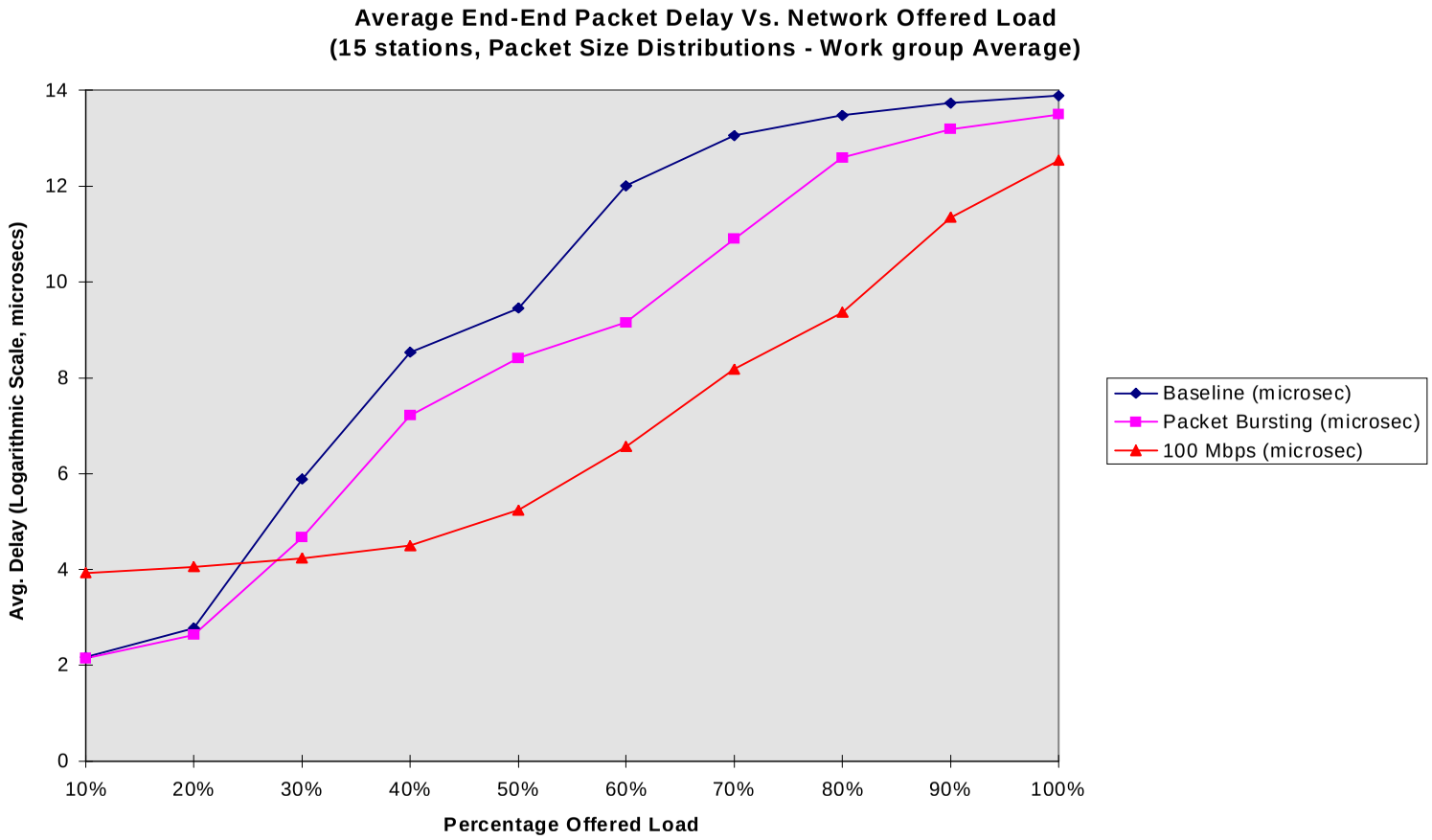

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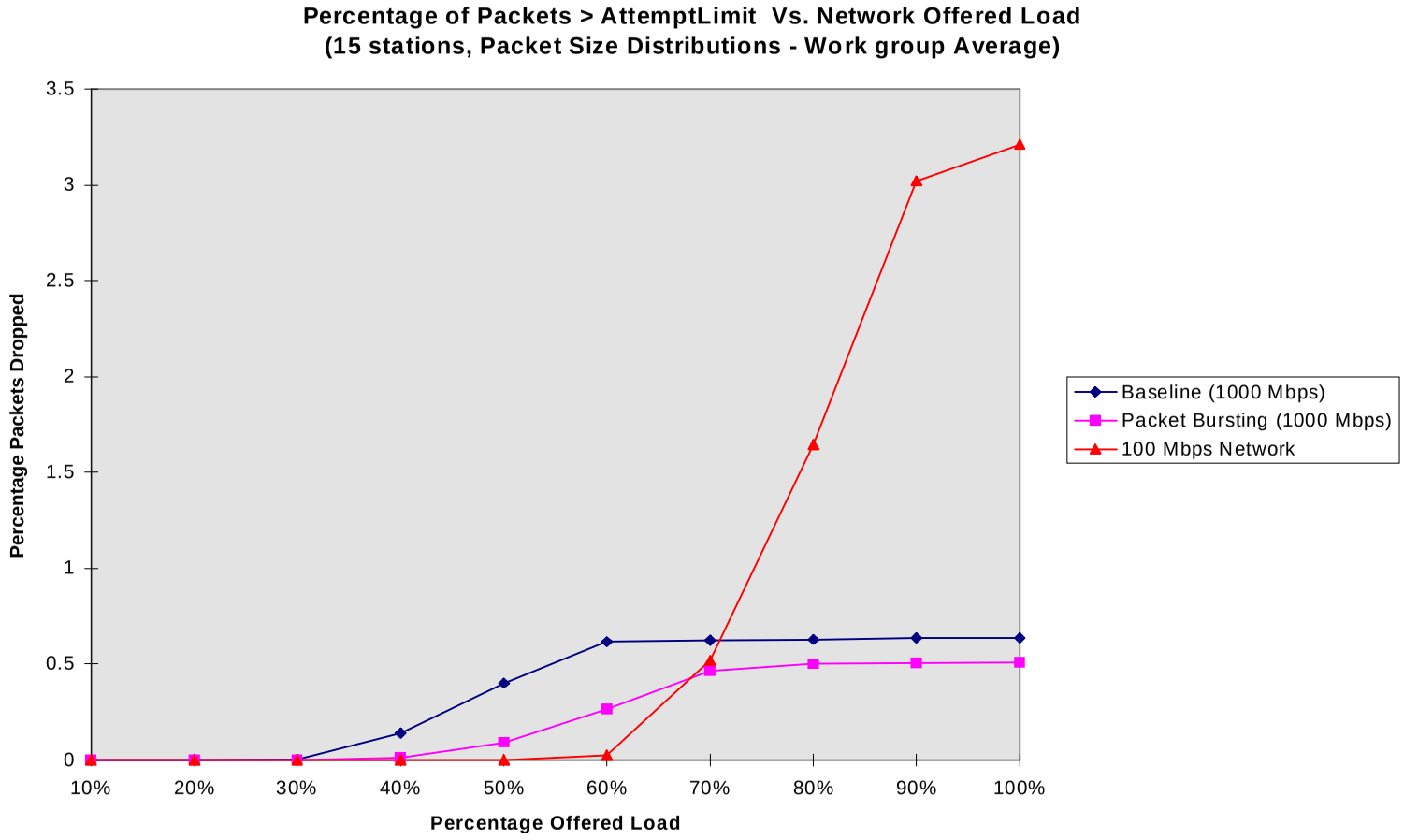

