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1. Installation

Joram 5.2 includes:

- A **messaging server** (or MOM), providing the messaging functionalities: basically hosting and routing the messages exchanged by the client applications.
- A **JNDI** compliant naming server, distributed (since release 4.1) persistent and reliable.
- **Client classes** allowing applications to access the MOM functionalities. Those interfaces are defined by the **JMS 1.1** specifications.
- A specific set of classes usable by client applications running on a **J2ME** environment. This set of classes is JMS 1.1 like, and is called **kJoram**.
- **Samples** illustrating the various features provided by Joram.
- JCA 1.5 connector allowing deployment in J2EE 1.4 platform.

1.1. Requirements

Joram can run on a wide variety of platform, a typical hardware and software platform is:

**Hardware requirements**

- Year 2000 compliant 32-bit Intel based PC hardware (or equivalent)
- 256 Mb RAM, 5 Gb disk,
- Communication hardware supporting TCP/IP

**Software requirements**

- Operating system: Linux, Windows 2000 and XP, etc.
- Connectivity: TCP/IP.
- Java environment: JDK 1.4 and later.

1.2. Getting Joram binary distribution

The packages are downloadable from the following location:


For release **x.y.z**, the following tar file is provided:

- **joram-x.y.z.tgz**, including the client and server libraries, as well as the graphical tool library, the J2ME client library, the javadoc and the samples sources.

A package is expanded by UNIX users with the **gunzip** and **tar** commands; Windows developers can use the **Winzip** utility.
1.2.1. **Directory structure and description**

**Joram binary distribution**

The distribution is expanded in a `joram-x.y.z/` directory. It includes the following directories:

- apidoc/
- samples/
  - bin/…
  - config/…
  - src/
    - joram/…
    - kjoram/…
- ship/lib/
- ship/licenses/
2. Using samples

This chapter describes the samples provided with JORAM and for each, the architecture of the underlying platform. The samples are provided with the JORAM distributions under the `samples/` directory. It’s a good way to verify the correctness of Joram installation.

The `samples/src/joram` directory includes the samples codes of JORAM clients. Compiling and launching are done with the `ant` command.

Configuration files are located in the `samples/config` directory. They might be edited and adapted to your environment. For more information, please refer to the administration part of this document (chapter 3). This directory contains:

- `a3config.dtd`, the DTD for server configuration;
- `a3debug.cfg`, a default logger configuration file;
- `centralized_a3servers.xml`, a configuration file for a centralized server architecture;
- `distributed_a3servers.xml`, a configuration file for a distributed servers architecture;
- `soap_a3servers.xml`, the configuration file for the SOAP samples server architecture;
- `jndi.properties`, a default configuration file for JNDI's clients.
- `soap_jndi.properties`, the configuration file for JNDI's SOAP clients;

The `samples/bin` directory provides Unix and Windows script files for launching JORAM servers and clients if you don’t want to use ant targets.

All examples creates a `samples/run` where logging files and the persistence root (if any) are created. Current configuration files are copied in this directory. When starting a platform with a new configuration, or when a clean platform is expected, this directory should be removed.

2.1. Compiling JORAM samples

The Joram samples need to be compiled. Under the `samples/src/joram` directory, simply type:

```
ant clean compile
```

This creates a `samples/classes/joram/` directory holding the compiled classes. For removing this directory, type:

```
ant clean
```

2.2. Running Joram samples

2.2.1. The classic samples

The JMS API provides a separate domain for each messaging approach, point-to-point or publish/subscribe:

- The `point-to-point` domain is built around the concept of queues, senders and receivers.
- The `publish/subscribe` domain is built around the concept of topic, publisher and subscriber
Additionally it provides an unified domain with common interfaces that enable the use of queue and topic. This domain is defines the concept of producers and consumers.

This sample demonstrates the different messaging domains of JMS, point-to-point with a sender, a receiver and a queue browser, publish/subscribe with a subscriber and a publisher, and unified with messages producers and consumers.

The classic sample uses a very simple configuration (centralized) made of one server hosting a queue and a topic. The server is administratively configured for accepting connections requests from the anonymous user.

The platform is run in non persistent mode (property “Transaction” is set to “fr.dyade.aaa.util.NullTransaction” in a3servers.xml configuration file).

Running the demo with Ant:

- For starting the platform:
  ```
  ant reset single_server
  ```
  - As defined in the configuration file (run/a3servers.xml) it launches a Joram server without persistency. It creates a ConnectionManager, a TCP/IP entry point and a JndiServer (port 16400); the ConnectionManager defines a default administrator (username “root”, password “root”). The reset target is used to removes all out-of-date data in the run directory.

- For running the admin code:
  ```
  ant classic_admin
  ```
  - This client connects to the Joram’s server, then creates 2 JMS destinations (a queue and a topic) and an anonymous user. It defines 3 different ConnectionFactory, one for each messaging domain.
  - Each administered objects is then bound in JNDI.

- Using the point-to-point messaging domain:
  - It uses the QueueConnectionFactory “qcf”, and the Queue “queue” retrieved from JNDI.
  - For running the sender sample, type “ant sender”; each time, it sends 10 messages to the defined queue.
  - For running the browser sample, type “ant browser”; it allows to look messages on queue without removing them.
  - For running the receiver sample, type “ant receiver”; each time, it consumes 10 messages from the queue. If there is not enough messages, it stops until new messages are produced.
Using the publish/subscribe messaging domain:
  - It uses the TopicConnectionFactory "tcf", and the Topic "topic" retrieved from JNDI.
  - For running the subscriber sample, type "ant subscriber". It subscribes to the defined topic, and then receives all messages later published on this topic.
  - For running the publisher sample, type "ant publisher". It publishes 10 messages on the topic.

Using the unified messaging domain:
  - It uses the common ConnectionFactory "cf", and the Destination "queue" and "topic" retrieved from JNDI.
  - For running the consumer sample, type "ant consumer". It continuously reads messages sent to the queue or the topic.
  - For running the producer sample, type "ant producer". It sends 10 messages to the queue, and 10 messages to the topic.

2.2.2. The chat sample

The chat sample uses a very simple configuration (centralized) made of one server hosting a single queue. The server is administratively configured for accepting connections requests from the anonymous user.

The platform is run in non persistent mode (property “Transaction” is set to “fr.dyade.aaa.util.NullTransaction” in a3servers.xml configuration file).

![Figure 2 - Chat sample configuration](image)

Running the demo:

- For starting the platform:
  ant reset single_server

- For running the admin code:
  ant chat_admin
  - This client connects to the Joram’s server, and then creates a topic and an anonymous user. It defines a TopicConnectionFactory. Each administered objects is then bind in JNDI.
  - To start a chat client, type “ant chat1”. It launches a chat client with user1 speudo, then each message typed at console is sent to the topic, and each message published on the topic is written to the console.
To start a second chat client, type \texttt{ant chat2}. It simply launches a chat client with user2 speudo.

### 2.2.3. The distributed sample

The distributed sample illustrates Joram under a distributed architecture. Its configuration involves three servers. The clients producing messages (sender and publisher) connect to server 0. The clients consuming the messages (receiver and subscriber) connect to server 2. The destinations they interact with are deployed on server 1. The platform is run in persistent mode. The provided configuration locates all three servers on "localhost" host.

![Distributed sample configuration](image)

- **Running the demo:**
  - Starting the configuration, type \texttt{ant reset servers}. It cleans the run directory the launches the 3 servers. You can start separately each servers by typing:
    - \texttt{ant reset}
    - \texttt{ant server0}
    - \texttt{ant server1}
    - \texttt{ant server2}
  - Running the admin code:
    - \texttt{ant archi_admin}
  - Running the producers:
    - \texttt{ant archi_sender}
    - \texttt{ant archi_pub}
  - Running the consumers:
    - \texttt{ant archi_receiver}
2.2.4. **The dotcom demo**

The dotcom demo simulates what could be a commercial transaction involving many participants:

- Web server: server on which a customer order items.
- Customer server: centralizes the processing of the orders.
- Inventory server: checks if the items ordered are available.
- Billing server: centralizes the processing of the bank references.
- Control server: checks the bank references of the customers.
- Delivery server: receives the order ready for delivery.

The next picture shows the actors of this simulation and the destinations through which they interact. The provided architecture is centralized. The platform runs in persistent mode.

![Diagram of Dotcom sample configuration](image)

**Figure 4 - Dotcom sample configuration**

**Scenario:**

1. A customer buys an item on a web site. The Web Server publishes the order on a topic to which the Customer Server, the Inventory Server and the Billing Server have subscribed.

2. The Inventory Server checks if the item ordered is available and sends his answer back to the Customer Server. The Billing Server forwards the order to the Control Server who will check the bank references of the customer and send his answer back to the Billing Server. Then, the Billing Server forwards that answer to the Customer Server.

3. If the order has been validated by both Inventory Server and Billing Server, the Customer Server forwards it to the Delivery Server for delivery.

**Running the demo:**
Starting the configuration:

```
ant reset single_server
```

Running the admin:

```
ant dotcom_admin
```

Running the servers:

```
ant webServers
```

Running the client:

```
ant webClient
```

The dotcom sample's GUI:

A GUI allows to interact with the demo. Each time a server receives a message, its window appears.

The WebServer's interface simulates the choice the user has to make between items: shoes, socks, trousers, shirt and hat. He must select one and then Send the order or set an Other order. The Send button must be pressed after the last order. It commits all previous orders. For cancellation, the Cancel button rollback the orders. The Quit button sends the quit command to the other participants, closes the connections of the Web Server and terminates the program. Quit doesn't kill the middleware, thus it is possible to simply restart the application without having to relaunch the Agent server and the Admin.

