JCSP Networking 2.0

(or maybe JCSP 1.1 rc4)

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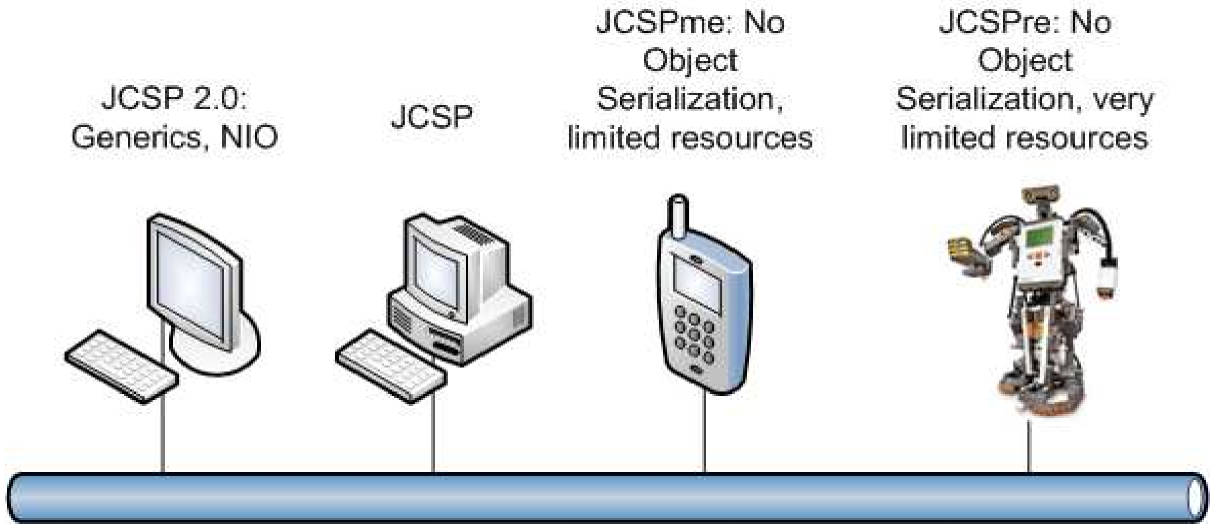
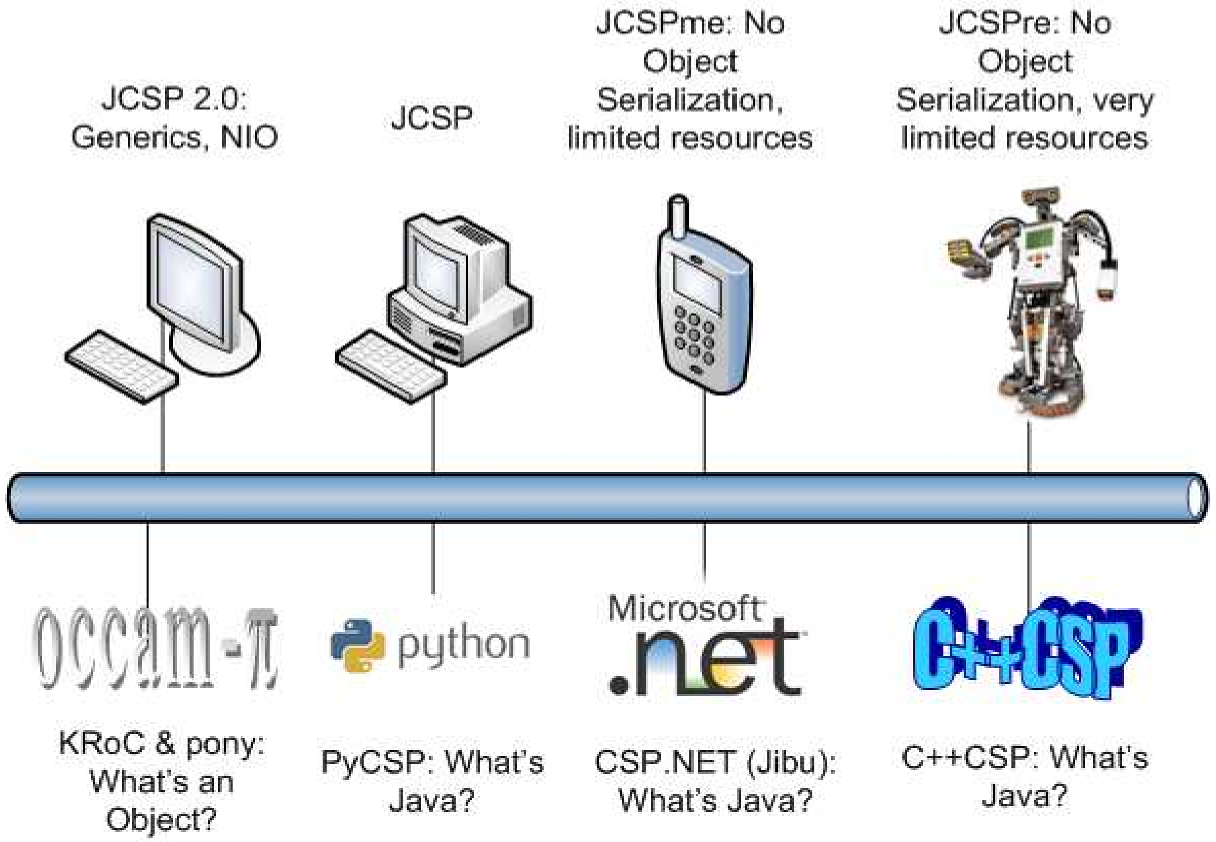
Aims

