



Automatic Noise Simulation in UDP

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Outline

- ♦ UDP transport
- Solution Strategy Difficulties in testing UDP based application
- ♦ ConTest/UDP Automatic noise simulation in UDP
- Comparing ConTest/UDP to white box testing in testing of group communication





UDP VS TCP

- Transport protocols over IP
- ♦ TCP
 - Connection based
 - Reliable
 - Analogous to making a telephone call
 - ♦ Usage examples: FTP, HTTP
- ♦ UDP
 - Not connection based
 - ♦ Unreliable
 - Analogous to sending a letter
 - ◆ Usage examples: Ping, Multicast, Stocks Quote server
- ♦ Java programs use TCP or UDP through the java.net package

Java.net
Transport
(TCP/UDP)
Network
(IP)
Link
(device driver)





Unreliable flow in UDP – Losing messages







Unreliable flow in UDP – Duplicating messages







Unreliable flow in UDP – Changing the order







Unreliable flow in UDP – Delaying messages







Testing UDP based applications

- A UDP based application must handle network noises
 For example Any reliable component on top of UDP
- ♦ Testing scenarios of network noise is compulsory
- The probability to encounter such scenarios during testing in normal environment is low





Automatic Simulation of Noise by ConTest/UDP

- ConTest/UDP addresses the difficulties in testing UDP applications
- ConTest/UDP simulates UDP noise and network failures
- SonTest/UDP creates an intermediary layer above the Java API
- ConTest/UDP is part of the ConTest suite, that aims to increase the probability of exposing concurrent bugs





ConTest/UDP Options

- ♦ Remote Nodes apply noise on messages from/to certain nodes
- ♦ Direction incoming and/or outgoing messages
- Mode
 - ♦No noise
 - ♦ Delay packets are accumulated by the tool
 - ♦ Block packets are lost
 - Random noise packets are tampered randomly
- ♦ Strength determines the random noise level





Delaying messages with ConTest/UDP







Delaying messages with ConTest/UDP







Losing messages with ConTest/UDP







Losing messages with ConTest/UDP







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- OnTest/UDP Automatic noise simulation in UDP
- Comparing ConTest/UDP to white box testing of a group communication application





Group Communication

- Multi-point to multi-point communication for a dynamic group of processes
- Supplies a group membership service that tracks the set of group members view
- Supports various guarantees for its messages delivery:
 - ♦ FIFO delivery
 - Virtual Synchrony
 - Total Order





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Versatile Replication Infrastructure

- VRI Java implementation based on Clue (AS400)
- ♦ All layers support a generic interface
- ♦ Every layer is responsible for a certain task







Testing the reliability of the Transport Layer

- The Transport Layer provides reliable Multicast delivery over UDP
- Testing the reliability is possible using Contest/UDP and a Verification Layer
- Running with the Random mode provides powerful automatic testing







Testing partitions – required scenario







Testing partitions – required scenario







Testing partitions – simulated scenario







Testing partitions – simulated scenario







The Manipulator Layer

- ♦ Follows the white box testing strategy
- Responsible for injecting noise into the VRI stack
- Implements the generic interface of a layer in the stack







View message synchronization

- This scenario illustrates that sometimes it is hard to create certain scenario with ConTest/UDP.
- When a new view is established in a certain member C before another member B, C should queue view messages from B until the new view is established





















































Conclusions

- ConTest/UDP provides a powerful utility to test UDP-based programs
- ConTest/UDP easy to use with no effect on the application code
- ConTest/UDP not always suitable to test application specific scenarios
 Such scenarios require specifically tailored testing code