

JMSGroups: Towards JMS-Compliant Group Communication

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Roadmap

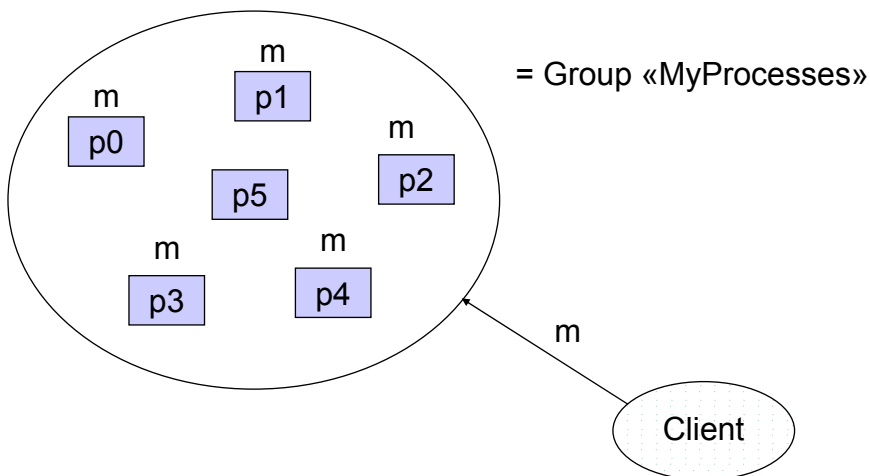
1. A Flavor of Group Communication.
2. JMSGroups the JMS API for Group Communication.
3. JMSGroups - Joram Based Implementation.

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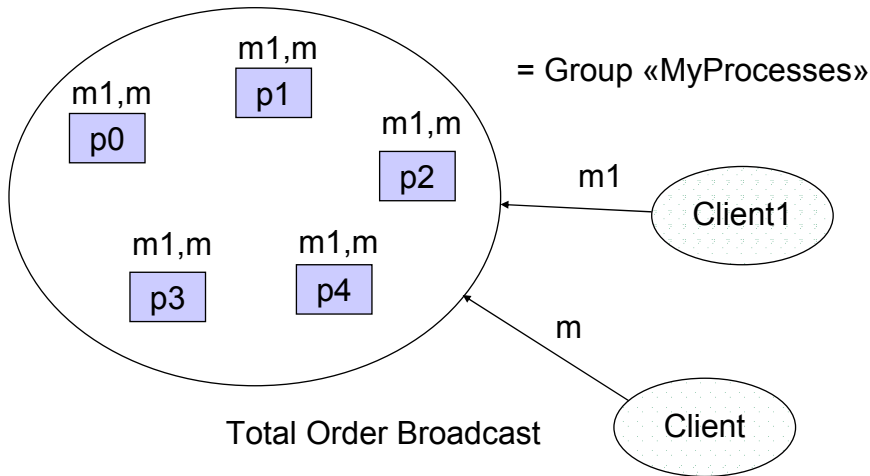
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Group Communication

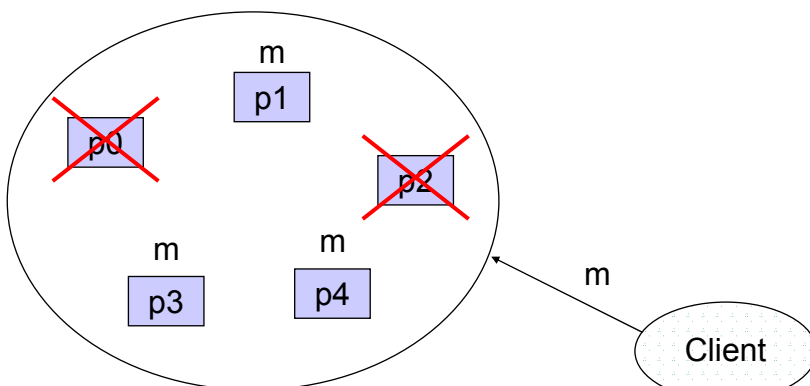


Group Communication



Group Communication (2)

Common use for the Group Communication is software replication for Fault-Tolerance



Group Communication (3)

Group Membership:

- The processes, which form a group (group View).

Group Communication Primitives:

- **Atomic Broadcast** (also called **Total Order Broadcast**) - all members deliver messages in the same order.

Group Communication Toolkits

There are numerous toolkits developed in academia:

- **Isis / Horus / Ensemble** – Cornell University, USA
- **Totem** – University of California, USA
- **Transis** – Hebrew University of Jerusalem, Israel
- **Phoenix** – EPFL, Switzerland
- **OGS** – EPFL, Switzerland
- **Eternal** - University of California, USA
- **JGroups** – Cornell, USA

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Limitations of Group Communication Toolkits

Limitations:

- Each toolkit uses proprietary ad-hoc interface.
- Painful integration into existing systems.
- Interoperability problems.