![Figure 5 - Web Server's interface](image)

The Inventory and Control Servers windows allow to simulate the work of those servers by validating or not the order they received.

![Figure 6 - Inventory Server's and Control Server's interfaces](image)

According to the results of previous controls, the Customer Server either will be able to ask for delivery, or won't.

![Figure 7 - Customer Server's interfaces](image)

Finally, if sent by the Customer Server, the order reaches the Delivery Server.
2.2.5. The perfs samples

The perfs samples have been developed for checking Joram’s performances. What is actually measured is the messages mean travel time (travel from the producer to the consumer). The configuration used is centralized, made of one queue and one topic. For testing PTP and Pub/Sub modes, the available clients are a Sender, a Publisher, a Receiver and a Subscriber.

These clients, as provided, are non transactional, subscriber is non durable. Of course these parameters may be changed for testing various configurations. Tests might be run on a persistent platform or a non persistent one.

The receiver and subscriber samples produce a PerfsFile file containing the mean messages travel time (computed for groups of 10 messages in the PTP case, 50 messages in the Pub/Sub case).

Starting the platform:
- Persistent platform:
  `ant reset server0`
- Or non persistent platform:
  `ant reset single_server`
- Running the admin code:
  `ant perfs_admin`

Testing the PTP mode:
- Running the receiver:
  `ant perfs_receiver`
- Running the sender:
  `ant perfs_sender`

Testing the Pub/Sub mode:
- Running the subscriber:
  `ant perfs_sub`
- Running the publisher:
  `ant perfs_pub`

2.3. Using scripts

In the previous sections, it has been explained how to launch the provided samples through Ant targets. It is also possible to use the script files located in the `samples/bin` directory. This section explains how to use those scripts.
2.3.1. **First step**

The first step consists in fixing the JAVA_HOME and the JORAM_HOME environment variables. The JAVA_HOME property value must point to your Java installation directory. The JORAM_HOME value must point to your JORAM directory (the directory actually containing the samples/ sub-directories).

2.3.2. **Launching a JORAM platform**

Launching a JORAM platform with the scripts has the same effects as using the Ant targets.

Depending on the script, it will set the appropriate configuration: copy the right a3servers.xml and jndi.properties from config/ directory in the created run/ directory, etc.

Those scripts are:

- `single_server.[sh/bat]`: copies the config/centralized_a3servers.xml file as a3servers.xml and config/jndi.properties in run directory. If not already done, creates the run/ directory. Then launches the non persistent server 0.

- `server.[sh/bat] x`: copies distributed_a3servers.xml as a3servers.xml and jndi.properties as jndi.properties if not already done, creates the run/ directory if it does not exist, and launches the persistent server x.

- `clean.[sh/bat]`: deletes the a3servers.xml and jndi.properties files, deletes the run/ directory.

When starting a new persistent server, the clean script must be executed in order to remove any existing persistence root which may alter the way the server starts. When re-starting a stopped or crashed persistent server, the clean script should not be called in order to keep the needed persistence root.

2.3.3. **Launching the JORAM administration and monitoring tool**

Launching the graphical admin and monitoring tool is simply done by executing the admin. [sh/bat] script. The tool may be launched before or after starting the JORAM platform.

This supposes that the administration tool has been compiled (by the CVS and sources package users), and that the joramgui.jar library is available in the ship/lib/ directory. Also, the admin GUI tool requires to use a 1.4 jdk.

The JORAM platform may be administered either directly through the tool, or still by launching the appropriate administration client. Nothing prevent you from running an admin code and watching in the tool the configuration of the platform.

2.3.4. **Launching a JORAM client**

The jmsclient script may be used for launching a client. It takes as argument the class of the client to execute. For example, for launching the classic sender class:

```
jmsClient classic.ClassicSender
```

Of course, this supposes that the samples have been compiled (and that the JORAM platform has been administered for the classic samples, either by running the ClassicAdmin client, or by using the administration graphical tool).
2.3.5. **Running the classic samples using script files**

The example below use `.sh` scripts on a Linux platform; if you use a Windows™ platform you may use the corresponding `.bat` scripts. All these scripts need the definition of `JAVA_HOME` and `JORAM_HOME` environment variable:

- Set `JAVA_HOME` to the directory where JDK is installed.
- Set `JORAM_HOME` to the directory that you installed Joram (the directory containing the ship and samples directories).

First cleans the persistence directory and configuration settings, then launches the server.

```bash
$> cd $JORAM_HOME/bin
$> ./clean.sh
== Cleaning the persistence directories and configuration settings ==

$> ./single_server.sh
== Launching a non persistent server#0 ==
AgentServer#0 started: OK
```

You can create all needed administered objects through the `ClassicAdmin` class.

```bash
$> ./jmsclient.sh classic.ClassicAdmin
== Launching the classic.ClassicAdmin client ==
Classic administration...
Admin closed.
```

Then you can send or receive messages using the Sender/Receiver or Publisher/Subscriber classes; for example:

```bash
$> ./jmsclient.sh classic.Sender
== Launching the classic.Sender client ==
Sends messages on the queue...
10 messages sent.

$> ./jmsclient.sh classic.Receiver
== Launching the classic.Receiver client ==
Requests to receive messages...
Msg received: Test number 0
Msg received: Test number 1
Msg received: Test number 2
Msg received: Test number 3
Msg received: Test number 4
Msg received: Test number 5
Msg received: Test number 6
Msg received: Test number 7
Msg received: Test number 8
Msg received: Test number 9
10 messages received.
```

You can launch the administration GUI JAMT using the admin.sh (respectively admin.bat) script:
2.4. Administration through XML scripts

There is three way to deploy Joram's administered objects: the administration API, the graphical administration tool (JAMT) and now the XML scripting capability.

This feature use the AdminModule to execute the corresponding XML script. The script allows describing the administration connection, creating and binding administered objects (see chapter 3.6).

2.4.1. Classic sample administration using XML script

The ant target classic_adminxml uses the AdminModule main static method to execute the administration script, this script is equivalent to the ClassicAdmin code.

```
$> ant classic_adminxml
Buildfile: build.xml

init:

classic_adminxml:
   [copy] Copying 1 file to C:\cygwin\home\freyssin\owjoram\joram\samples\run

BUILD SUCCESSFUL
Total time: 3 seconds
```

In the script (see file samples/src/joram/classic/joramAdmin.xml) we described:

- The connection to Joram's configuration: a default TCP connection with hostname, port, username and password.
- The connection factory and the JNDI binding:
  - an unified TCPConnectionFactory named “cf”,
  - a QueueTCPConnectionFactory named “qcf”
  - and TopicTCPConnectionFactory named “tcf”.
- The anonymous user.
- The destinations with their JNDI binding and security settings: a queue and a topic with freereader and freewriter settings.
3. Administration Guide

3.1. Introduction

JORAM provides a messaging platform allowing distributed applications to exchange data through message communication (Figure 9).

The messaging system takes care of distributing the data produced by an application to another application. Applications do not need to know each other, or to be present at the same time.

In order to provide a standardized way to access its messaging functionalities, JORAM implements the set of classes and methods defined by the JMS API. JMS “client” applications may then, without any modification, use JORAM messaging platform.

This document presents how to configure and start the underlying messaging platform, and how to administer it so that it is usable by standard JMS clients.

3.2. Administration concepts

3.2.1. Overall view

A Joram messaging platform is constituted by one or many servers, interconnected, possibly running on remote nodes (Figure 10).

- A Joram server is a Java process providing the messaging functionalities, and hosting messaging destinations.
- A Joram JMS client is a Java process using the messaging functionalities through the JMS interfaces. In order to do so it connects to a Joram server.
The goal of administration is to start and configure the messaging platform so that it provides all the features needed by the "client" applications. It is also to administer this platform so that standard JMS clients can access it and use it for their messaging operations.

The basic administration tasks are creating and deleting physical destinations on the messaging platform, setting or removing user’s access to this platform.

To have the platform usable by standard JMS clients, the administration phase also consists in creating the `javax.jms.ConnectionFactory` and `javax.jms.Destination` administered objects (see JMS specification, §4.2), and to bind those instances to a JNDI compliant naming server.

### 3.2.2. User

A user access to a JORAM platform is fully described by:

- server parameters (such as host name and port number), identifying to which server of the platform the user will connect;
- a protocol, used for the client – server communication (usually TCP, might be SOAP or "local", for collocated client and server);
- a user identification (name and password).

The actual “physical” connection is wrapped by a `javax.jms.Connection` instance. A JMS Connection is created by calling the `createConnection` method on a `javax.jms.ConnectionFactory` instance. It is this ConnectionFactory instance which wraps the server and communication protocol parameters. This standard object allows to isolate clients from the proprietary parameters needed for opening a connection with a messaging platform (Figure 11).
A connection is opened by calling the `ConnectionFactory.createConnection` method. You can either use the method specifying an explicit user identity (login name and password) or assume the default identity (login “anonymous”, password “anonymous”). The default identity may be adjusted client side by setting the `JoramDfltLogin` and `JoramDfltPassword` properties.

If the user identification (either anonymous – anonymous, or name – password) is unknown server side, the `createConnection` methods won’t succeed and will throw a `JMSSecurityException`.

Allowing a client access to the platform requires then:

1. to create the appropriate `ConnectionFactory` instance wrapping the parameters of a server of the plaform, and of the communication protocol;
2. to bind this instance in a name space such as JNDI server so that users may later retrieve it;
3. to set the client as a user on this server.

### 3.2.3. Destinations

Client applications exchange messages not directly but through destinations. A destination is, server side, an instance of an object receiving messages from producers and answering to consuming requests from consumers. As shown on Figure 12, a destination may be deployed on any server of a configuration, whatever the servers the clients are connected to.