- Update to JCSP 1.1
  - Poisonable network channels
  - Remove pesky rejectable channels
  - Extended rendezvous
  - No networked AltingBarrier (yet!)
- Reduce overheads
  - No process per channel
  - No LoopbackLink
  - LinkManager now a passive data object
  - Smaller message size

Aims

- Extensibility, configurability and error handling
  - Layered model – easier to add extensions
  - NetworkBarrier!
  - Better NetworkConnection (soon)
  - All networked channels mobile (maybe)
  - Priority of communication layer
  - Buffer size
  - Quick creation of channels (no Channel Name Server required)
  - JCSPNetworkException
- Interaction
  - Towards a universal protocol


JCSP 2.0: Generics, NIO
JCSP
JCSPme: No Object Serialization, limited resources
JCSPre: No Object Serialization, very limited resources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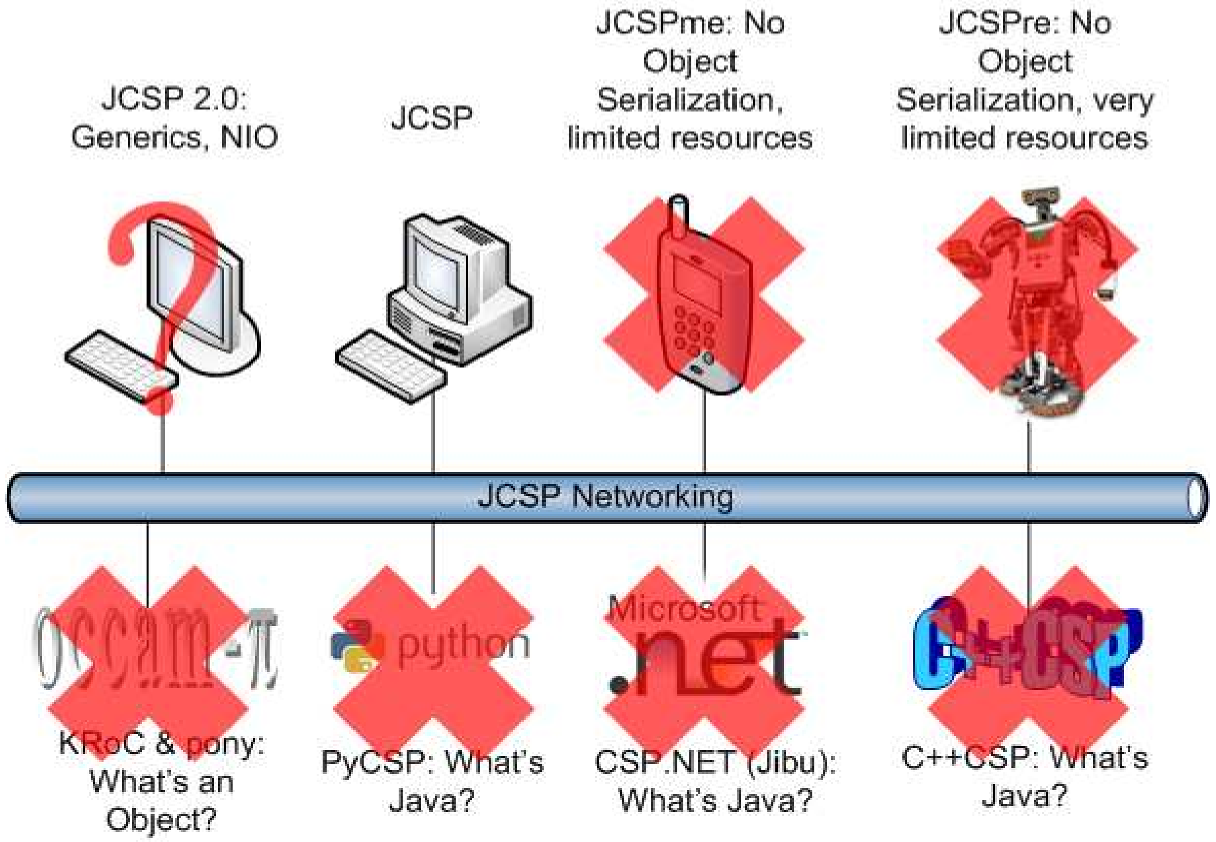
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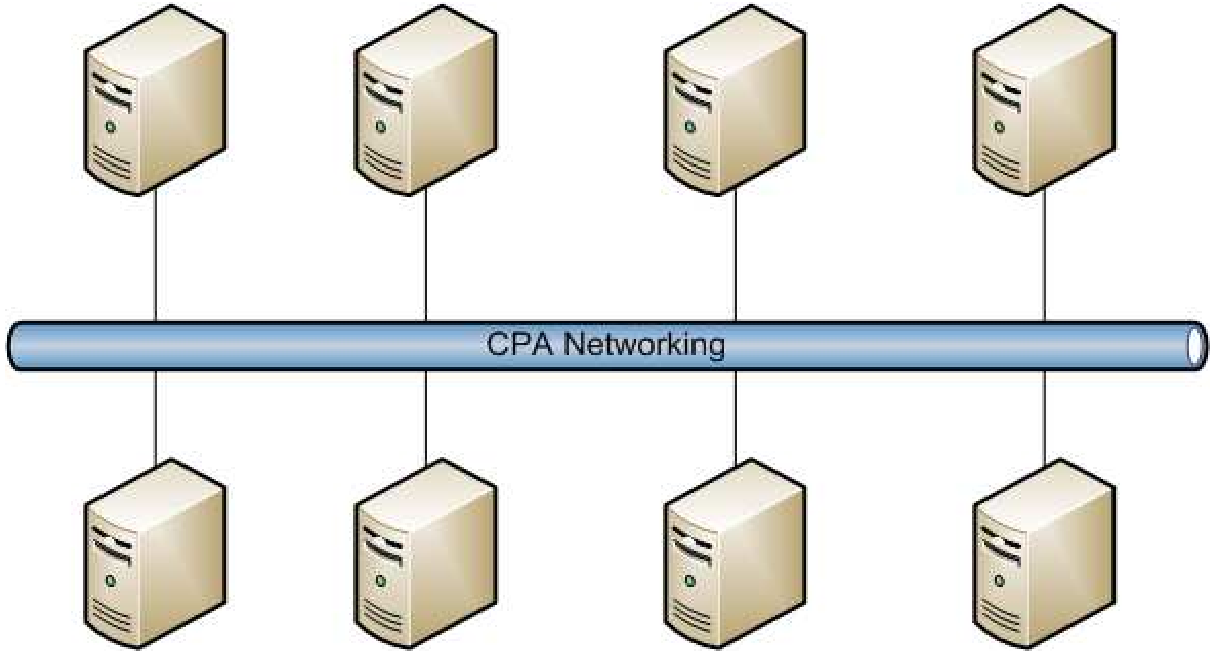
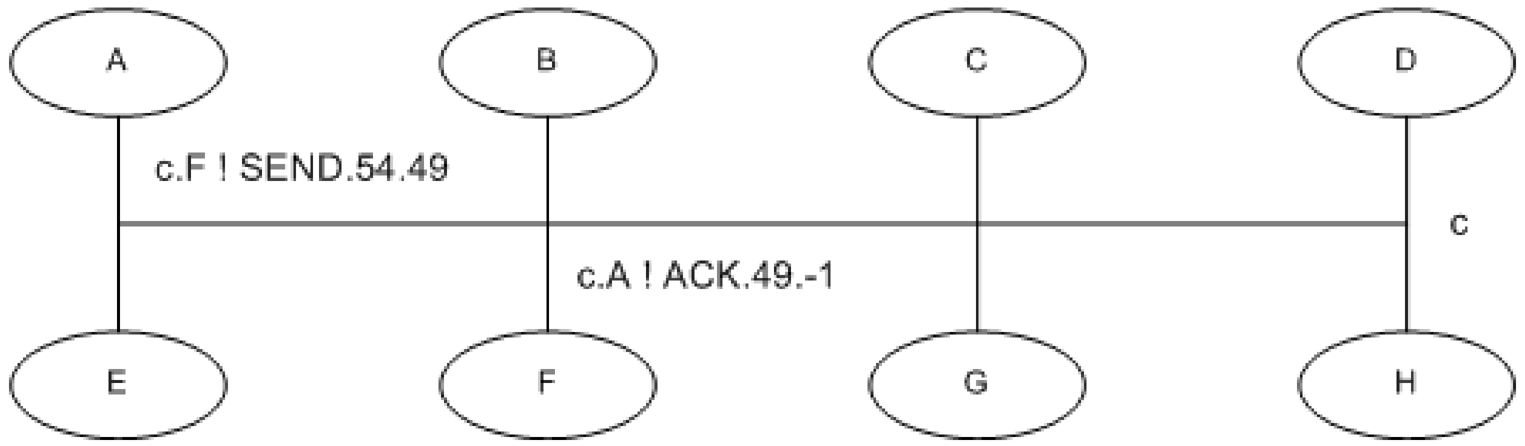
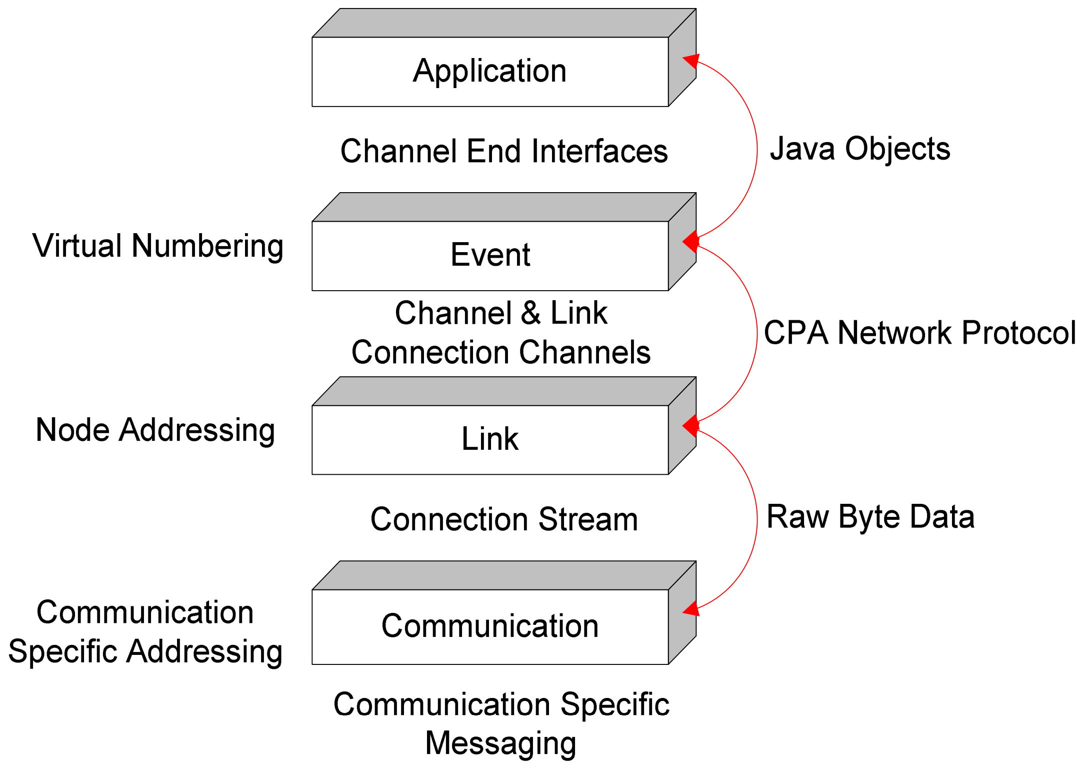