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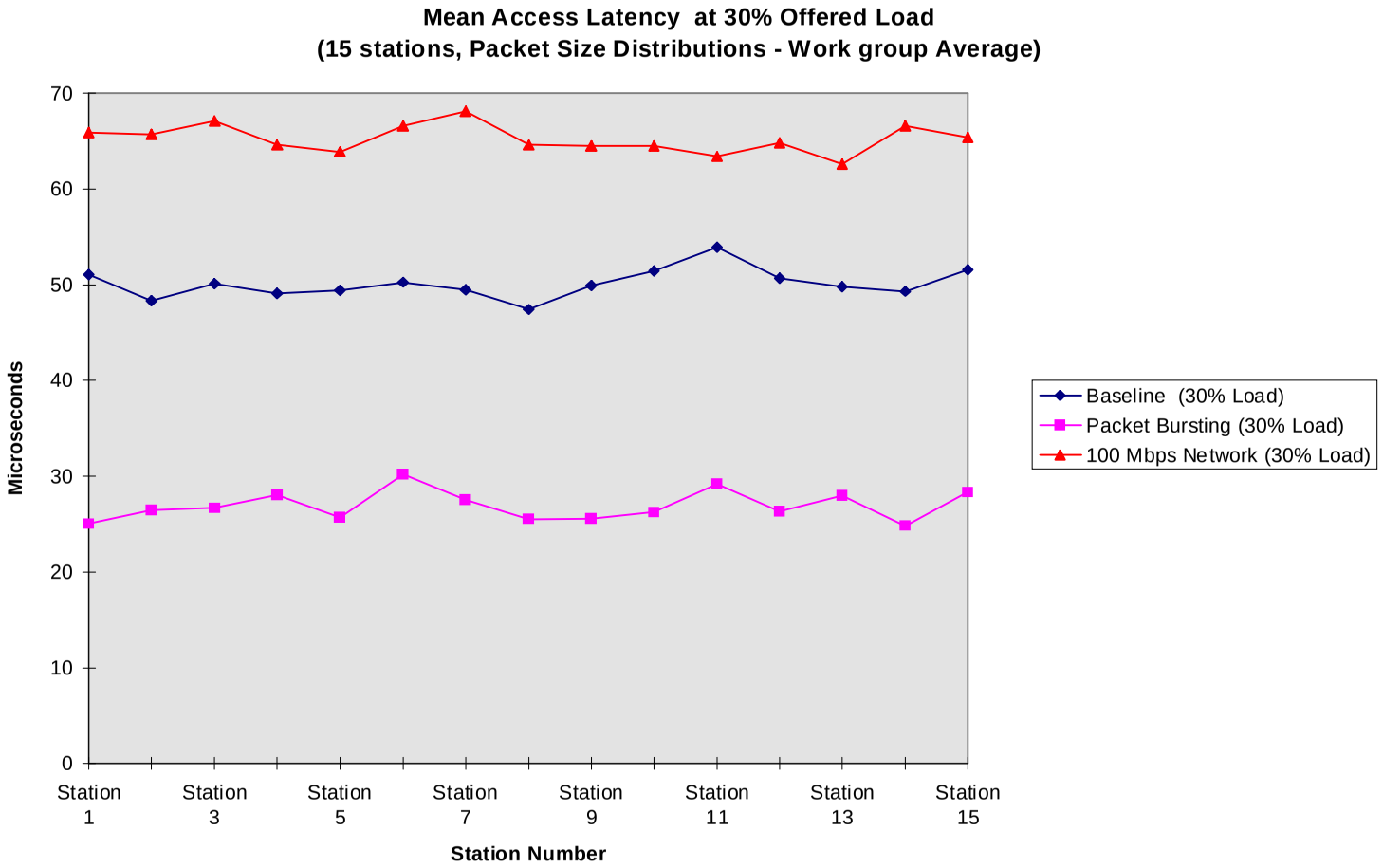

