WANCE: A Wide Area Network Communication Emulation System

Yongguang Zhang
Bharat Bhargava

Department of Computer Sciences
Purdue University
West Lafayette, IN 47906

ygz@cs.purdue.edu
bb@cs.purdue.edu

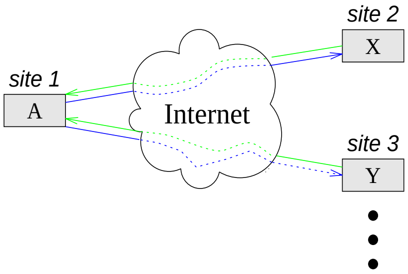
Motivation

- Wide Area Network and Large Scale Distributed System
- Questions that interest us:
  1. *What is the communication latency and reliability in WANs?*
  2. *How does communication performance impact transaction processing (concurrency, atomicity, replication, recovery)? How will the ACID properties change?*
  3. *How to improve the scalability of the distributed systems?*
- Related work
  C. Pu (Columbia 90), D. Long (UCSC 91), R. Cáceres (USC 91), A. Agrawala (Maryland 92).

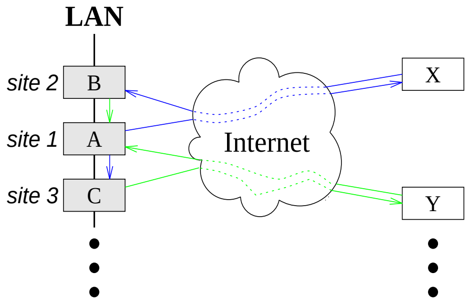
Experimental Infrastructure

- Problem: difficult to obtaining resource at remote sites to coduct experiments.
- Solution: an **emulation** approach – a local host emulates a remote host.
- Pros and Cons:
  Pro: excellent geographic scale, easy setup, virtually you can use any host.
  Con: limited number of sites, need more work for asymmetric processing.
- WANCE tool – a special communication library for experimenting distributed systems using emulation.