CPA Networking


A
B
C
D
c.F ! SEND.54.49
c
c.A ! ACK.49.-1
E
F
G
H

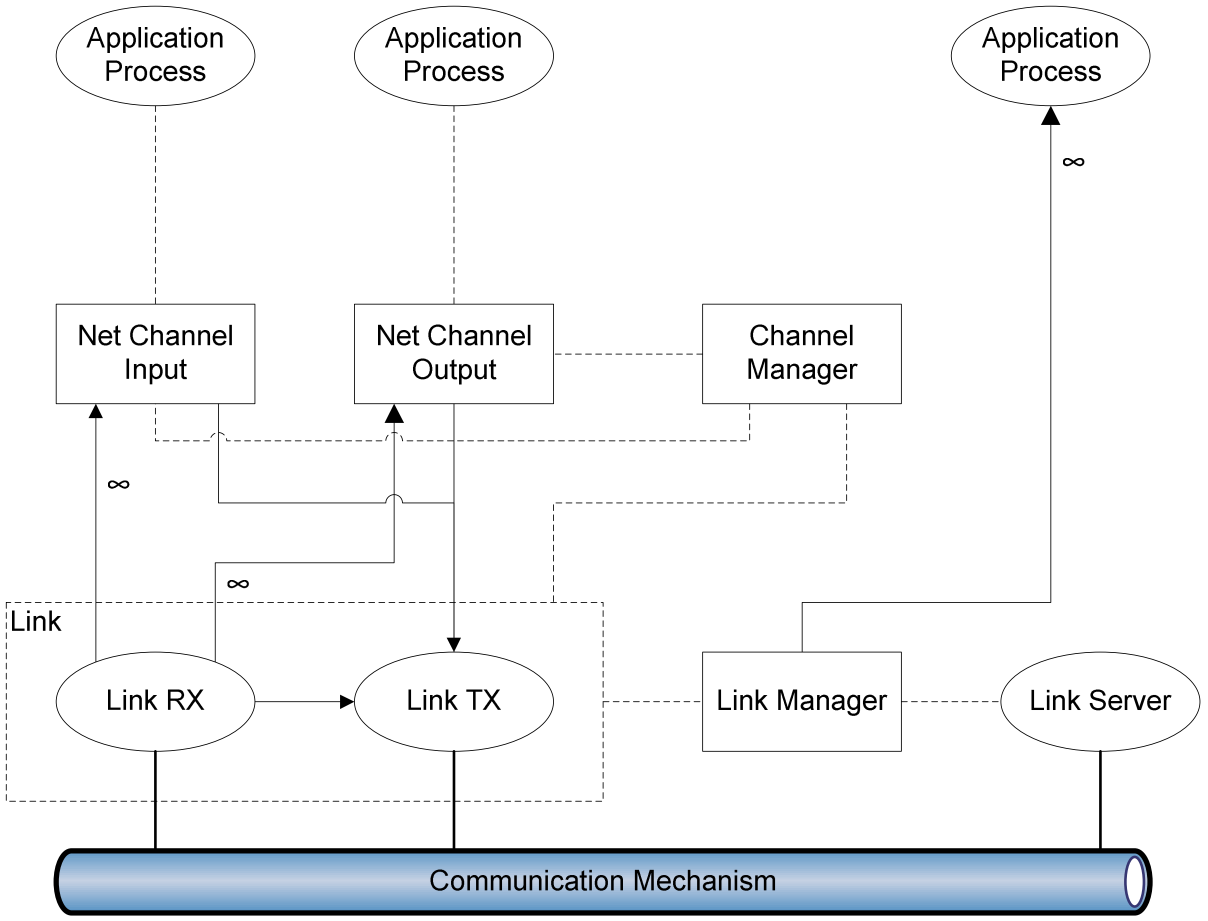
Towards a Universal Protocol

- Messages are no longer objects
  - SEND | *Destination* | *Source* | *<data>*
  - <1, 0, 0, 0, 54, 0, 0, 0, 49, <data>>
- Data encoding and decoding handled at channel level
  - User defined methods possible
  - Object serialization default, raw data and class loading provided

Layered Model



Layered Model



Creating an Application

- Old way
- Use Channel Name Server
  - Can use names – implies lookup on receiving Node

```
Node.getInstance().init(new TCPIPNodeFactory("CNS_IP"));
NetChannelInput in = CNS.createNet2One("channel_In");
NetChannelOutput out = CNS.createOne2Net("channel_Out");