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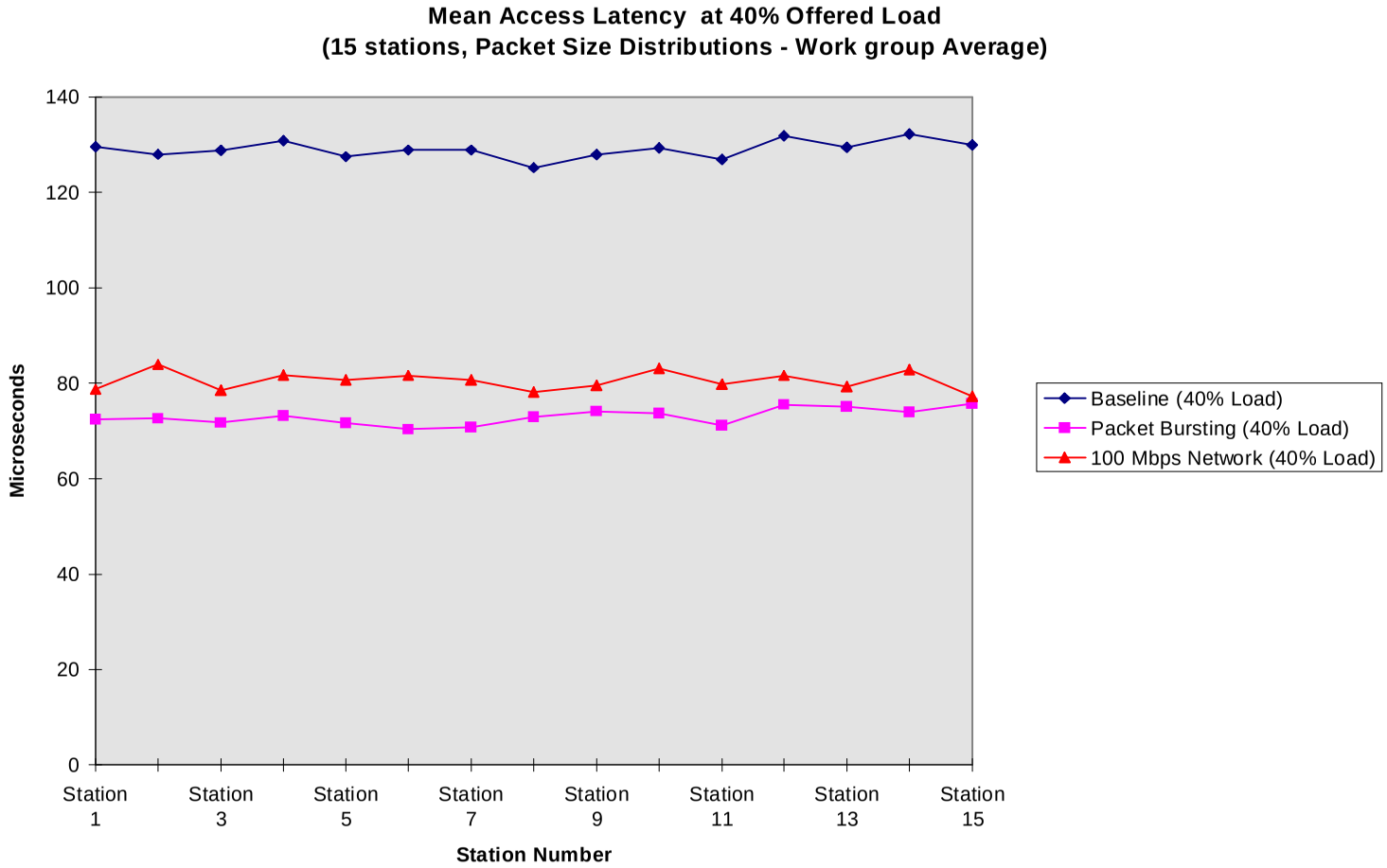