Server-side physical destinations are “represented” client side by `javax.jms.Destination` instances. A `Destination` instance wraps the parameters of the corresponding physical destination, and allows clients to be isolated from the proprietary parameters of a physical server side destination (Figure 12).
A destination might either be a “queue” or a “topic”. Messaging semantics is what makes the difference (check any documentation about message-oriented-middleware or the JMS spec §5 and §6):

- Queue: each message is read only by a single client.
- Topic: All clients that have previously subscribed to this topic are notified of the corresponding message.

Beyond this main characteristic, each destination may have a particular semantic; Joram supply many specific destinations: hierarchical or clustered destinations, bridge, etc.

The creation of a destination is then a three steps process:

1. first, creating the physical destination on a given server of the platform,
2. second, creating the corresponding `javax.jms.Destination` instance wrapping the parameters of the server side destination,
3. third, binding the `Destination` instance in a name space such as a JNDI server, so that clients may then retrieve it.

Once retrieved, a destination allows clients to perform operations according to their access rights. A client set as a READER will be able to request messages from the destination (either as a subscriber to a topic, or as a receiver or browser on a queue). A client set as a WRITER will be able to send messages to the destination.

**Dead Message Queue (DMQ)**

The Dead Message Queue (DMQ) is a particular queue used to store the dead messages. A dead message is a message that cannot be delivered for various reasons (see chapter 4.1 below). The DMQ can be configured at different levels: server, destination, etc.

### 3.3. Platform configuration

Configuring a JORAM messaging platform consists in defining the number of servers that will constitute it, where they will run, and in defining services each will provide. The minimal configuration is a single server configuration. A platform configuration is described by an XML configuration file.

A dynamic configuration feature is available since Joram 4.2, it allows to modify a Joram platform at run-time by adding and removing servers.

**Server services**

The services a server may host are:
A **connection manager service**, managing the connection requests from “external” clients. This service may also authorize the connection of an administrator client, authenticated by a name and a password. It is required on any server accepting at least a client connection. At the platform level at least one server must accept an administrator connection, meaning that at least one server must host a connection manager service authorizing an administrator connection.

A **TCP proxy service**, allowing TCP clients to connect to the server. This service takes as argument a port number, defining on which port the TCP connection requests should be made.

A **JNDI service**, listening to a given port, providing a naming server to clients for binding and retrieving administered objects. It is required on one of the platform's servers if clients and administrators intend to use JORAM's naming server. If this service is provided by none of the platform’s servers, that means that clients and administrators do not intend to use JNDI, or that they will use an other JNDI implementation than the one provided by JORAM.

### 3.3.1. Centralized configuration

The example below sets a configuration made of one server running on host `localhost`. This server, identified by the number 0, is named `s0`. It provides a connection manager service allowing an administrator identified by `root – root` to connect, and a TCP proxy service listening on port 16010. A JNDI service is also provided, listening to JNDI requests on port 16400.

```xml
<?xml version="1.0"?>
<config>
  <property name="Transaction" value="fr.dyade.aaa.util.NullTransaction"/>
  <server id="0" name="S0" hostname="localhost">
    <service class="org.objectweb.joram.mom.proxies.ConnectionManager"
             args="root root"/>
    <service class="org.objectweb.joram.mom.proxies.tcp.TcpProxyService"
             args="16010"/>
    <service class="fr.dyade.aaa.jndi2.server.JndiServer"
             args="16400"/>
  </server>
</config>
```

The above platform is non persistent, meaning that if it crashes and is then re-started, pre-crash data is lost. To have a platform able to retrieve its pre-crash state when re-starting, it should run in persistent mode. If message persistence is required, this is the mode to use (see below).

In order to allow a standard JNDI access to administrators and clients, a `jndi.properties` file is provided. It must be accessible to the administrators and clients through their classpath.

For the above configuration, this file looks as follows:

```
java.naming.factory.initial fr.dyade.aaa.jndi2.client.NamingContextFactory
java.naming.factory.host localhost
java.naming.factory.port 16400
```

It allows retrieving the naming context through:

```
javax.naming.Context jndiCtx = new javax.naming.InitialContext();
```
Running a platform

The configuration file is named `a3servers.xml`, and it must be accessible through the classpath. Then, the server is launched by typing:

```
java fr.dyade.aaa.agent.AgentServer 0 ./s0
```

Configuring a persistent server

In order to configure a persistent server you have to change the `Transaction` property in `a3servers.xml` configuration file. For example you may use `fr.dyade.aaa.util.NTransaction` class.

When such a persistent server is stopped or crashes, there are two options when re-starting it:

- Either it is expected to resume the operations it was involved in before the crash, in which case the persistence directory `s0` should not be deleted; it may happen that a `Lock` file in this directory remains and should be removed.

- Or it is a bright new server that is expected to start, in which case the persistence directory `s0` should be totally removed.

3.3.2. Distributed configuration

A distributed configuration made of three persistent server (as on figure 2) looks as follows:

```xml
<config>
  <property name="Transaction" value="fr.dyade.aaa.util.NTransaction"/>
  <domain name="D1"/>
  <server id="0" name="S0" hostname="localhost">
    <network domain="D1" port="16301"/>
    <service class="org.objectweb.joram.mom.proxies.ConnectionManager" args="root root"/>
    <service class="org.objectweb.joram.mom.proxies.tcp.TcpProxyService" args="16010"/>
    <service class="fr.dyade.aaa.jndi2.server.JndiServer" args="16400"/>
  </server>
  <server id="1" name="S1" hostname="host1">
    <network domain="D1" port="16301"/>
    <service class="org.objectweb.joram.mom.proxies.ConnectionManager"/>
    <service class="org.objectweb.joram.mom.proxies.tcp.TcpProxyService" args="16010"/>
  </server>
  <server id="2" name="S2" hostname="host2">
    <network domain="D1" port="16301"/>
    <service class="org.objectweb.joram.mom.proxies.ConnectionManager"/>
  </server>
</config>
```

This configuration is made of 3 persistent servers, each running on a given node (`host0`, `host1` and `host2`). All are part of the same domain (multiple domains might be needed for very large configurations). The server 0 of the configuration provides the same services as server 0 of the previous centralized configuration. Server 1 allows TCP connection on its local 16010 port, no administrator access, and no JNDI server. Server 2 allows client connections (thanks to the
connection manager service) but the TCP protocol is not supported (the protocol might then be SOAP or “local”).

The \texttt{jndi.properties} file needed by administrators and clients should look as follows:

```
java.naming.factory.initial fr.dyade.aaa.jndi2.client.NamingContextFactory
java.naming.factory.host host0
java.naming.factory.port 16400
```

### Running a platform

Each host on which a server of the configuration will run must have a copy of the \texttt{a3servers.xml} file, and this copy must be accessible through the classpath.

Then, the servers of the configuration are launched one by one:

- On node 0:
  ```
  java fr.dyade.aaa.agent.AgentServer 0 ./s0
  ```
- On node 1:
  ```
  java fr.dyade.aaa.agent.AgentServer 1 ./s1
  ```
- On node 2:
  ```
  java fr.dyade.aaa.agent.AgentServer 2 ./s2
  ```

**Warning:** Be careful, removing the persistence directory of one server in a distributed configuration may cause damages.

### 3.3.3. Stopping a server

A method is provided for stopping a given server of the administered JORAM platform. If the server to stop is the server to which the administrator is connected, the admin session is automatically terminated and closed.

Stopping server 0:

```
AdminModule.stopServer(0);
```

### 3.3.4. Dynamic configuration

The dynamic configuration feature is available from the Joram version 4.2. It allows to modify a Joram platform at run-time by adding and removing servers. As the servers can be gathered into several domains you can also add and remove domains.

**Adding a new server**

You can dynamically configure your Joram platform by adding new Joram servers. This is a two steps operation:

1. define the new server in the platform configuration using the Joram administration API
2. start the new server

Let's take an example in order to illustrate how it works. This simple scenario starts from a very simple Joram platform configuration that contains only one server called \texttt{S0}. This configuration is defined in Joram user guide (chapter 3.3.1).

```
<?xml version="1.0"?>
<config>
  <property name="Transaction" value="fr.dyade.aaa.util.NullTransaction"/>
  <server id="0" name="S0" hostname="localhost">
```

<config>
**Server definition**

The definition of a new server is programmatically done using the class `AdminModule` from Joram's administration API (package `org.objectweb.joram.jms.admin`).

```java
import org.objectweb.joram.client.jms.admin.AdminModule;

First you need to connect the `AdminModule` to the Joram server S0:

```java
AdminModule.connect("localhost", 16010, "root", "root", 60);
```

In order to define a new server you must specify in which domain the server is added. As the initial configuration doesn't define any domain, you have to add a first domain to the platform configuration.

A domain is defined by three parameters:

1. its name (unique inside a platform)
2. the name of an existing server that will be the first server belonging to this domain. When this server already belongs to a domain, it becomes the router between this domain and the new domain.
3. the port used by the first server to communicate with the other servers from this domain (none at the beginning)

The following code adds the domain D0 that contains the server S0. The port used by S0 to communicate inside D0 is 17770.

```java
AdminModule.addDomain("D0", "S0", 17770);
```

Once the domain D0 is added you can add a new server S1 into this domain. A server is defined by five parameters:

1. the identifier of the server (unique inside a platform)
2. the address or name of the host where the server is running
3. the name of the domain where the server is added
4. the port used by the server to communicate with other servers inside the domain
5. its name (may be not unique)

```java
AdminModule.addServer("localhost", 1, "D0", 17771, "S1");
```

Now the server S1 has been added you need to get the overall configuration of the platform in order to start S1.

