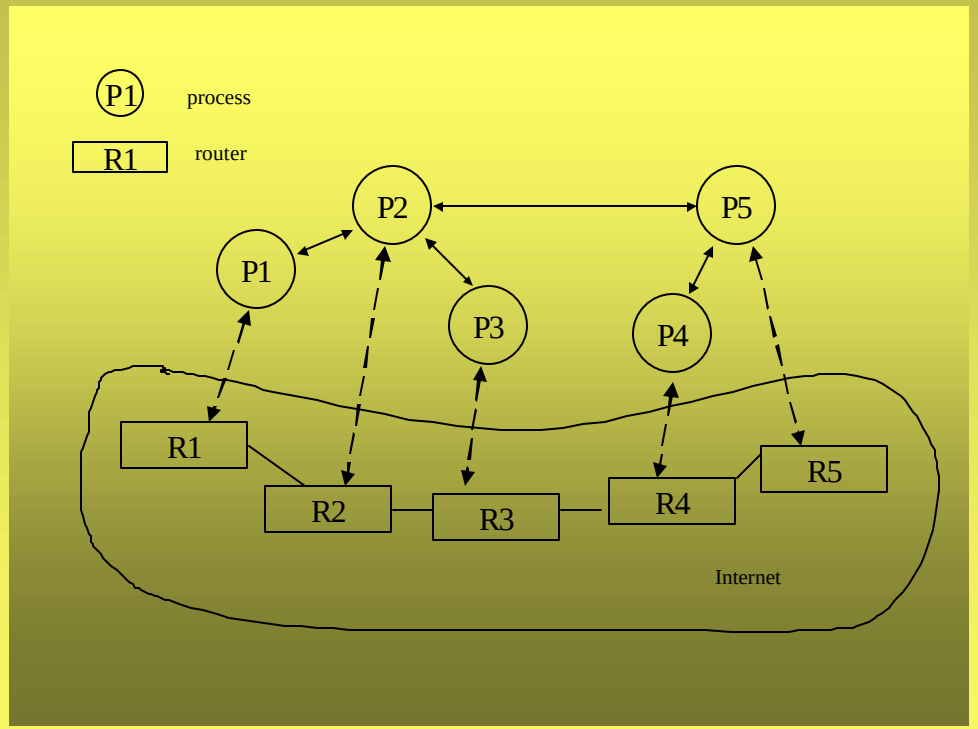
Analysis of End-to-End Delay in Computer Networks

Ashraf Jahangeer

University of Tennessee

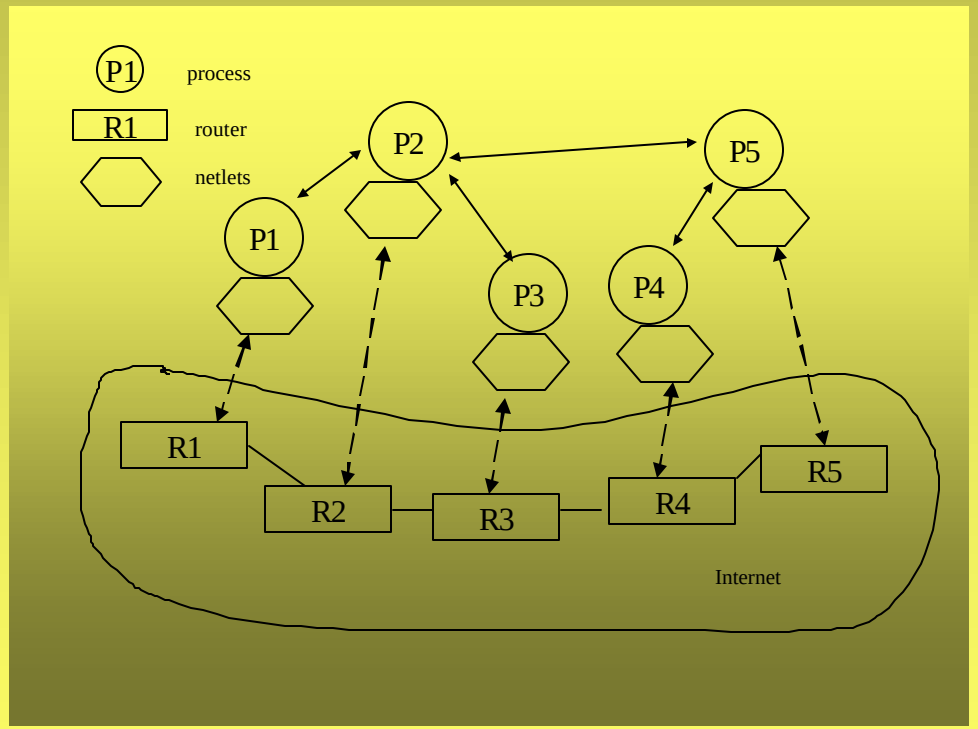
Present Day Networks

- Very little quality of service guaranteed
- Internet packets routed according to best-effort mechanism
- Once a packet is sent very little can be done about how it is sent
- Process-to-process communication achieved as peer-to-peer mechanism
- Parallelism in networks not taken advantage of