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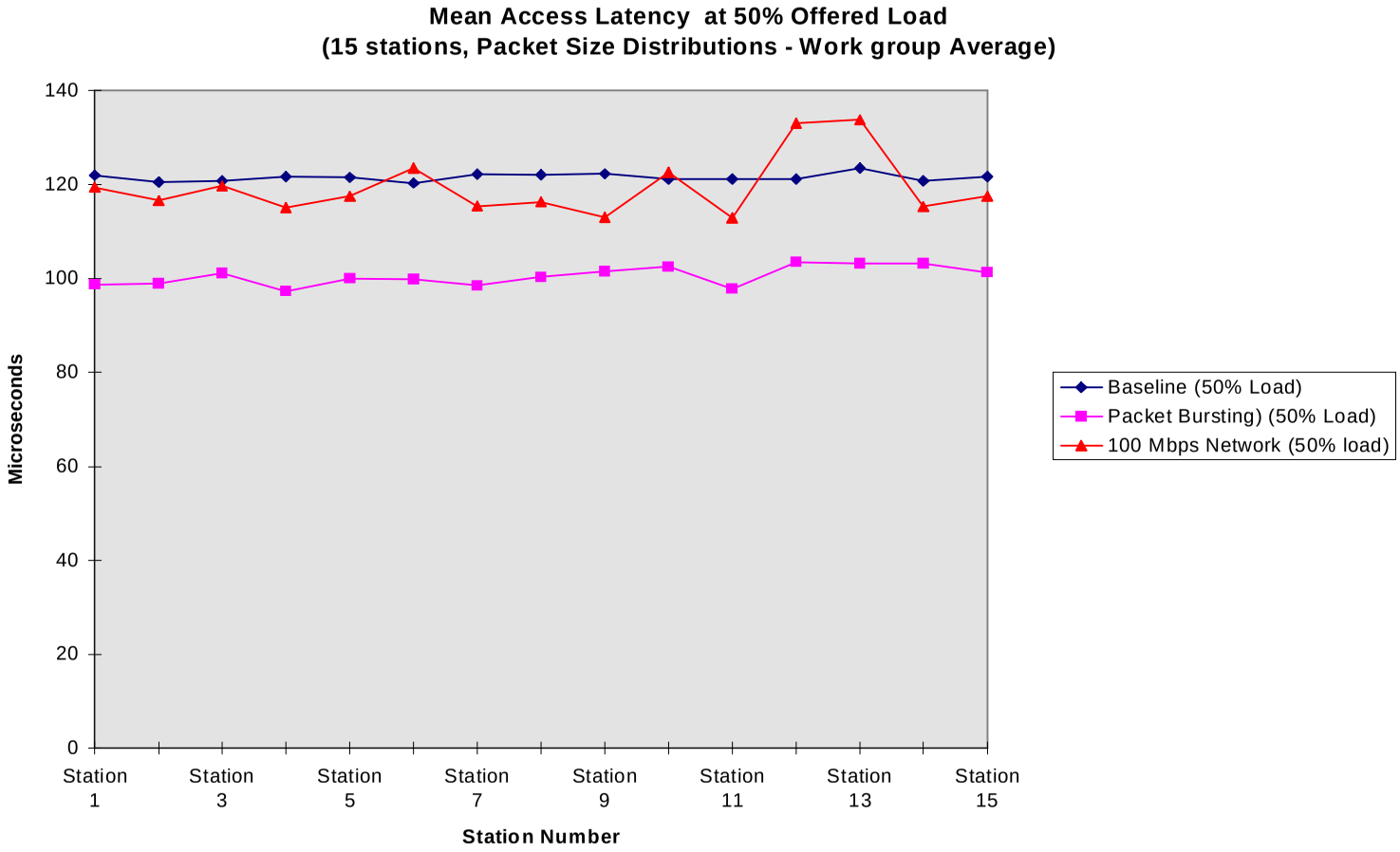

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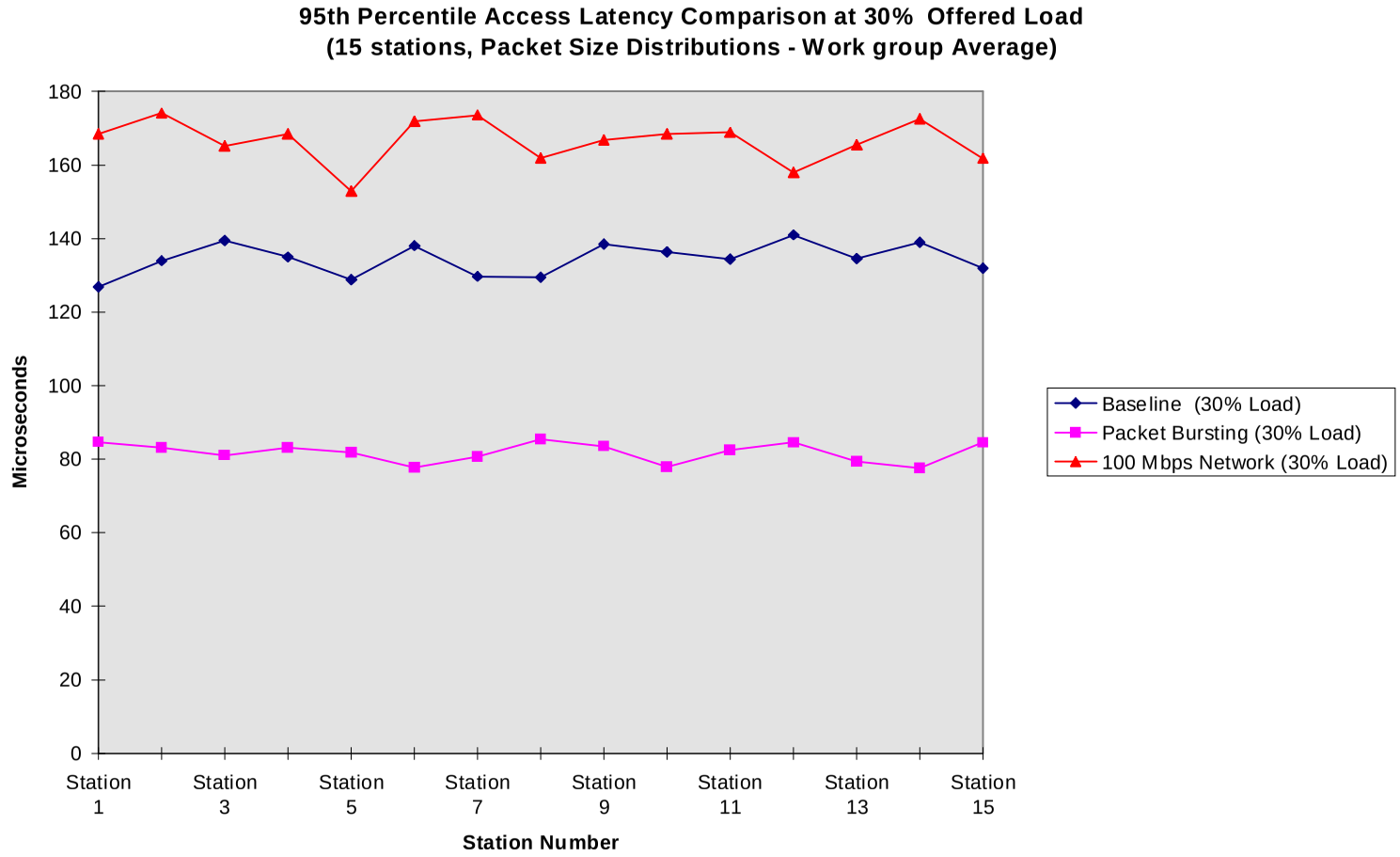