```

Creating an Application

- New way

```
Node.getInstance().init(new TCPIPNodeAddress(5000));
// Create Link to remote Node
TCPIPNodeAddress remoteAddr = new TCPIPNodeAddress("192.168.1.100", 4000);
// Get NodeID
NodeID remoteNode = LinkFactory.getLink(remoteAddr).getRemoteNodeID();
// Create channels
NetChannelInput in = NetChannel.numberedNet2One(55);
NetChannelOutput out = NetChannel.one2net(remoteNode, 49);
```

- Other methods possible
  - Original method
  - From NodeAddress and VCN
  - From NetChannelLocation

Other Channel Options

- Poison

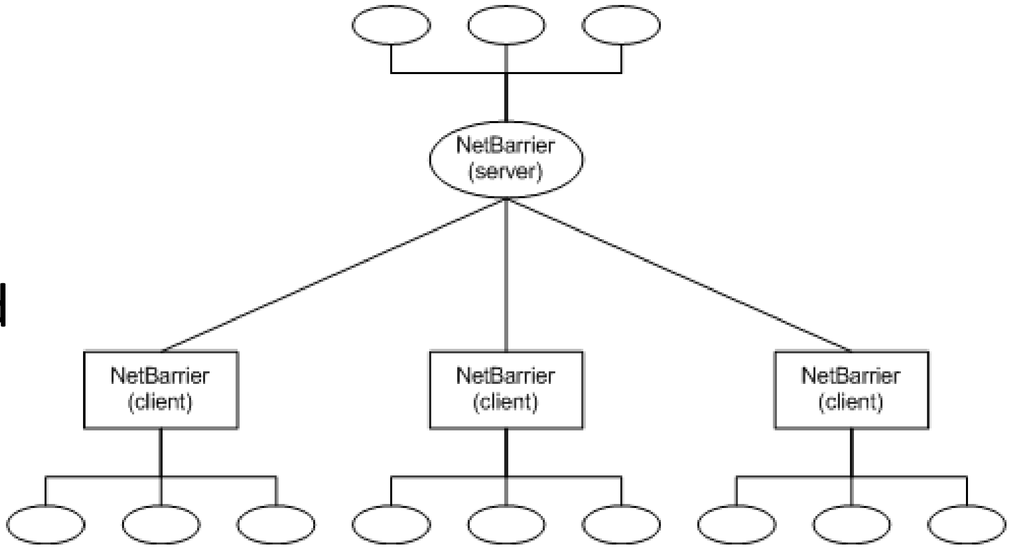
```
NetChannelInput in = NetChannel.net2one(10);
NetChannelOutput out = NetChannel.one2net(location, 10);
```

