Package for Controlling Delivery of Messages

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Introduction

Transit is package for controlling distribution of messages between java programs. The user can choose to use it asynchronously or synchronously as Transit asynchronously sends and receives messages into a queue.

Core features

- Abstracts away low level TCP handling
- Allows developers to add custom logic before delivering received message to their application like
  - Change the order of messages
  - Or deciding to accept or reject messages
- Works with any serializable object as a message

Restrictions at this time

- Only supports JAVA
- Only uses TCP on the back-end
- Intended for distributed architecture
- No stream support, only message passing

DEMO 1: Request Reply

1. Run hello.Server
2. Run hello.Client
3. Discuss Code and Kill All
4. Run inventory.Server 3003 inventory.txt aka homework 1
5. Run inventory.Client localhost 3003
    a. list
    b. purchase sam ps4 2
6. Run 3 other clients
    a. search sam
7. Discuss Code and Kill All

DEMO 2: Push Socket and Out of Order Messages

1. Run hello.CausalOrderCounterTest 3 times, entering 3, 2, 1 as server IDs
2. Hit Enter for 1 and 2 and show 3's messages are out of order
3. Discuss Sending One Way and Bind early then receive anytime

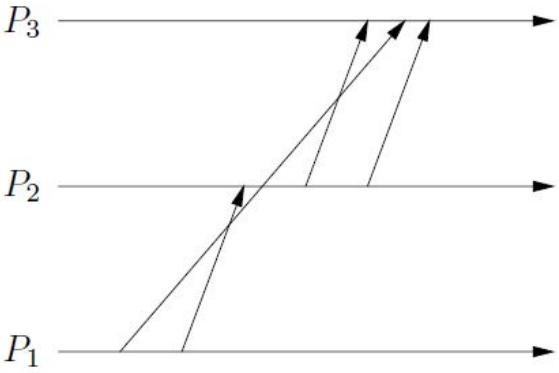


Figure 12.1: A FIFO computation that is not causally ordered

DEMO 3: Causally Ordered Messages

1. Run hello.CausalOrderTest 3 times, entering 3, 2, 1 as server IDs
2. Hit Enter for 1 and 2 and show 3's messages are IN order
3. Discuss Bind first because sender is important to receiver
4. Connect/Send and Receive anytime or never