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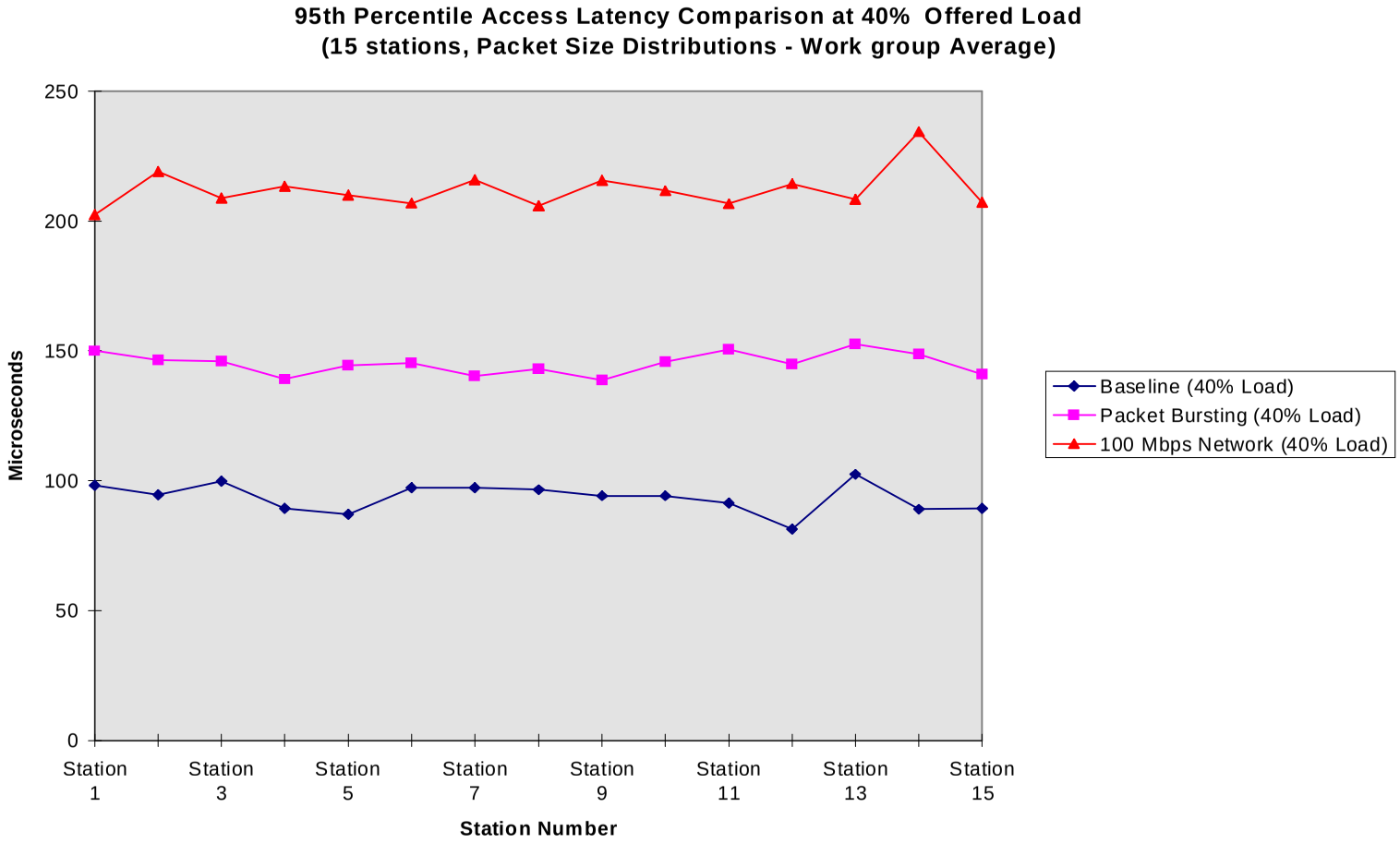

