

NetLets: Mechanisms for Measurement-Based End-to-End Performance

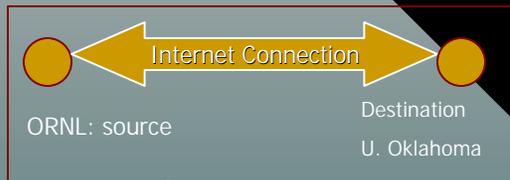


Currently, no control once data reaches the network

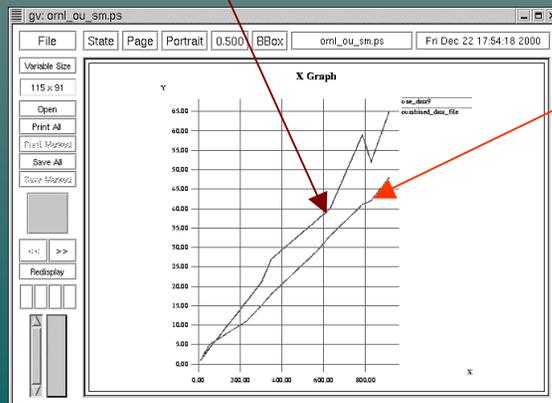


NetLets collect measurements, compute optimal paths and route

Internet Measurements

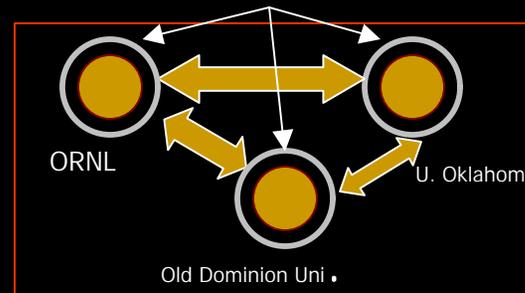


Small messages: few bytes

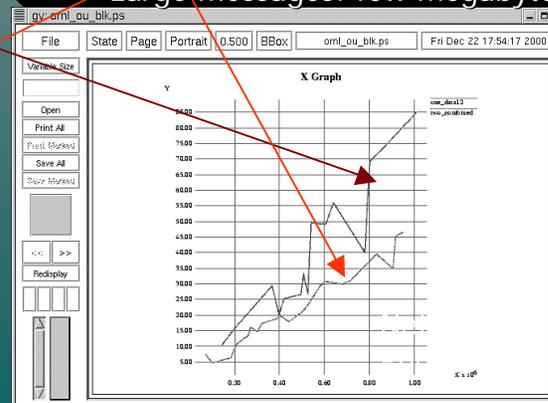


X-axis: number of messages

NetLets at host nodes



Large messages: few megabytes



X-axis: message sizes

Objective:

End-to-end delay minimization for ORNL-OU

Solution:

Two-paths via NetLets:

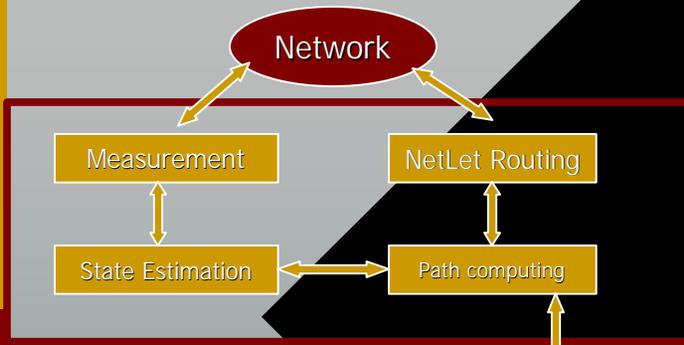
ORNL-OU, ORNL-ODU-OU

Average reduction in end-to-end delay

is about 20-30%

These results a a combination of :
statistical estimation,
graph and flow algorithms, and
network engineering

NetLet Daemons:
Implemented on top of TCP/IP stack



Use measurements to estimate delay regressions
to provide end-to-end minimization



Sponsored by
DARPA/ITO
Network Modeling and
Simulation Program

Theory helped implementation:

1. Appropriate measurements and their optimization
2. Performance savings are real

Performance Guarantees: End-to-End delay

Method:

Regression based on delay measurements,
followed by path computation

Given only measurements of sufficient (finite) size
Performance guarantee:

$$P\left\{\left|T(\hat{P}_R, R) - T(P_R^*, R)\right| > \epsilon\right\} < d$$

irrespective of the joint delay distributions

Informally, end-to-end delay of computed path is within specified
tolerance of optimal with a specified probability

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