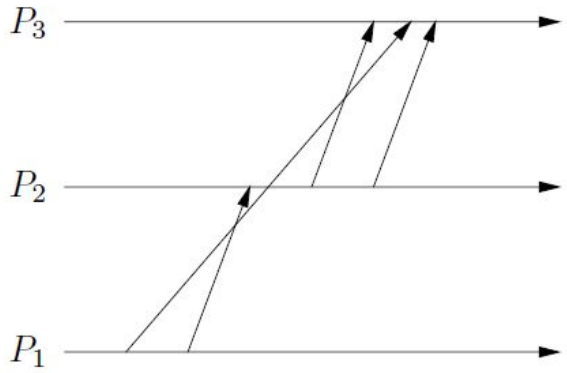
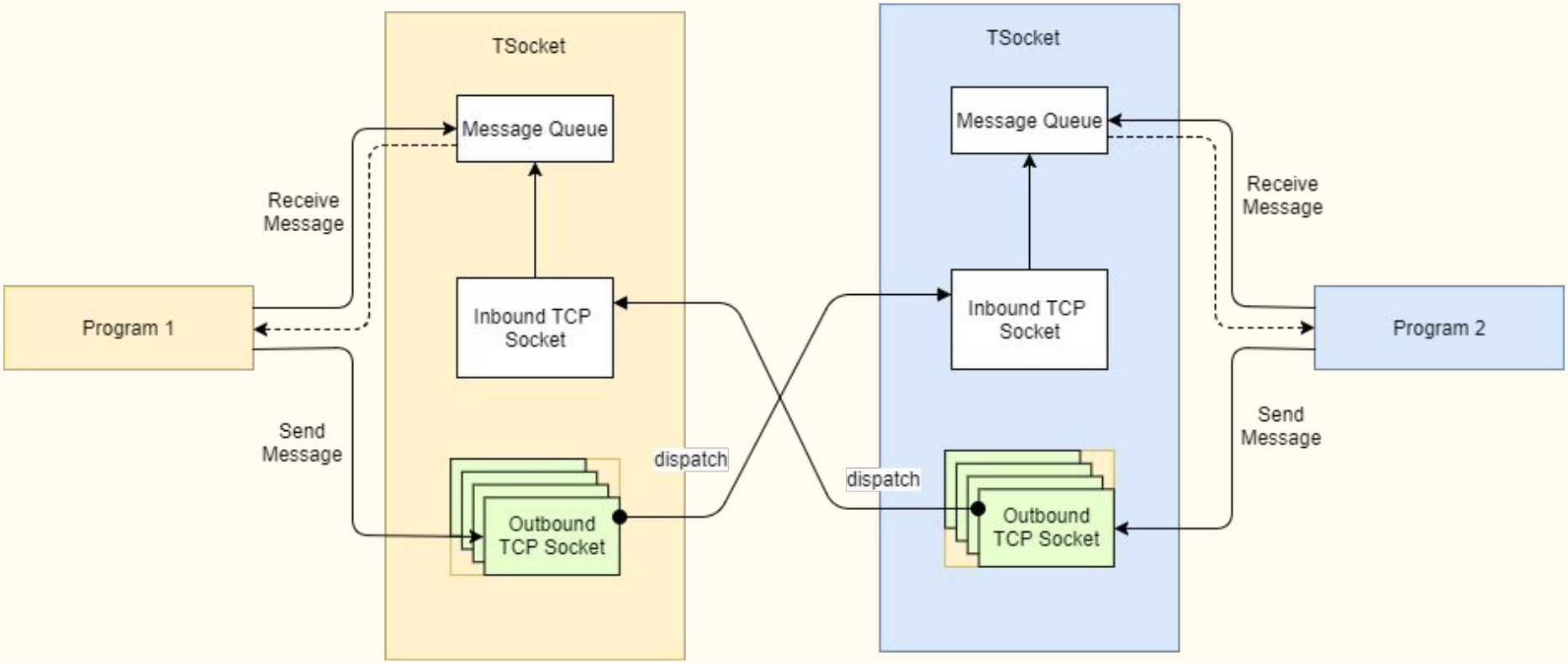


Figure 12.1: A FIFO computation that is not causally ordered

Message communication model



The BaseSocket

- Uses queue to buffer receives messages
- Binds to the configured port and listens to message on a different thread
- On send it opens a socket to the destination process
- Uses a packet that holds the message and source process information
- On receiving a new message it pushes it to the buffer and allows the consuming code to do anything with the messages

BaseSocket Implementation

```
class BaseSocket {
        protected TAddress _bindEndPointAddress;
        protected TAddress _connectEndPointAddress;
        protected Thread _serverRunnerThread;
        protected ConcurrentLinkedQueue<TPacket> messageQueue;
        ...
        protected void bind(String host, int port)
        protected void sendOneWay(Serializable message, TAddress address)
        protected void send(Serializable message, TAddress address)
        protected TPacket receivePacket()
        protected boolean peek()
...
}
```

Request/Reply

- Commonly seen pattern, e.g. homework 1
- Clients use the Requestor class and connect to a server
- Servers use the Replier class and bind to an IP and port
- Clients send a request to the server
- Servers call receive to get the next request in the queue and call reply
- Clients use receive to get the reply
- Both requests and replies are queued up so both sides can do work between receives without losing messages.

PushSocket

- No differentiation between senders and receivers
- FIFO if all in the same thread as send is synchronous
- Bind if you want to receive messages
- Send message to any IP/Port
- If you bound you can call receive to pop a message out of the queue
- Sender addresses are not attached automatically to messages
- Good for tasks such as homework 2’s recovery messages

Causal Order

- BaseSocket is extended to create a CausalSocket, and this class holds
  - Network topology
  - Message matrix
- Since the base implementation provides a queue with pending message only a delivery queue is added to apply the algorithm

Extending BaseSocket

```
public class CausalSocket extends BaseSocket {
        int M[][];
        int N;
        LinkedList deliveryQ = new LinkedList();
        ArrayList<CausalParticipant> participants;
        ...

        void connect(String host,int port)
        boolean okayToRecv(int w[][], int srcId)
        void checkPendingQ()

        ...
}
```

Proposed features

- Closing Receive Sockets and Request Socket
- Timeouts
- Message queue for outgoing messages
- Acks for outgoing messages
- Broadcast Socket
- Multicast Socket
- AMPQ