```java
String platformConfig = AdminModule.getConfiguration();
```

The configuration is returned as a `String` which content is:

```xml
<?xml version="1.0"?>
<!DOCTYPE config SYSTEM "a3config.dtd">
<config>
  <domain name="D0" network="fr.dyade.aaa.agent.SimpleNetwork"/>
</config>
```
As you can see, the initial platform configuration has been extended with the definition of a new domain D0 and a new server S1.

Store this configuration into a file `a3servers_updated.xml`. This file is necessary to start the new server S1.

```java
File platformConfigFile = new File("a3servers_updated.xml");
FileOutputStream fos = new FileOutputStream(platformConfigFile);
PrintWriter pw = new PrintWriter(fos);
pw.println(platformConfig);
pw.flush();
pw.close();
fos.close();
```

**Server start**

The server S1 is started in the same way as described in Joram user guide (see 3.3.2, running a platform):

1. copy the file `a3servers_updated.xml` in the directory where you want to start S1 and rename it to `a3servers.xml`. You also need to put the DTD file `a3config.dtd` in the same directory.
2. customize the configuration of S1 by modifying the file `a3servers.xml`. For example, you can add services (e.g. distributed JndiServer).
3. start the server with the following commands:
   ```
   cd <S1_Running_Dir>
   java fr.dyade.aaa.AgentServer 1 ./s1
   ```

**Removing a server**

This is a two steps operation:

1. stop the server
2. remove the server from the platform configuration using the Joram administration API

Notice that you can also remove it first from the configuration and then stop it.
Server stop
To stop a server you need to specify the identifier of the server. Notice that this operation is not synchronous, i.e. the server is asynchronously stopped. The server may still be running a while after the method `stopServer` returned.

```java
AdminModule.stopServer(1);
```

Server removal
To remove a server from the platform configuration, you need to give the identifier of the server. This operation destroys all the pending messages sent to the removed server through the whole platform.

```java
AdminModule.removeServer(1);
```

You can also remove a domain even if it is not empty. In this last case, the servers inside this domain are also removed. So you have to stop them.

```java
AdminModule.removeDomain("D0");
```

This last operation removes the domain D0 but not the server S0 because it is used to make the dynamic configuration.

When you manipulate configurations with multiple domains by removing servers and/or domains, be careful not to split your platform into several parts.

3.3.5. Logging configuration
JORAM uses Monolog (see [http://www.objectweb.org/monolog/](http://www.objectweb.org/monolog/)) for logging. Monolog is an API which abstracts log operations from their implementation.

Logging is configured in an `a3debug.cfg` file. It has to be in the classpath of the client and of the server (the server's process as well as the client's might be logged).

The `a3debug.cfg` configuration file defines the appenders used to log. By defaults, it logs on the standard output but a file is usable instead.

This file also defines all the categories which are available for logging. These categories are:

- Agent logs (categories starting with `fr.dyade.aaa.agent`): these categories log what happens in the low level messaging platform.
- MOM logs (categories starting with `org.objectweb.joram.mom`): these categories log what happens in a JORAM server, more particularly:
  - in the server’s proxies (`org.objectweb.joram.mom.Proxy`),
  - in the server’s destinations (`org.objectweb.joram.mom.Destination`).
- JNDI logs (`fr.dyade.aaa.jndi2`): this category logs all JNDI operations, more particularly:
  - in JNDI's server side (`fr.dyade.aaa.jndi2.server`),
  - in JNDI's client side (`fr.dyade.aaa.jndi2.client`).

3.4. High level administration
When the messaging platform has been configured and started, the situation looks as follows:

- one or many interconnected servers run;
- each server may provide services for connecting and administering.
At that point an administrator client needs to connect to the platform and further configure it for allowing JMS clients to access and use it.

This administrator works either through a Java application using proprietary JORAM administration methods (described in this section), or through a graphical interface provided since release 3.7 and documented separately (Erreur : source de la référence non trouvée).

When the administration process is performed by a Java application, it uses JORAM’s proprietary administration methods and objects. Those objects are:

- org.objectweb.joram.client.jms.admin.AdminModule
- org.objectweb.joram.client.jms.admin.AdminHelper
- org.objectweb.joram.client.jms.admin.User
- org.objectweb.joram.client.jms.Queue
- org.objectweb.joram.client.jms.Topic

And the various connection factory objects located in:

- org.objectweb.joram.client.jms.local
- org.objectweb.joram.client.jms.soap
- org.objectweb.joram.client.jms.tcp

Exceptions describing failing administration requests are of this class:

- org.objectweb.joram.client.jms.admin.AdminException

### 3.4.1. Administration “session”

Administration operations (calls to administration methods) may be performed within an administration “session”. Such a session is started when an administration connection is established with the JORAM platform to administer.

The utility class for managing administrator sessions is org.objectweb.joram.client.jms.admin.AdminModule.

**TCP administrator connection**

Such a connection is opened as follows:

```java
AdminModule.connect("host1", 16010, "root", "root", 60);
```

This connects an application to a JORAM server running on “host1” and listening to port 16010 through the TCP protocol. It will work if the target server on “host1” provides the following services:

```xml
<service class="org.objectweb.joram.mom.proxies.ConnectionManager"
  args="root root"/>
<service class="org.objectweb.joram.mom.proxies.tcp.TcpProxyService"
  args="16010"/>
```

The last parameter of the connecting method (60), is the timer in seconds during which connecting to the server is attempted. This timer will be useful if the server is not yet started when the administration code is launched.

It is also possible to establish a “default” TCP connection to the server running on “localhost” and listening to port 16010 as follows:

```java
AdminModule.connect("root", "root", 60);
```

If the connecting request finally fails because the server is not reachable, the methods throw a ConnectException. If the administrator identification is incorrect, the methods throw an AdminException.

**Disconnecting the administrator**

The administration session ends by calling:
Any call to any administration method outside the `AdminModule.connect()` and `AdminModule.disconnect()` boundaries will fail (a `ConnectException` will be thrown).

### 3.4.2. Managing a user

#### User identity

Users are manipulated through the helper class `User` from package `org.objectweb.joram.jms.admin`. An instance of this class represents a given user and provides methods for administering it.

#### Creating a user

- `User.create(String name, String password, int server)` is a static method setting a user with a given identification on a given server, and creating the corresponding `User` instance.
- `User.create(String name, String password)` is similar to the previous method, except that it creates the user on the server the administrator is connected to (local server).

```java
User user = User.create("name", "pass", 0);
```

- An `AdminException` is thrown if the user creation fails server side or if the server is not part of the platform. A `ConnectException` is thrown if the admin connection with the server is closed or lost.

#### Updating a user identity

- `User.update(String newName, String newPass)` updates the user identification.

```java
user.update("newName", "newPass");
```

- An `AdminException` is thrown if the user has been deleted server side, or if its new identification is already taken on its server. A `ConnectException` is thrown if the admin connection with the server is closed or lost.

#### Deleting a user

- `User.delete()` unsets the user.

```java
user.delete();
```

- The request is not effective if the user has already been deleted server side. A `ConnectException` is thrown if the admin connection with the server is closed or lost.

### 3.4.3. User connectivity

A given user accesses the JORAM platform by connecting to a given server (set when actually creating the user, last section). The connection might be of different kinds:

- either a TCP connection;
- or a SOAP connection (documented in Using SOAP specific documentation);
- or "collocated" (documented in Using a collocated server specific documentation).

The `javax.jms.ConnectionFactory` class is meant to determine to which server and through which protocol a client application will connect when calling the `createConnection` method.
Creating a ConnectionFactory instance for the TCP protocol

- TcpConnectionFactory.create(String host, int port): static method creating a ConnectionFactory instance for accessing a server running on a given host and listening to a given port.
- TcpConnectionFactory.create(): static method creating a ConnectionFactory instance for accessing the server the administrator is connected to.

ConnectionFactory cnxFact = TcpConnectionFactory.create("localhost", 16010);

- QueueTcpConnectionFactory.create(String host, int port): static method creating a QueueConnectionFactory instance for accessing a server running on a given host and listening to a given port.
- QueueTcpConnectionFactory.create(): static method creating a QueueConnectionFactory instance for accessing the server the administrator is connected to.

- TopicTcpConnectionFactory.create(String host, int port): static method creating a TopicConnectionFactory instance for accessing a server running on a given host and listening to a given port.
- TopicTcpConnectionFactory.create(): static method creating a TopicConnectionFactory instance for accessing the server the administrator is connected to.

- XATcpConnectionFactory.create(String host, int port): static method creating a XAConnectionFactory instance for accessing a server running on a given host and listening to a given port.
- XATcpConnectionFactory.create(): static method creating a XAConnectionFactory instance for accessing the server the administrator is connected to.

- XAQueueTcpConnectionFactory.create(String host, int port): static method creating a XAQueueConnectionFactory instance for accessing a server running on a given host and listening to a given port.
- XAQueueTcpConnectionFactory.create(): static method creating a XAQueueConnectionFactory instance for accessing the server the administrator is connected to.

- XATopicTcpConnectionFactory.create(String host, int port): static method creating a XATopicConnectionFactory instance for accessing a server running on a given host and listening to a given port.
- XATopicTcpConnectionFactory.create(): static method creating a XATopicConnectionFactory instance for accessing the server the administrator is connected to.

Setting the factory parameters

The following parameters may be set on a factory:

- Connecting timer: time (in seconds) during which connecting is attempted in case of failures.
- Transaction pending timer: time (in seconds) during which a transacted JMS session might be inactive before being automatically rolled back.
- Connection pending timer: time (in milliseconds) between two "ping" requests sent by the connection to the server; a connection is kept alive server side during twice the value of this parameter.
Those parameters are accessible through a FactoryParameters object (class FactoryParameters in package org.objectweb.joram.client.jms), obtainable by calling the getParameters() method on the factories.

When a client detects a connection failure, it automatically tries to reconnect every 2 seconds, during the period defined by the connecting timer parameter.

3.4.4. Managing a destination

Destinations are manipulated through the classes org.objectweb.joram.jms.Queue and org.objectweb.joram.jms.Topic. An instance of one of these classes represents a given destination and provides methods for administering it. Specialized destination management requires additional classes (see specific documentation: 4).

Creating a destination: Queue or Topic

- Queue.create(int server): static method creating a queue on a given server, and creating the corresponding Queue instance.
- Queue.create(): is similar to the previous method, except that it creates the queue on the server the administrator is connected to (local server).
- Topic.create(int server): static method creating a topic on a given server, and creating the corresponding Topic instance.
- Topic.create(): is similar to the previous method, except that it creates the topic on the server the administrator is connected to (local server).