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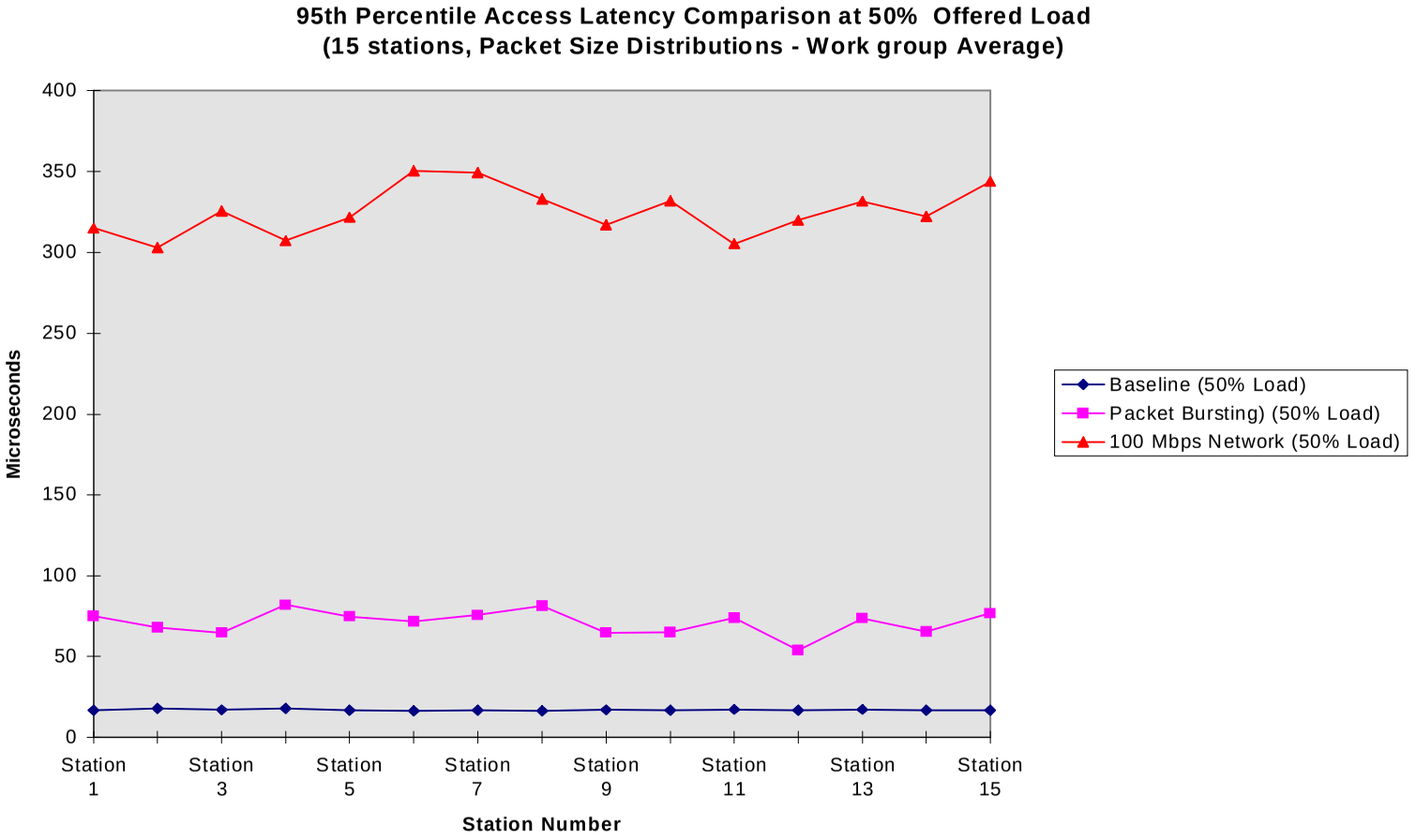