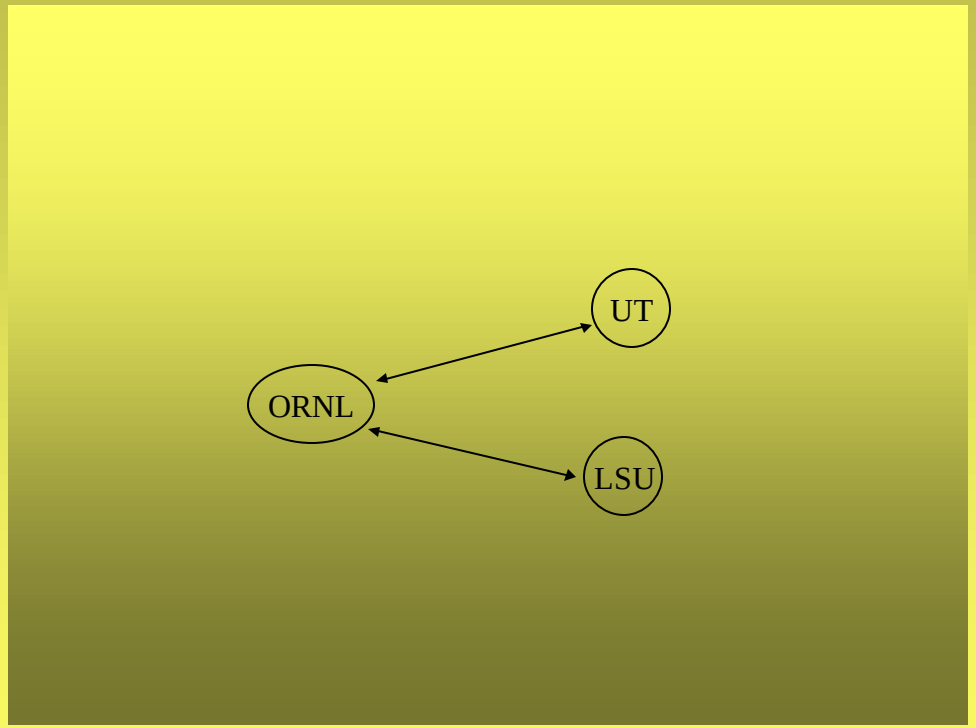
Netlets

- Process-to-process communication handled through netlets which run as daemons on the hosts
- Netlets collect measurements, compute optimal paths and route messages to ensure probabilistic end-to-end quality of service
- Netlets use both configuration and state of network



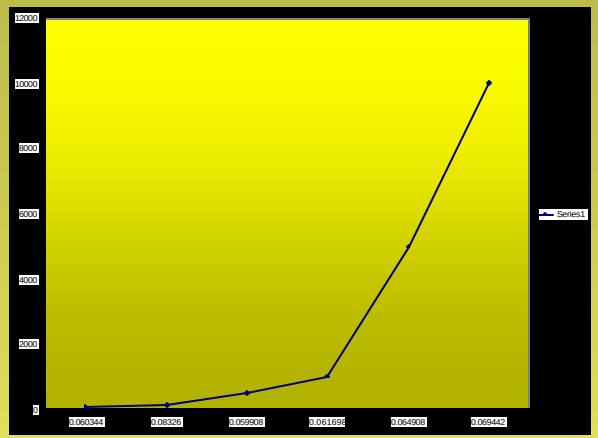
Network Measurements

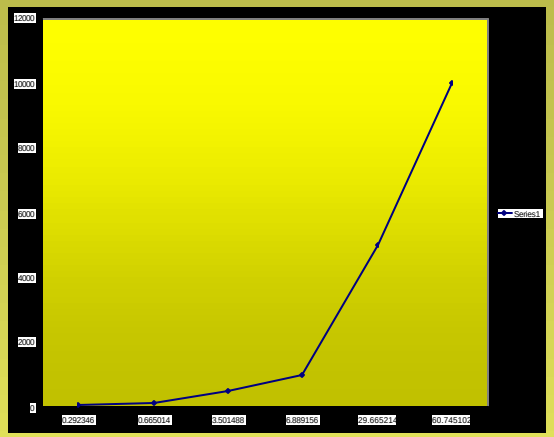
- Packet distribution size essential to ensure maximum speed of data transfer
- End-to-end delay computed between several hosts using different data transfer sizes.