```java
Queue queue = Queue.create();
Topic topic = Topic.create();
```

An AdminException is thrown if the destination deployment fails server side, or if the server is not part of the platform. A ConnectException is thrown if the admin connection with the server is closed or lost.

Creating a destination with a specified name

When creating a destination, queue or topic, you can specify an internal name; if a destination exists with the specified name it is returned to the user, in the contrary case it is created and registered in the internal naming service.

- Queue.create(int server, String name)
- Queue.create(String name): creates a queue on the given or default server with the specified name. If the named queue already exists it is simply returned.
- Topic.create(int server, String name)
- Topic.create(String name): creates a topic on the given or default server with the specified name. If the named topic already exists it is simply returned.

Setting the configuration parameters

Options can be set using properties at queue/topic creation time, by sending a message to the collector queue/topic or by Mbean queue/topic component. The following options are available:

- "period": defines the time in millisecond to run tasks at regular interval: cleaning of out-of-date messages, etc.

Setting free access on a destination

- Destination.setFreeReading(): grants the READ right to all on the destination.

---

1 Not a JNDI's name.
dest.setFreeReading();

- Destination.setFreeWriting(): grants the WRITE right to all on the destination.

dest.setFreeWriting();

- An AdminException is thrown if the destination has been deleted server side. A ConnectException is thrown if the admin connection with the server is closed or lost.

**Unsetting free access on a destination**

- Destination.unsetFreeReading(): removes the READ right to all on the destination.

dest.unsetFreeReading();

- Destination.unsetFreeWriting(): removes the WRITE right to all on the destination.

dest.unsetFreeWriting();

- An AdminException is thrown if the destination has been deleted server side. A ConnectException is thrown if the admin connection with the server is closed or lost.

**Setting a right for a user on a destination**

- Destination.setReader(User user): sets a given user as a reader on the destination.

dest.setReader(user);  

- Destination.setWriter(User user): sets a given user as a writer on the destination.

dest.setWriter(user);  

- An AdminException is thrown if the destination or the user does not exist server side. A ConnectException is thrown if the admin connection with the server is closed or lost.

**Unsetting a right for a user on a destination**

- Destination.unsetReader(User user): unsets a given user as a reader on the destination.

dest.unsetReader(user);  

- Destination.unsetWriter(User user): unsets a given user as a writer on the destination.

dest.unsetWriter(user);  

- An AdminException is thrown if the destination does not exist server side. A ConnectException is thrown if the admin connection with the server is closed or lost.

**Getting the access rights**

- Destination.isFreelyReadable(): returns true if the READ right is granted to all on the destination.

- Destination.isFreelyWriteable(): returns true if the WRITE right is granted to all on the destination.
- Destination.getReaders(): returns a List of users granted with the READ right on the destination.
- Destination.getWriters(): returns a List of users granted with the WRITE right on the destination.
  - An AdminException is thrown if the destination does not exist server side. A ConnectException is thrown if the admin connection with the server is closed or lost.

**Handling the DMQ setting (see chapter 4.1)**
- Destination.setDMQ(DeadMQueue): sets the given Dead Message Queue as the default DMQ for the destination.
- Destination.getDMQ(): returns the default Dead Message Queue instance set for the destination, null if none.
  - An AdminException is thrown if the destination does not exist server side. A ConnectException is thrown if the admin connection with the server is closed or lost.

- Deleting a destination
  - Destination.delete(): deletes the destination.
  - dest.delete();
  - The request is not effective if the destination does not exist server side. A ConnectException is thrown if the admin connection with the server is closed or lost.

### 3.4.5. Managing a Queue

**Getting the state**
- Queue.getPendingMessages(): returns the number of messages on the queue waiting to be delivered.
- Queue.getPendingRequests(): returns the number of “receive” requests on the queue waiting for matching messages.
  - An AdminException is thrown if the queue does not exist server side. A ConnectException is thrown if the admin connection with the server is closed or lost.

**Handling the queue threshold**
The threshold value determines the maximum number of times a message can be denied. It allows to avoid an erroneous message to be delivered infinitely; the guilty message is then forwarded to the Dead Message Queue if any (deleted otherwise).
- Queue.setThreshold(int threshold): sets the threshold value for the queue.
- Queue.getThreshold(): returns the threshold value set on the queue (-1 for none).
  - An AdminException is thrown if the queue does not exist server side. A ConnectException is thrown if the admin connection with the server is closed or lost.

**Handling the queue limit**
A maximum number of undelivered messages can be set for the queue. Additional messages are forwarded to the Dead Message Queue if any (deleted otherwise).
Queue.setNbMaxMsg(int nbMaxMsg): sets the maximum number of undelivered messages for the queue (-1 for no limit).
Queue.getNbMaxMsg(): returns the maximum number of undelivered messages value set on the queue (-1 for none).

3.4.6. Managing a Topic

A topic manages subscriptions. Subscription can be retrieved from User objects.

Getting the state
- Topic.getSubscriptions(): returns the number of active subscriptions on the topic.
- Topic.getSubscriberIds(): returns the list of user's proxy ids registered.
  - An AdminException is thrown if the topic does not exist server side.
  - A ConnectException is thrown if the admin connection with the server is closed or lost.

3.4.7. Managing the platform

Methods are also provided for getting information about how the platform has been configured. Data is available at the platform, server, destination and user levels.

Getting the servers of the platform
- AdminModule.getServersIds(): returns a List containing the identifiers of all the servers involved in the monitored JORAM platform.
  - A ConnectException is thrown if the admin connection to the server is closed or lost.

Handling default DMQ settings
- AdminModule.getDefaultDMQ(int serverId): returns the DeadMQueue instance representing the default DMQ of a given server, null if none.
  - An AdminException is thrown if the target server does not belong to the platform. A ConnectException is thrown if the admin connection to the server is closed or lost.
- AdminModule.getDefaultDMQ(): is similar to the previous method, except that it returns the default DMQ of the server the administrator is connected to.
  - A ConnectException is thrown if the admin connection to the server is closed or lost.
- AdminModule.getDefaultThreshold(int serverId): returns the default threshold value of a given server.
  - An AdminException is thrown if the target server does not belong to the platform. A ConnectException is thrown if the admin connection to the server is closed or lost.
- AdminModule.getDefaultThreshold(): is similar to the previous method, except that it returns the default threshold of the server the administrator is connected to.
  - A ConnectException is thrown if the admin connection to the server is closed or lost.

Getting the destinations
- AdminModule.getDestinations(int serverId): returns a List containing Destination instances representing all the destinations deployed on a given server.
• An AdminException is thrown if the target server does not belong to the platform. A ConnectException is thrown if the admin connection to the server is closed or lost.

• AdminModule.getDestinations() is similar to the previous method, except that it returns the destinations of the server the administrator is connected to.
  • A ConnectException is thrown if the admin connection to the server is closed or lost.

Getting the users

• AdminModule.getUsers(int serverId): returns a List containing User instances representing all the users set on a given server.
  • An AdminException is thrown if the target server does not belong to the platform. A ConnectException is thrown if the admin connection to the server is closed or lost.

• AdminModule.getUsers() is similar to the previous method, except that it returns the users of the server the administrator is connected to.
  • A ConnectException is thrown if the admin connection to the server is closed or lost.

3.5. JMX administration of Joram

You can configure your Joram server to export some MXBean, so you can monitor and handle it through a JMX console. This example is designed in a JDK 1.5 environment with the integrated JMX 1.2 implementation.

To launch a Joram server with JMX capabilities enabled, you just have to fix the environment variable MXServer; for example typing -DMXServer=com.scalagent.jmx.JMXServer in the command line.

In order to allow a remote access to these beans, you may either declare the JMXRIHttpService (com.scalagent.jmx.JMXRIHttpService class) in a3servers.xml configuration file or use a standard adapter. For example, if using JDK1.5, you can declare -Dcom.sun.management.jmxremote in the command line and then use the jconsole graphical tool to browse the beans:
At starting you there is two nodes added in the MBean’s tree:

- The first one, named **AgentServer**, describes the ScalAgent platform: domains and networks, engine and agents.
- The second one, named **Joram**, allows the handling of Joram’s users and destinations.

### 3.6. ScriptsXML

This feature allows to execute administration operation using an XML script. It is possible to create and bind in JNDI connection factories, destinations and users. The complete DTD is available in CVS: “joram/src/org/objectweb/joram/client/jms/admin/joramAdmin.dtd”.

#### 3.6.1. Administrator connection

First, it needs to define the administration connection through a connect tag; you can define various attributes:

- **host**: the DNS name or IP address of the machine hosting the server (default localhost).
- **port**: the listen port of the Joram’s TCP service (default 16010).
- **name**: the user identity of administrator (default root).
- **password**: the password for the administrator user (default root).
- **cnxTimer**: time-out value in seconds for the connection (default 60).
- **reliableClass**: implementation class for the protocol between the client and the server. By default it use the TCP protocol:

```java
org.objectweb.joram.client.jms.tcp.ReliableTcpClient
```
3.6.2. **Naming**

If you want to register all created objects in a JNDI's repository you have to declare an `InitialContext` element defining properties `java.naming.factory.initial`, `java.naming.factory.host` and `java.naming.factory.host`.

3.6.3. **User and connectivity**

**ConnectionFactory**

Each `ConnectionFactory` is defined by an element with an attribute class specifying the classname of the implementation:

- `name`: the name of the ConnectionFactory needed for later use in the script (building of clustered destination's for example).
- `classname`: the implementation class, by default a TcpConnectionFactory.

The ConnectionFactory is completed by a protocol element (local, tcp or soap for example) and usually a jndi binding:

- `local`: empty element defining a colocated connection.
- `tcp`: define the tcp settings for a TCPConnectionFactory:
  - `host` and `port`: host address and listen port for server, by default `localhost:16010`.
  - `reliableClass`: the class implementation.
- `soap`: define the protocol settings for a SoapConnectionFactory.
  - `host` and `port`: host address and listen port for server, by default `localhost:8080`.

**User**

A user definition is a simple XML element, you must at least define name and password properties:

- `name`: the name of the user needed for later use in the script (handling of destination's rights for example).
- `login`, `password`: login and password for user, if the login is not fixed the name is used by default.
- `serverId`: unique identifier of location server. If not set the user is created on the server the administrator is connected.
- `dmq`, `threshold`: Dead Message Queue settings for the user.

3.6.4. **Destination**

The syntax allows to create queue, topic and Dead Message Queue, specialized destinations can be deployed specifying the MOM's implementation class of the destination:

**Queue**

A queue definition defines some optional properties, it can be completed by JNDI or security elements:

- `name`: the Joram's internal name for the queue.
- `serverId`: unique identifier of location server. If not set the queue is created on the server the administrator is connected.
• dmq, threshold: Dead Message Queue settings for the queue.
• NbMaxMsg:
• className: the real class name of the MOM's destination. By default a simple queue, org.objectweb.joram.mom.dest.Queue.

**Topic**
A topic definition defines some optional properties, it can be completed by JNDI or security elements:

• name: the Joram's internal name for the topic.
• serverId: unique identifier of location server. If not set the topic is created on the server the administrator is connected.
• parent: the internal name of the hierarchical parent of this topic.
• className: the real class name of the MOM's destination. By default a simple topic, org.objectweb.joram.mom.dest.Topic.

**DMQueue**

• name: the Joram's internal name for the Dead Message Queue.
• serverId: unique identifier of location server. If not set the DMQ is created on the server the administrator is connected.

### 3.6.5. Destination security and naming

Destination element can be completed by security or naming settings:

**freeReader**
Grants the read right to all on this destination.

**freeWriter**
Grants the write right to all on this destination.

**reader**
Sets a user as a potential reader on the destination, the user name is given in the attribute `user`.

**writer**
Sets a user as a potential writer on the destination, the user name is given in the attribute `user`.

**jndi**
Registers the destination in JNDI context. The symbolic name is given in the attribute `name`.

**property**
Additional properties can be defined for destinations. Each property is an element with two attributes: `name` and `value`.

### 3.6.6. Example

In the example below (from the classic sample) we first define an administration connection through TCP to the local host on port 16010. The administrator's login is “root” and the password is “root”.

Remark: as their values are the default ones, these parameter's definitions can be omitted.
A TCPConnectionFactory (localhost:16010) is defined and bind in JNDI (name "cf").
A user named “anonymous” is created (password “anonymous”), then a queue named “queue” and a topic named “topic” are created. All these objects are created on the default server. The Read and write right are granted for all, the queue is bind in JNDI with the name “queue”, and the topic with the name “topic”.

```xml
<JoramAdmin>
  <AdminModule>
    <connect hostName="localhost" port="16010" name="root" password="root"/>
  </AdminModule>

  <ConnectionFactory
    className="org.objectweb.joram.client.jms.tcp.TcpConnectionFactory">
    <tcp host="localhost" port="16010"/>
    <jndi name="cf"/>
  </ConnectionFactory>

  <User name="anonymous" password="anonymous"/>

  <Queue name="queue">
    <freeReader/>
    <freeWriter/>
    <jndi name="queue"/>
  </Queue>

  <Topic name="topic">
    <freeReader/>
    <freeWriter/>
    <jndi name="topic"/>
  </Topic>

</JoramAdmin>
```
4. Specialized destinations

4.1. Dead Message Queue

4.1.1. Dead message queue

Introduction

A dead message queue is a destination where dead messages are sent. A dead message is a message located server side and considered as undeliverable for various reasons. Those reasons are:

- the target destination does not exist,
- the sender does not have the writing right on the target destination,
- the message expires before it is delivered,
- the message is constantly denied by the consuming client,
- the maximum number of messages in the queue has been reached,
- the message has been deleted on the queue.

An application may also consider a message it got as to be sent to the DMQ. This “manual” sending is allowed to any application.

The Figure 13 shows an example of DMQ usage. A DMQ has been set as the DMQ of a given queue. This queue receives a message from a producer and tries to deliver it to a consumer. This consumer keeps denying the received message. When the number of delivery attempts overtakes a given threshold value, the message is removed from the queue and sent to the DMQ.
Creating and setting a dead message queue

As any destination, a dead message queue may be deployed on any server of the configuration, even if it is intended to log dead messages of destinations located on other servers.

The setting of a dead message queue may take place at various levels. A dead message queue may be set as the dead message queue for:

- the destinations and users on a given server (it is then considered as the default DMQ for this server),
- a given destination,
- a given user.

A threshold value may also be set. If set, this value is the number of times a message may be delivered to a consumer before being considered as undeliverable. Its setting takes place at the same levels as for DMQs:

- as the default value for the queues and subscribers of a given server,
- for a queue,
- for a user.

The settings for a given destination and a given user precede the default settings (see the scenarios). No setting means that message is indefinitely delivered, even to failing consumers.

**Scenarios**

1. the target destination does not exist: the produced messages are sent to the producer’s DMQ if set, or to the default producer server’s DMQ if set.
2. The target destination is not writable: the produced messages are sent to the producer’s DMQ if set, or to the default producer’s server’s DMQ if set, or to the destination’s DMQ if set, or to the default destination’s server’s DMQ if set.

3. A message expires on a queue: it is sent to the queue’s DMQ if set or to the queue’s server’s default DMQ if set.

4. A message on a queue reaches the maximum delivery attempts: it is sent to the queue’s DMQ if set, or to the queue’s server’s default DMQ if set; the threshold value is the queue’s one if set, or the queue’s server’s default one if set.

5. A message for a given subscriber expires: it is sent to the subscriber’s DMQ if set, or to the subscriber’s server’s default DMQ if set.

6. A message for a given subscriber reaches the maximum delivery attempts: it is sent to the subscriber’s DMQ if set, or to the subscriber’s server’s default DMQ if set; the threshold value is the subscriber’s one if set, or the subscriber’s server’s default one if set.

---

**Watching a dead message queue**

Accessing a dead message queue through a JMS client means that the DMQ has preliminary been bound in a name space like JNDI, as any “normal” destination. Also, watching a dead message queue requires a JMS client granted with a READ access on it.

The client may consume or browse the queue. A DMQ behaves exactly as a “normal” queue. It can even log its own messages as dead messages on other DMQs.

Dead messages carry special properties describing why they were considered as “dead”. Those properties are:

- **JMS_JORAM_ERRORCOUNT**, this property is mapped to an integer telling the number of consecutive errors which happened.
- **JMS_JORAM_ERRORCODE_X**, with \(1 \leq X \leq \text{ERRORCOUNT}\) returns the error code of the error number \(X\).
- **JMS_JORAM_ERRORCAUSE_X**, with \(1 \leq X \leq \text{ERRORCOUNT}\) is mapped to a string detailing the error. This can be one of the following:
  - **Deleted destination**, if the target destination of the message could not be found,
  - **Destination is not writable**, if the target destination of the message did not accept the sender as a WRITER,
  - **Expired at XXX**, if the message expired before delivery. The XXX stands for a long number holding the date when the message expired.
  - **Undeliverable after X tries**, if the number of delivery attempts of the message overtook the threshold. The \(X\) is replaced by the threshold value.
  - **Message deleted by an admin**, if the message being dead is the result of an admin deletion with `queue.deleteMessage(String msgId)` or `queue.clear()` methods.
  - **Queue full**, if the queue has reached its maximum number of messages.
  - **Unexpected error**, if there was an unexpected error, for example a connection problem while using a mail queue.

The **JMSXDeliveryCount** property is also available for getting the number of delivery attempts of the message, including the delivery to the DMQ consumer. All those properties are available through the dedicated `Message` methods. A typical check can be as following:
// Getting a dead message through a DMQ consumer:
Message deadM = (Message) deadMconsumer.receive();

int errorCount = deadM.getIntProperty("JMS_JORAM_ERRORCOUNT");
for (int i = 1; i <= errorCount; i++) {
    System.out.println(deadM.getIntProperty("JMS_JORAM_ERRORCODE_" + i));
    System.out.println(deadM.getIntProperty("JMS_JORAM_ERRORCAUSE_" + i));
}

// Do specific things if the message has expired.
if (deadM.getIntProperty("JMS_JORAM_ERRORCODE_" + i) ==
    MessageErrorConstants.EXPIRED) {
    ...
}
}

4.1.2. Managing a Dead Message Queue

Creating a dead message queue

- DeadMQueue.create(int server): creates a DMQ on a given server, and instantiates the corresponding DeadMQueue object.
- DeadMQueue.create() is similar to the previous method, except that it creates the dead message queue on the server the administrator is connected to.