How Emulation Works



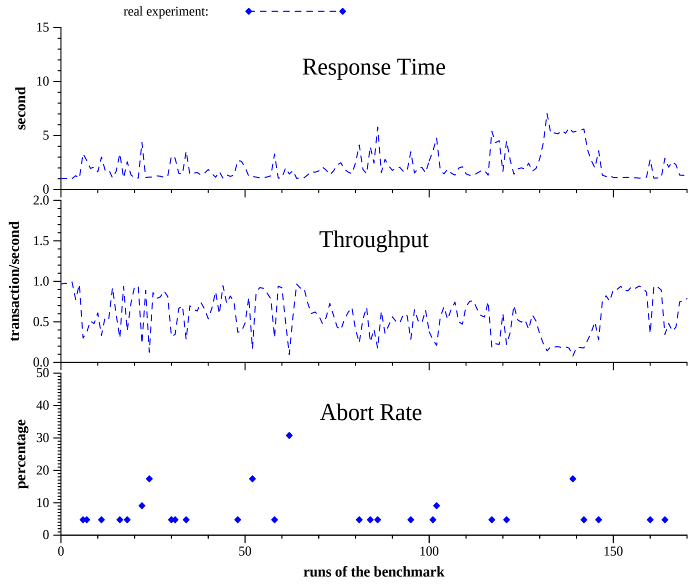
real experiment setup



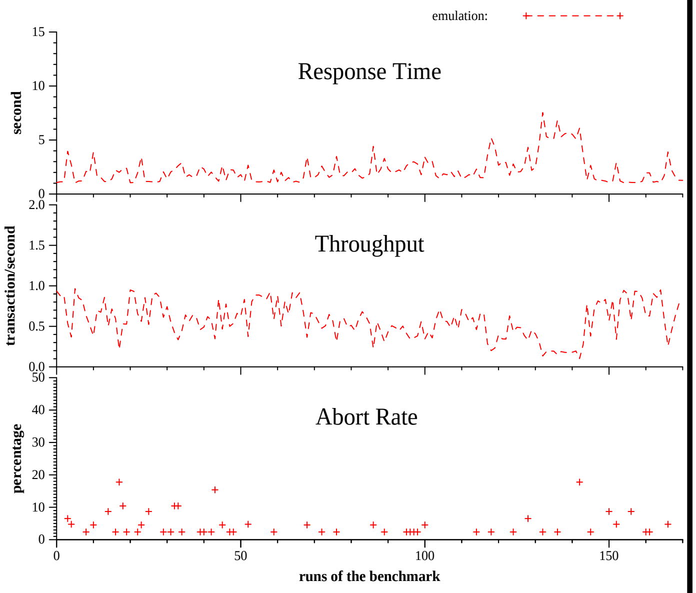
emulation experiment setup

Validation Result (Purdue – Hong Kong)

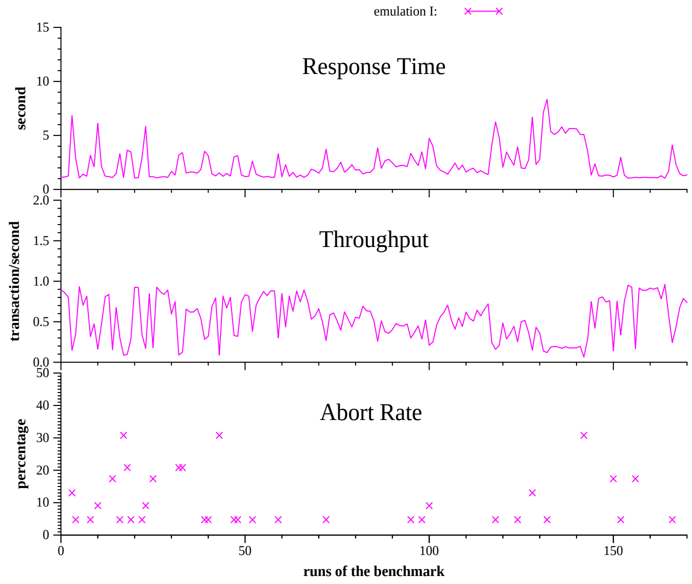
Distributed transaction processing. DebitCredit benchmark.
Each data point is based on 20 transactions.



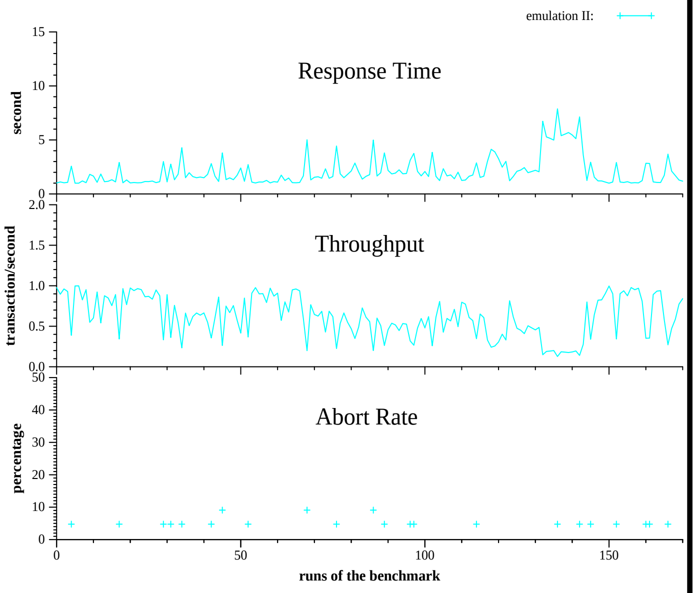
4



4-a



4-b



4-c

Conclusion

- We can use the WANCE tool to conduct emulation experiments and the results are as valid as in real experiments.

- The emulation experiments can be an inexpensive and accurate replacement for real experiments.

Reference

1. Bharat Bhargava, Yongguang Zhang, and Enrique Mafla. *Evolution of Communication System for Distributed Transaction Processing in Raid.* Computing Systems (USENIX), Summer, 1991.

2. Yongguang Zhang and Bharat Bhargava. *WANCE: A Wide Area Network Communication Emulation System.* Purdue TR, 1993.

3. Bharat Bhargava and Yongguang Zhang. *A Study of Distributed Transaction Processing in Wide Area Networks.* Purdue TR, 1993.