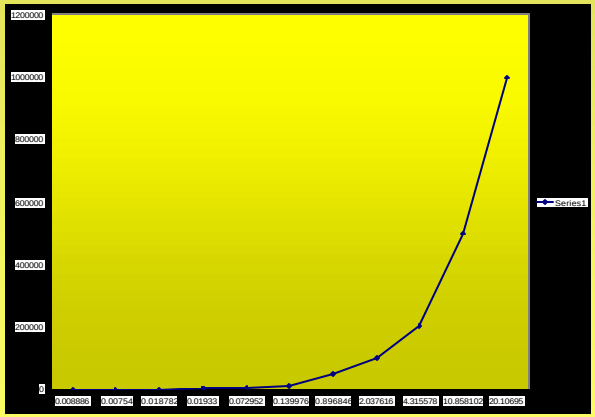


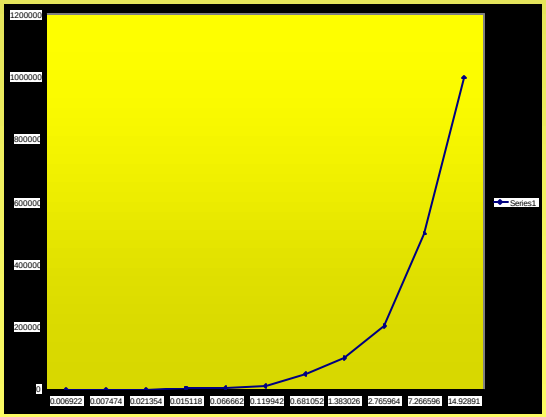
Network Host

- End-End delay
- Client and server on the same network but different machines
- Data transfer rate vs. time graph plotted