```
DeadMQueue dmq = DeadMQueue.create(0);
```

- An AdminException is thrown if the destination deployment fails server side, or if the server is not part of the platform. A ConnectException is thrown if the admin connection with the server is closed or lost.

Setting a dead message queue

- AdminModule.setDefaultDMQ(int serverId, DeadMQueue dmq): sets a given DMQ as the default DMQ for the destinations and users on a given server (set DMQ as null for unsetting it).
- AdminModule.setDefaultDMQ(DeadMQueue dmq) is similar to the previous method except that it sets the DMQ on the server the administrator is connected to.

```
AdminModule.setDefaultDMQ(0, dmq);
```

- A ConnectException is thrown if the admin connection to the server is closed or lost. An AdminException is thrown if the server is not known in the platform, or if the DMQ has been deleted server side.
- Destination.setDMQ(DeadMQueue dmq): sets a given DMQ as the DMQ for the destination (set DMQ as null for unsetting it).
- User.setDMQ(DeadMQueue dmq): sets a given DMQ as the DMQ for the user (set DMQ as null for unsetting it).

```
topic.setDMQ(dmq);
user.setDMQ(null);
```

- An AdminException is thrown if the destination or the user has been deleted server side. A ConnectException is thrown if the admin connection to the server is closed or lost.
### Setting a threshold value

- `AdminModule.setDefaultThreshold(int serverId, int threshold);` sets a given value as the default threshold for the queues and users on a given server (set threshold to -1 for unsetting it).
- `AdminModule.setDefaultThreshold(int threshold)` is similar to the previous method except that it sets the threshold on the server the administrator is connected to.

```java
AdminModule.setDefaultThreshold(0, 5);
```

- A `ConnectException` is thrown if the admin connection to the server is closed or lost. An `AdminException` is thrown if the server is not known in the platform.
- `Queue.setThreshold(int threshold);` sets a given value as the threshold for the queue.
- `User.setThreshold(int threshold);` sets a given value as the threshold for the user.

```java
queue.setThreshold(5);
user.setThreshold(-1);
```

- An `AdminException` is thrown if the queue or the user has been deleted server side. A `ConnectException` is thrown if the admin connection to the server is closed or lost.

### 4.1.3. Running the “Dead Message Queue” sample

The dead message queue sample simulates various cases where messages are considered as undeliverable. It involves a message producer, a failing consumer, and a DMQ watcher actually consuming the messages on the DMQ.

The next picture shows the DMQ configuration. The configuration used is centralized and the server run in non persistent mode.

![Diagram of the Dead Message Queue sample](image)

**Figure 14 - Dead message queue sample**

Running the demo:

- For starting the platform:
ant reset single_server

- For running the admin code:
  ant dmq_admin

- For launching the watcher:
  ant dmq_watcher

- For launching the producer and the consumer:
  ant dmq_client

### 4.2. Hierarchical Topic

#### 4.2.1. Hierarchical topic

**Introduction**

The JMS specification allows topics to have a hierarchical structure such as the one shown in Figure 15. The interest of such a structure is to allow a subscriber to specifically choose the type of information it is interested in, by allowing it to subscribe to the corresponding subtopic. To the contrary, a subscriber may want to get all the sub information by subscribing to the topic root or father.

![Figure 15 - A Hierarchical topic](image)

**Example**

The example of Figure 15 shows a hierarchy of news. A subscriber to the Tennis topic would only get the news concerning tennis, whereas a subscriber to the Sports topic would get the news concerning tennis and soccer and sports in general. Also, a subscriber to the Business topic would get business information only, whereas a subscriber to the News topic will get the business related news, the sports related news, and news in general.

**Creation**

Creating such a hierarchy requires first to create the topics that will constitute it, then to notify each topic of the hierarchy it is part of.

Each topic of the hierarchy may be bound in a name space such as JNDI, so that clients may then retrieve them. Access rights are managed individually, on each topic of the hierarchy.
Distributed deployment

To be noted, a hierarchy may be spread over many servers (Figure 16). A distributed architecture introduces flexibility and availability. If server 1 is down, for example, the News and Business leafs of the hierarchy would go on working. Subscribers to the news and to the business would get information related to news and business (News subscribers would get nothing related to sports until server 1 is started again).

Figure 16 - A distributed Hierarchical topic

4.2.2. Managing a Hierarchical Topic

Creating a hierarchical topic

Creating a hierarchical topic requires first to create all the topics of the hierarchy. If we consider the example shown on figure 6:

```java
Topic news = Topic.create(0);
Topic business = Topic.create(0);
Topic sports = Topic.create(0);
Topic tennis = Topic.create(0);
Topic soccer = Topic.create(0);
```

The hierarchy needs then to be constructed. Topics are linked two by two with the following method:

- `Topic.setParent(Topic father)`: sets a given topic as the father of an other topic.

Going back to our example:

```java
business.setParent(news);
sports.setParent(news);
tennis.setParent(sports);
soccer.setParent(sports);
```

An AdminException is thrown if one of the topics has been deleted server side, or is already part of a cluster, or if the son parameter already has a father. A ConnectException is thrown if the admin connection with the server is closed or lost.
Modifying a hierarchy

A hierarchy might be modified either by adding a new branch, or by modifying the existing ones, or by removing the existing ones. The following method is provided:

- Topic.unsetParent(): unsets the father of the topic.

For example, for unseting the link between the sports related informations and the general news:

```
sports.unsetParent();
```

Subscribers to the sports topic would still get the tennis and soccer news, but subscribers to the news topic would not get anything related to sports.

A ConnectException is thrown if the admin connection with the server is closed or lost. An AdminException is thrown if the topic has been deleted server side or does not have a father.

Also, removing a topic of the hierarchy removes the links this topic was involved in. For example, by calling:

```
sports.delete();
```

the tennis and soccer topics become independent. News subscribers won't get anything related to tennis or soccer.

Getting info about cluster or hierarchy

- Topic.getClusterFellows(): returns a List of Topic instances representing other topics part of a same cluster.
- Topic.getHierarchicalFather(): returns a Topic instance representing the topic set as hierarchical father.

An AdminException is thrown if the topic does not exist server side. A ConnectException is thrown if the admin connection with the server is closed or lost.

4.2.3. Running the topic tree sample

The topic tree sample illustrates the use of a hierarchical topic. A producer produces various informations destined to the leafs of a hierarchical topic: news, business, sports, tennis. A consumer subscribes to all these leafs. Its subscription to the news will get all the messages. Its subscription to the business information will only get the messages related to business. Its subscription to the sports will get all the sports-related messages, and its subscription to the tennis news will only get the messages about tennis.

The next picture shows the topic tree configuration. The configuration used is centralized and the server run in non persistent mode.
Running the demo:

- For starting the platform:
  \[ \text{ant reset single_server} \]
- For running the admin code:
  \[ \text{ant tree_admin} \]
- For launching the consumer:
  \[ \text{ant tree_consumer} \]
- To start the producer:
  \[ \text{ant tree_producer} \]

### 4.3. Clustered Topic

#### 4.3.1. Introduction

A non hierarchical topic might also be distributed among many servers. Such a topic, to be considered as a single logical topic, it made of topics representatives, one per server. Figure 18 shows such a topic located on three servers.

Such an architecture allows a publisher to publish messages on a representative of the topic. In the example shown in Figure 18, the publisher works with the representative on server 1. If a subscriber subscribed to any other representative (on server 2 in our example), it will get the messages produced by the publisher.
Added value

This special feature introduces more flexibility and availability to Publish/Subscribe communication. If server 0 is down, for example, the other representatives of the topic would go on working. The publisher would successfully send its messages to the representative on server 1, and a subscriber to the representative on server 2 would go on getting those messages.

Whereas a regular topic totally depends on the server it is deployed on, a clustered topic still partly works when some (not all) of the servers it is deployed on are down.

Creation and configuration

Creating a clustered topic requires first to create all its representatives. When it is done, each representative must be notified of the cluster it is part of.

Each clustered topic representative must be bound in a name space such as JNDI, so that clients may then retrieve them. Clients do not access the single logical topic, but a given representative of the cluster. Access rights are managed individually, on each topic of the cluster.

4.3.2. Managing a clustered topic

Creating a cluster

Creating a cluster requires first to create all the topics of the cluster. If we consider the example shown on figure 8:

```java
Topic topic0 = Topic.create(0);
Topic topic1 = Topic.create(1);
Topic topic2 = Topic.create(2);
```

The cluster needs then to be constructed. Topics are linked two by two with the following method:

- `Topic.addClusteredTopic(Topic addedTopic)`: adds a given topic to a cluster by joining it to a topic already belonging to the cluster, or chosen as the initiator of the cluster.

Going back to our example:
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**Modifying a cluster**

A cluster might be modified either by adding a new topic to it, or by removing a topic from it. The following method is provided:

- `Topic.removeFromCluster()` : notifies a given topic to leave the cluster it is part of.

For example, for removing the representative on server 2 from the cluster:

```java
topic2.removeFromCluster();
```

**Using clustered JNDI’s object**

An object representing the cluster, and which may be bound to a JNDI server, should be instantiated once the cluster is set server side. This object wraps the information allowing a given client application to access the right topic of the cluster according to the server it connects to.

The ClusteredTopic object may be handled either through the administration API or the XML scripting capabilities.

Let assume that there is three existing clustered topics `topic0 (server 0)`, `topic1 (server 1)` and `topic2 (server 2)`, and the corresponding `ConnectionFactory cf0`, `cf1` and `cf2`. The ClusterConnectionFactory and ClusterTopic objects allow to handle the clustered objects as a whole through a single object; each object is registered with a property specific to its location.