- Specified encoder / decoder

```
NetChannelInput in =
   NetChannel.net2one(new RawNetworkMessageFilter.FilterRX());
NetChannelOutput out = NetChannel.one2net
   (location, new RawNetworkMessageFilter.FilterTX());
NetChannelInput in =
   NetChannel.net2one(new CodeLoadingChannelFilter.FilterRX());
NetChannelOutput out = NetChannel.one2net
   (location, new CodeLoadingChannelFilter.FilterTX());
```

NetworkBarrier

- Two tier approach
  - Declaring (server) end
  - Multiple connecting (client) ends
  - Each end has *n* enrolled processes
  - Server end **MUST** have one enrolled process



NetworkBarrier

- Creation methods – as channels
  - Barrier Name Server (BNS)

```
NetBarrier servBar = BNS.netBarrier("barrier", 10, 10);
NetBarrier clientBar = BNS.netBarrier("barrier", 10);
```

  - Numbered barrier ends

```
NetBarrier servBar =
        NetBarrierEnd.numberedNetBarrier(55, 10, 10);
NetBarrier clientBar =
        NetBarrierEnd.netBarrier(nodeID, 55, 10);
```

- Server end declares both locally enrolled and expected remote client ends.

Error Handling

- Channels can throw JCSPNetworkException or NetworkPoisonException
  - Unchecked exceptions – no need to explicitly catch
  - If connection to input end fails, the output end will throw a JCSPNetworkException
  - If there is a problem during I/O (including encoding / decoding) a channel will throw a JCSPNetworkException
  - If the input end is destroyed, the output end will throw a JCSPNetworkException during next write operation
  - If a message is sent to an input channel that does not exist, a JCSPNetworkException will be thrown
  - If a channel end is poisoned with sufficient strength, every complement end will throw a NetworkPoisonException

Error Handling

- Barriers can only throw JCSPNetworkException
  - If the connection to the server NetBarrier fails, a client NetBarrier will throw a JCSPNetworkException and fail.
  - If the connection to a client NetBarrier fails, a server end will throw a JCSPNetworkException, decrement the enrolled network process count, and allow reuse if required.
  - If a client end tries to enrol on a non-existent server end, a JCSPNetworkException will be thrown.
  - If the locally enrolled count on the server end reaches zero, a JCSPNetworkException will be thrown.

Mobility

- Non-running process mobility via code mobility
  - Code loading channel filter
  - Reduced model from last years paper
- Running processes still require termination
  - Poison
  - Migration event
- Channel mobility via message boxes
  - Updated model soon....
  - Built into protocol?

Wrapping up

- New JCSP networking available on the JCSP repository (under the Networking-2 branch)
- More information and examples given in handouts
  - Set up
  - Channel creation, operations and error handling
  - Custom encoders and decoders
  - Network barriers
  - Mobility
  - Custom Link protocol creation

Wrapping up

- Hopefully everyone’s existing programs will still work
  - Same interfaces
  - Some packages not replicated (dynamic, remote, security, settings)
- More updates soon, once I’m finished writing up
  - NetConnections
  - Better channel mobility
  - AltingBarrier?
- Any requests for functionality / information let me know, and I’ll try and help as much as I can.

Questions?