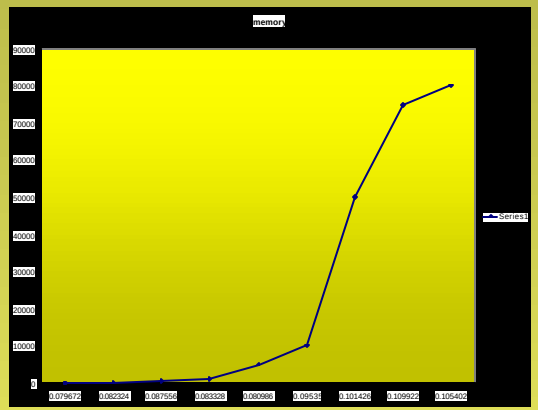


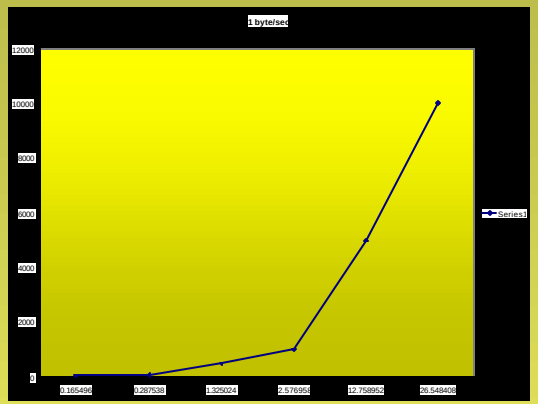


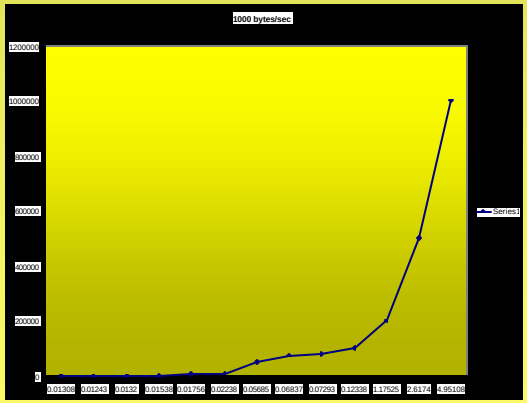


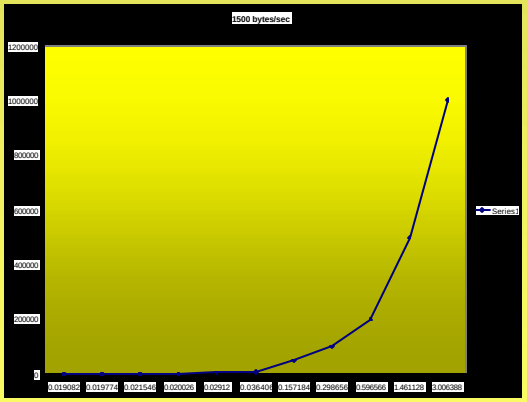
Local Host

- End-End delay
- Client and server on the same machine
- Data transfer rate vs. time graph plotted



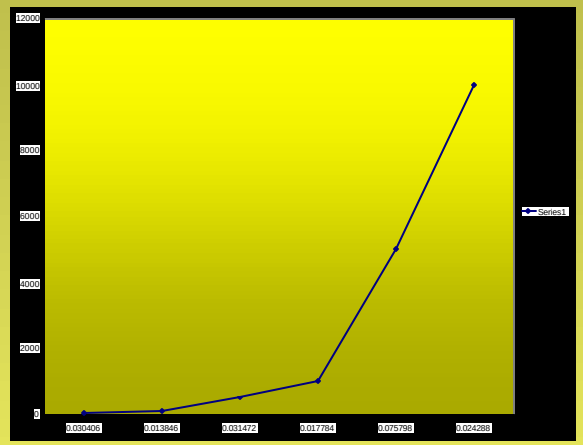


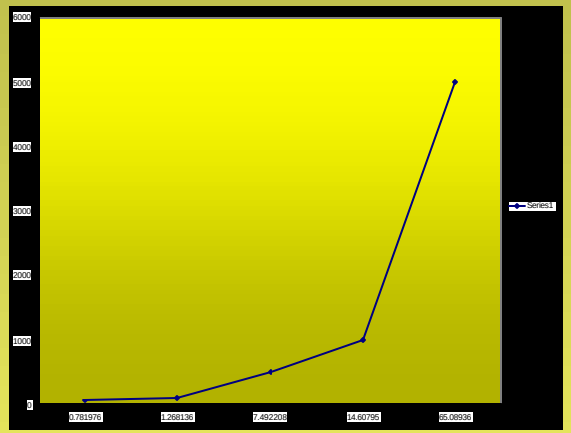


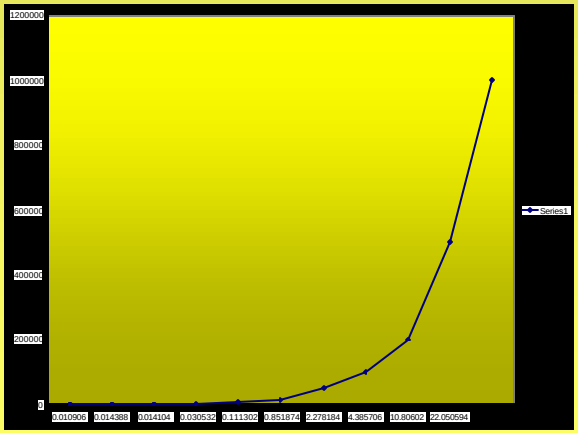


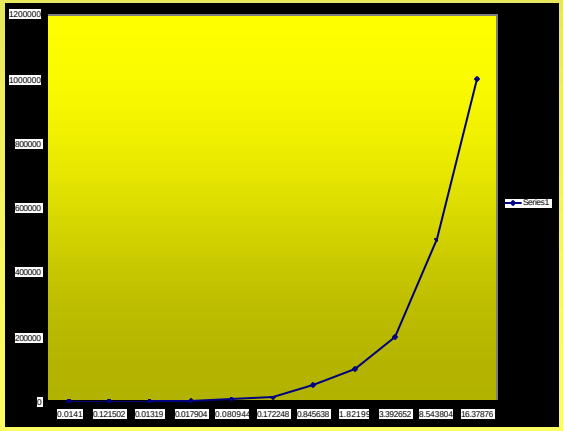
Remote Host-UT

- End-End delay
- Client at UT and server at ORNL
- Data transfer rate vs. time graph plotted