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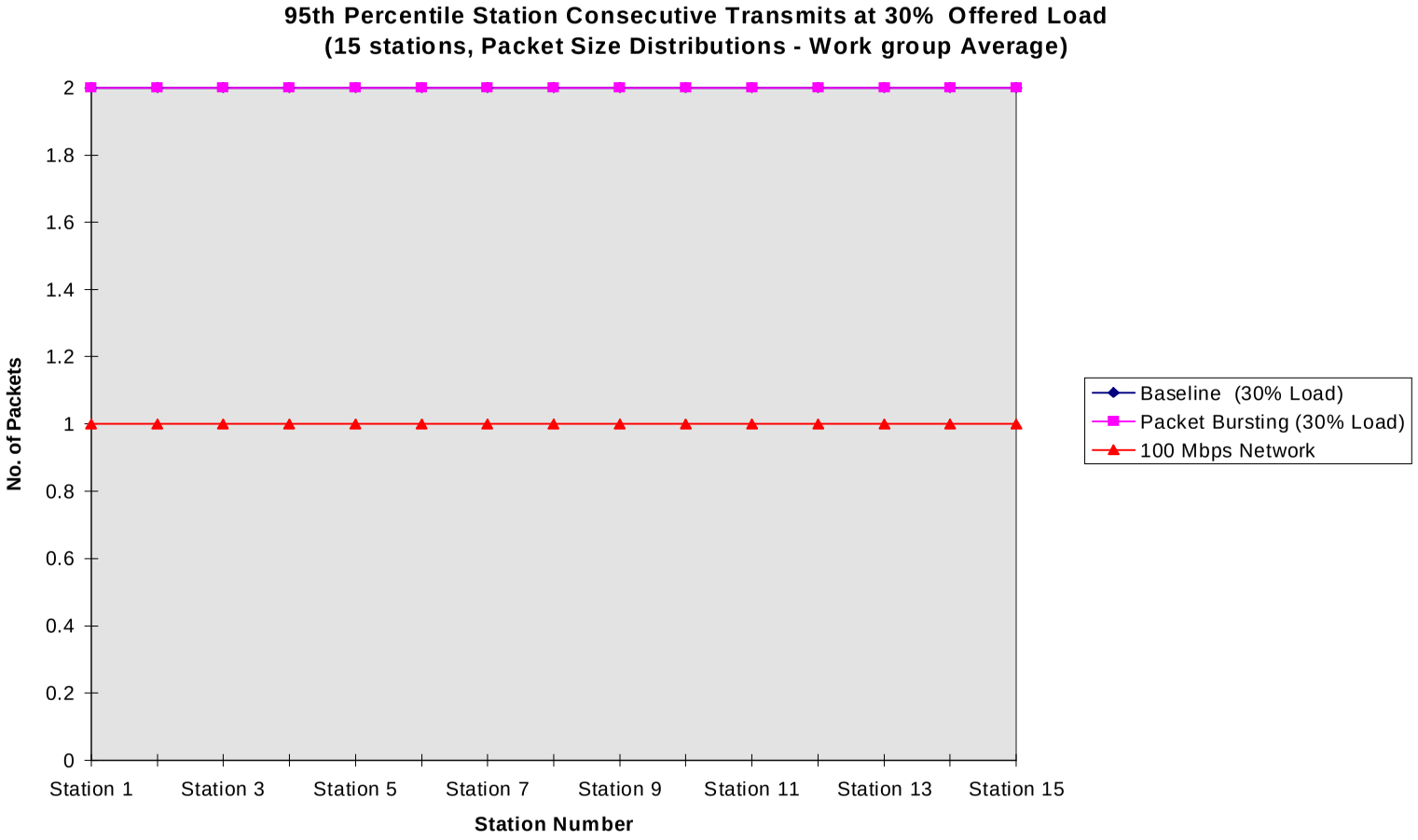

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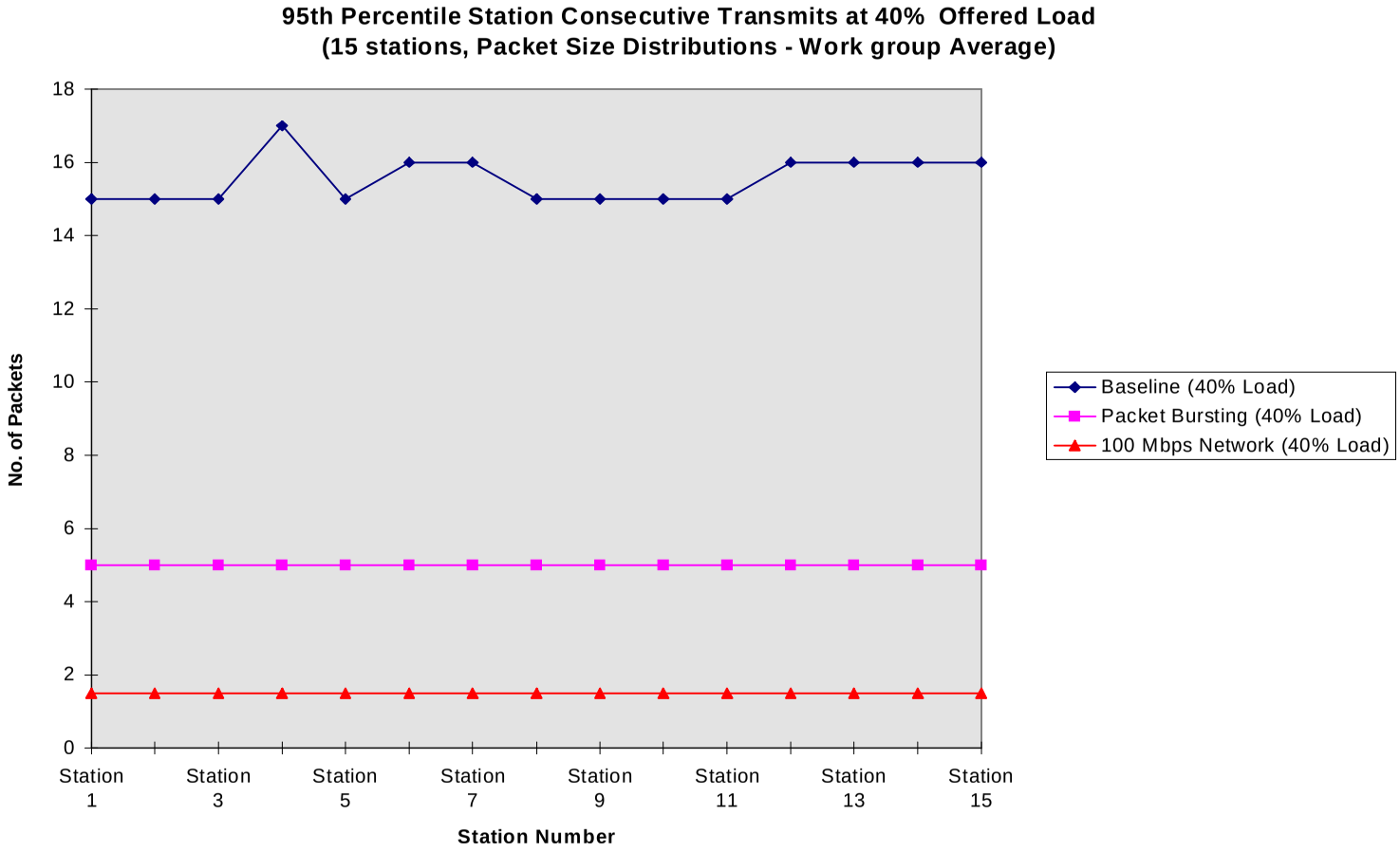