Group Communication based on JMS interfaces can overcome these limitations.

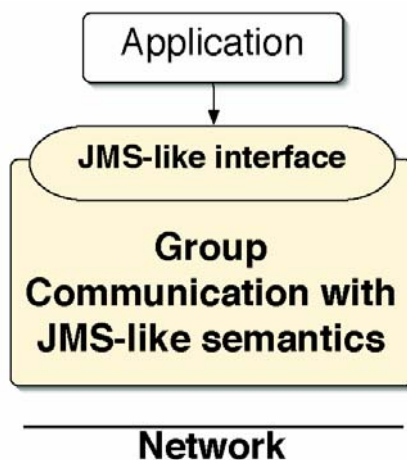
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Mapping Group Communication to JMS

Group	Topic
GroupMembership	Subscribers to the Topic
Broadcast(m)	TopicPublisher.publish(m)
ABcast	TopicPublisher.publish(m) – m with a special tag
Group View information	Tagged JMS message
Join / Leave Group	Subscribe / Unsubscribe to/from the Topic

Architecture



The resulting architecture must comply with JMS semantics:

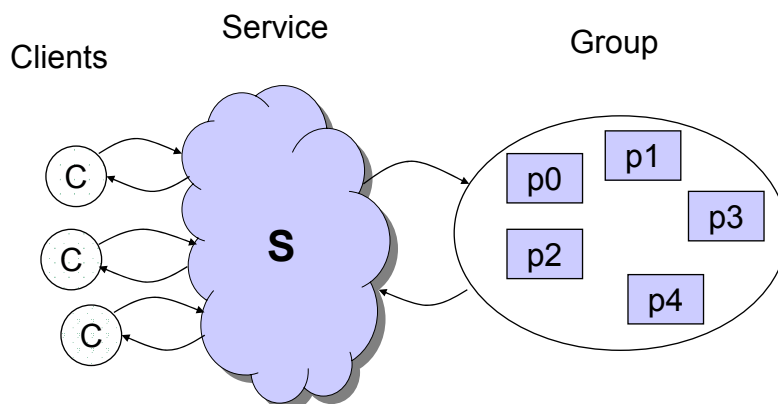
- Message Persistence
- Connection Durability
- QoS for the Messages

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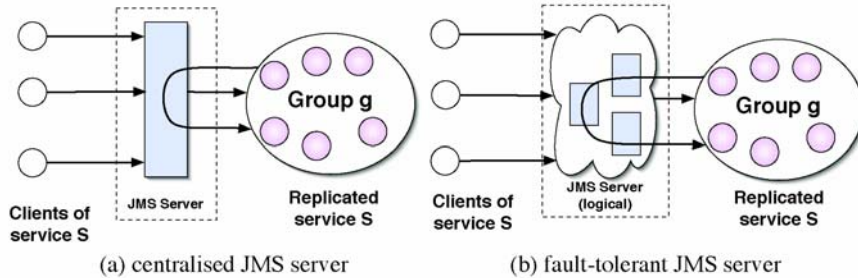
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JMSGroups Joram Based Implementation



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JMSGroups Joram Based Implementation (2)



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Changes to Joram

Additional features were added to Joram:

- GroupTopic and GroupUser implementations
- Proxy agent for GroupTopic
- Additional Network classes: AbcastNetwork and RecAbcastNetwork (based on the protocol stack developed by Sergio Mena)
- Additional Admin interface calls and notifications

They provide:

- Group View messages upon subscription/unsubscription
- Join / Leave events coded into the View messages
- Suspicion messages and member exclude facility
- Total order delivery between replicated servers

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Coming Extensions

Subscriber redirection to the different server replica in the case of crash:

- Redirection must be transparent for the JMSGroups subscriber.
- Proxy agent must be replicated on each server.
- Message delivery guarantees must be preserved.

Generic Broadcast Network:

- Allows to define different broadcast primitives per message basis.
- Does not order the messages if not needed.
- Should gain some performance.

Literature

- A. Kupšys, S. Pleisch, A. Schiper and M. Wiesmann, “**Towards JMS Compliant Group Communication – a Semantic Mapping**”, *Technical Report ID:200353*, I&C, EPFL, Switzerland, September 2003
- M. Wiesmann, X. Défago, and A. Schiper, “**Group communication based on standard interfaces**”, In *Proceedings of the IEEE International Symposium on Network Computing and Applications (NCA-03)*, pages 140-147, Cambridge, MA, USA, 2003