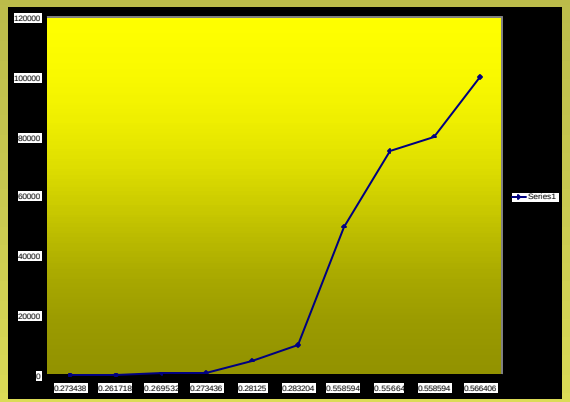


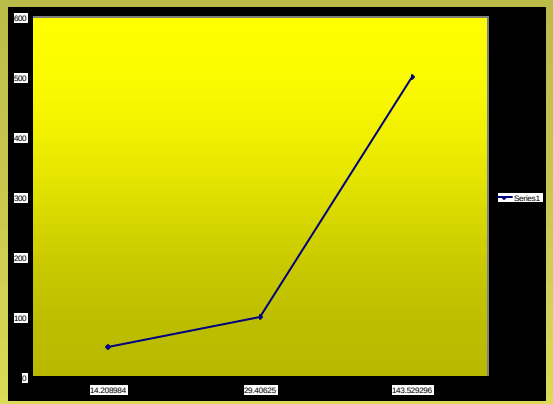


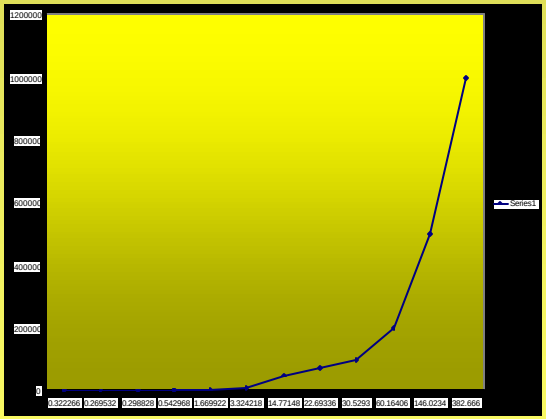


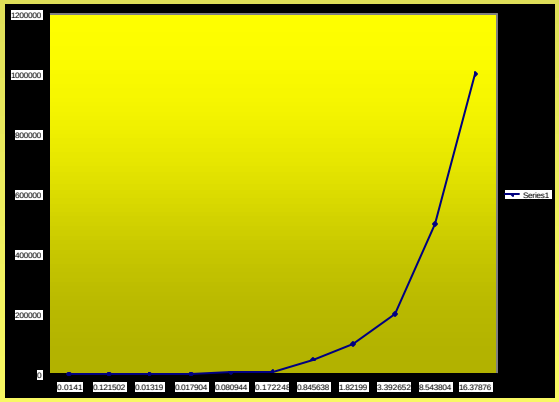
Remote Host-LSU

- End-End delay
- Client at UT and server on LSU
- Data transfer rate vs. time graph plotted









Conclusion

- Best results attained at data transfer rate of 1500 bytes i.e. capacity of ethernet
- Higher value of data transfer rate shows irregularities in terms of time measurement and unpredictability in terms of data delivery
- Netlets act as middleware i.e.work between the application and the network
- Netlets perform all the networking tasks needed to achieve the end-to-end performance

Continuing Work….

- Analysis of End-to-End delay measurement between two hosts connected by netlet routers
- Message break up and sent on different routes to ensure minimum end-to-end delay

The author would like to thank his mentor Dr. Nagi Rao who was a constant source of encouragement and a terrific guide. Special thanks to Dr. Tom Dunigan and Dr. Tom Potok for providing the chance to work at this prestigious organization. The author also thanks and appreciates the untiring efforts Debbie McCoy and Cheryl Hamby to make this program a success.

This research was performed under the Research Alliance for Minorities Program administered through the Computer Science and Mathematics division at the Oak Ridge National Laboratory. This program is sponsored by the U.S. Department of Energy. Oak Ridge National Laboratory is managed by UT-Battelle, LLC, for the U.S. Department of Energy under the contract DE-AC05-000R22725. Accordingly the U.S. Government retains a non exclusive, royalty free license to publish or reproduce the published form of this contribution, or allow others to do so, for U.S. Government purposes.