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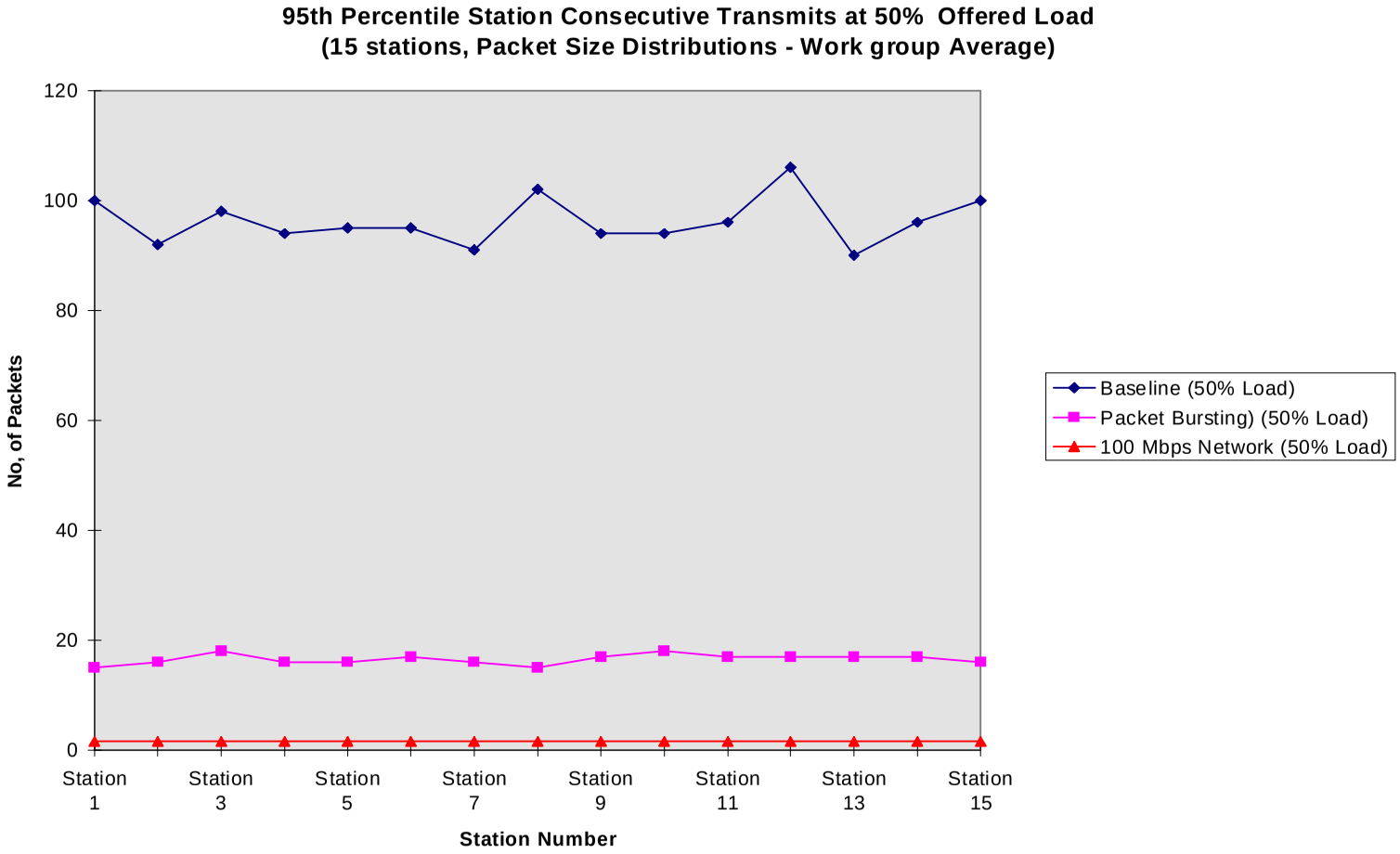

Results Summary

- **PB provides three times more throughput for small packets than baseline**
- **PB improves throughput by 25% for workgroup packet size distribution**
- **PB delays the capture effect to happen at higher offered loads than baseline**
- **PB improves all measures of performance for workgroup**

Summary & Observations

- **Packet Bursting provides a performance improvement similar to that of packet packing**
  - **– makes shared gigabit Ethernet an attractive option**
- **Packet Bursting does not require receivers and transmitters to hold multiple packets or statistics till end of collision window**
- **Packet Bursting requires minimal changes in MAC Pascal with Carrier Extension**
  - **– addition of burst length timer, a receiver flag and a transmit state variable**

Summary & Observations

- **No change to repeaters**
  - **Repeats everything after CRS assertion until CRS de-assertion**
  - **Oblivious to packet bursting**