WANCE: A Wide Area Network Communication Emulation System

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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. Cácceres (USC 91), A. Agrawala (Maryland 92).*

1

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.

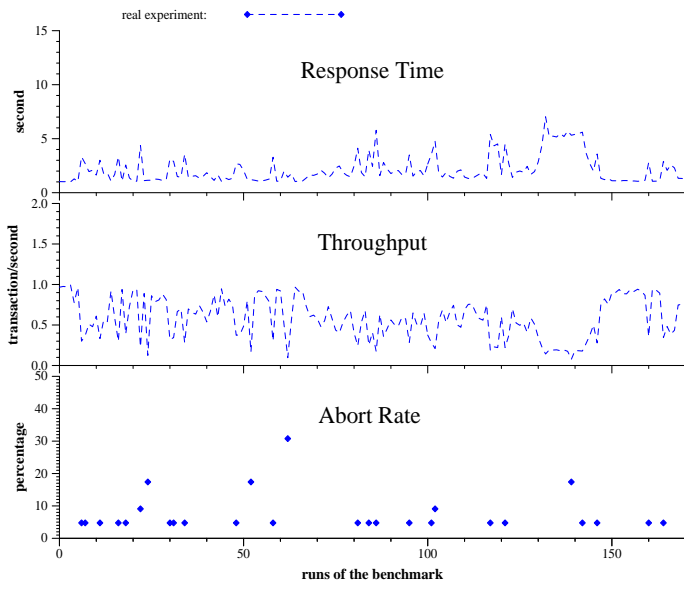- WANCE tool − a special communication library for experimenting distributed systems using emulation.

2

How Emulation Works

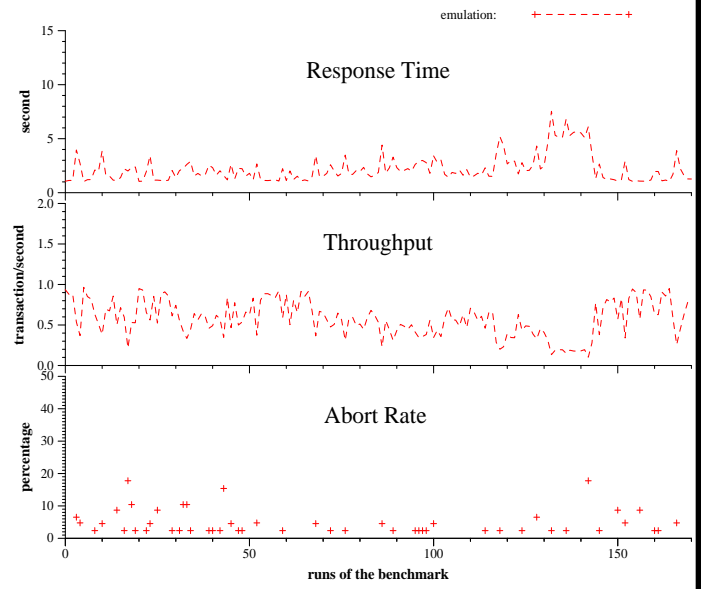
real experiment setup

emulation experiment setup
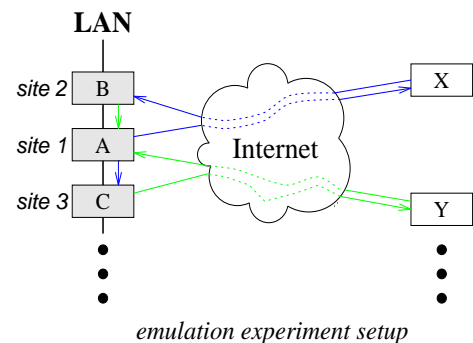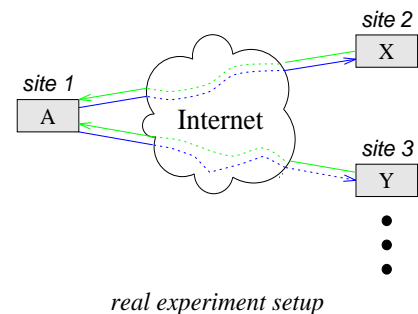
3

Validation Result (Purdue — Hong Kong)

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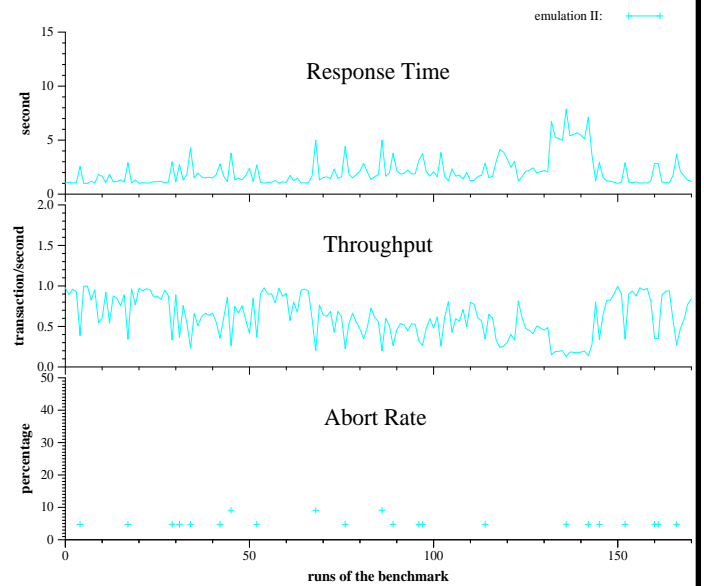Each data point is based on 20 transactions.

real experiment:

Response Time

Throughput

Abort Rate

runs of the benchmark

4

emulation:

Response Time

Throughput

Abort Rate

runs of the benchmark

4-a

emulation I:

Response Time

Throughput

Abort Rate

runs of the benchmark

4-b

emulation II:

Response Time

Throughput

Abort Rate

runs of the benchmark
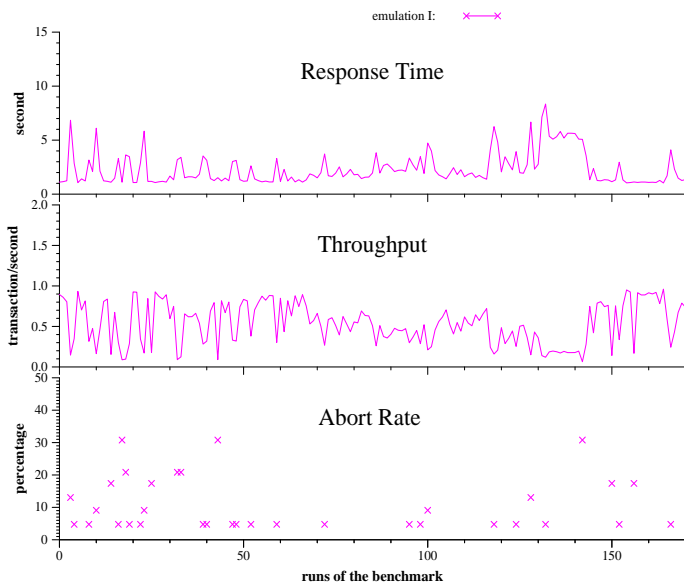
4-c

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.