```java
ClusterConnectionFactory clusterCF = new ClusterConnectionFactory();
clusterCF.addConnectionFactory("server0", cf0);
clusterCF.addConnectionFactory("server1", cf1);
clusterCF.addConnectionFactory("server2", cf2);
ictx.rebind("clusterCF", clusterCF);

ClusterTopic clusterTopic = new ClusterTopic();
clusterTopic.addDestination("server0", topic0);
clusterTopic.addDestination("server1", topic1);
clusterTopic.addDestination("server2", topic2);
ictx.rebind("clusterTopic", clusterTopic);
```

These objects can be registered in JNDI, then retrieved by a JMS client. When the client creates the JMS connection through the clustered `ConnectionFactory`, the connection is established depending of the “location” JVM property. Then the client can create the `Session` and the `MessageConsumer`; the physical topic used will also depend of the “location” property so the connection and the topic will formed a coherent pair.

```java
ConnectionFactory cf = ictx.lookup("clusterCF");
Topic clusterTopic = ictx.lookup("clusterTopic");
```

2 This property must be fixed according to the client needs; if it is not fixed the location is randomly set for later usage.
Connection cnx = cf.createConnection(...);
Session session = cnx.createSession(...);
MessageConsumer consumer = Session.createConsumer(clusterTopic);

Setting the access rights

Access rights to the cluster may be set individually, for each topic. They may also be set for the whole cluster, using the same methods. Simply, instead of manipulating Topic instances, you have to manipulate the ClusterTopic instance.

clusterTopic.setFreeReading();
clusterTopic.setFreeWriting();

4.3.3. Running the “Clustered Topic” Sample

This sample illustrates the use of Joram’s clustered topic. A clustered topic is a group of topics deployed on different servers behaving as a unique “logical” topic. This sample configuration is made of 3 servers, each server hosting a topic part of the cluster. The platform is run in persistent mode. The provided configuration locates all three servers on “localhost” host.

This sample code is located in the samples/src/joram/cluster/topic directory. In order to run the demo described below you must go to the samples/src/joram directory.

The publisher connects to a server and publishes messages on the local topic of this server. The subscriber connects to a server and subscribes to the local topic of this server. You can either fix dynamically the server used for the connection (giving its identification 0, 1 or 2 when ant prompt for it) or use a randomly chosen server (using the ‘-’ key at prompt).
Running the demo

- For compiling the sample code:
  `ant clean compile`
- For starting the configuration:
  `ant reset servers`
- For running the administration code:
  `ant topic_cluster_admin`
  or
  `ant topic_cluster_adminxml`
- For running a subscriber:
  `ant topic_cluster_subscriber`
- For running a publisher
  `ant topic_cluster_publisher`

Scenario:
When you launch a publisher on any server, all subscribers receives the messages sent.

4.3.4. Using XML Scripts

The XML scripting facility allows to create and bind in JNDI clustered ConnectionFactory and Destination.

ClusterConnectionFactory

A ClusterConnectionFactory is defined through a ClusterCF element. It is made up of a set of predefined ConnectionFactory element pointed out by their names. It can be completed by a JNDI declaration.

First we have to define each ConnectionFactory, one for each server of the cluster. The declaration below defines three ConnectionFactory (TcpConnectionFactory by default), cf0 allows the connection to server #0, cf1 to server #1 and cf2 to server #2. Each ConnectionFactory can be bound individually in JNDI.

```
<ConnectionFactory name="cf0">
  <tcp host="localhost" port="16010"/>
  <jndi name="cf0"/>
</ConnectionFactory>

<ConnectionFactory name="cf1">
  <tcp host="localhost" port="16011"/>
  <jndi name="cf1"/>
</ConnectionFactory>

<ConnectionFactory name="cf2">
  <tcp host="localhost" port="16012"/>
  <jndi name="cf2"/>
</ConnectionFactory>
```
Second we can define the ClusterConnectionFactory associating each ConnectionFactory with a location property\(^3\). The declaration above defines a ClusterConnectionFactory made up of three TcpConnectionFactory named cf0, cf1 and cf2. The resulted ConnectionFactory is bound in JNDI with the name clusterCF.

```xml
<ClusterCF>
  <ClusterElement name="cf0" location="server0"/>
  <ClusterElement name="cf1" location="server1"/>
  <ClusterElement name="cf2" location="server2"/>
  <jndi name="clusterCF"/>
</ClusterCF>
```

**ClusterTopic**

A clustered topic is made up of a set of Topic elements; each destination needs to be created separately. It can be completed by a JNDI declaration.

```xml
<Topic name="topic0" serverId="0">
  <jndi name="topic0"/>
</Topic>
<Topic name="topic1" serverId="1">
  <jndi name="topic1"/>
</Topic>
<Topic name="topic2" serverId="2">
  <jndi name="topic2"/>
</Topic>
```

The destinations must be linked in the cluster. The declaration below defines a ClusteredTopic made up of three Topic objects named topic0, topic1 and topic2. The location property allows to associate each Topic object with the corresponding ConnectionFactory of the clusterCF object (see paragraph “Using clustered JNDI’s object” above). The resulted queue is bound in JNDI with the name clusterTopic.

```xml
<ClusterTopic>
  <ClusterElement name="topic0" location="server0"/>
  <ClusterElement name="topic1" location="server1"/>
  <ClusterElement name="topic2" location="server2"/>
  <freeReader/>
  <freeWriter/>
  <jndi name="clusterTopic"/>
</ClusterTopic>
```

### 4.4. Clustered Queue

#### 4.4.1. Introduction

The clustered queue feature provides a load balancing mechanism. A clustered queue is a cluster of queues (a given number of queue destinations, knowing each other), exchanging messages depending on their load. The figure 9 shows an example of a cluster made of two queues. An heavy producer accesses its local queue (queue 0) and sends messages. The queue is also accessed by a consumer but requesting few messages. It quickly becomes loaded and decides to forward messages to the other queue (queue 1) of its cluster, which is not under heavy load. Thus,

---

\(^3\) This property allows to choose the right association between the ConnectionFactory and the representative of clustered destinations (see paragraph “Using clustered JNDI’s object”).
the consumer on queue 1 also gets messages, and messages on queue 0 are consumed in a quicker way.

![Image of a cluster of queues balancing heavy deliveries]

**Basic mechanism**

Each queue of a cluster periodically re-evaluates its load factor and sends the result to the other queues of the cluster. When a queue hosts more messages than it is authorized to do, and according to the load factors of the cluster, it distributes the extra messages to the other queues. When a queue is requested to deliver messages but is empty, it requests messages from the other queues of the cluster. This mechanism guarantees that no queue is hyper-active while some others are lazy, and tends to distribute the work load among the servers involved in the cluster.

**Creation and configuration**

Creating a cluster of queues consists first in setting the cluster’s parameters for load-balancing, then in creating the queues one by one, and finally in linking them as part of a same cluster. The needed configuration parameters are:

- a period of time before activating an automatic revaluation of the queues' load factor;
- a number of messages above which a queue is considered as over-loaded;
- a number of pending “receive” requests above which an empty queue requests messages from the other cluster queues;
- a period of time during which a queue which requested something from the cluster queues should not do it again.

Access rights to the cluster may be managed individually, for each queue, or for the whole cluster.
### 4.4.2. Managing a clustered queue

#### Setting the clustered queue parameters

Prior to creating the cluster, the following parameters must be set individually for each queue of the cluster:\(^4\)

- “period”: period in ms between two activations of the load factor evaluation routine for the queue;
- “producThreshold”: number of messages above which a queue is considered loaded, a load factor evaluation launched, messages forwarded to other queues of the cluster;
- “consumThreshold”: number of pending “receive” requests above which a queue will request messages from the other queues of the cluster;
- “autoEvalThreshold”: set to “true” for requesting an automatic revaluation of the queues’ thresholds values according to their activity;
- “waitAfterClusterReq”: time (in ms) during which a queue which requested something from the cluster is not authorized to do it again.

Properties are set in a `java.util.Properties` instance. For example:

```java
java.util.Properties prop = new java.util.Properties();
prop.setProperty("period", "10000");
prop.setProperty("producThreshold", "60");
prop.setProperty("consumThreshold", "2");
prop.setProperty("autoEvalThreshold", "true");
prop.setProperty("waitAfterClusterReq", "500");
```

#### Creating the clustered queues

Creating a clustered queue consists first in creating the queues that will be part of it. For a cluster of three queues, let’s create queue0, queue1 and queue2 and servers 0, 1 and 2 through the `Queue.create` method.

```java
String className = "org.objectweb.joram.mom.dest.ClusterQueue";
Queue queue0 = Queue.create(0, "queue0", className, prop);
Queue queue1 = Queue.create(1, "queue1", className, prop);
Queue queue2 = Queue.create(2, "queue2", className, prop);
```

The next step consists in clustering the queues. Queues are linked two by two using `Queue` class with the following method:

- `addClustered(Queue addedQueue)`: adds a given queue to a cluster by joining it to a queue already belonging to the cluster, or chosen as the initiator of the cluster.

Going back to our example:

```java
queue0.addClusteredQueue(queue1);
queue0.addClusteredQueue(queue2);
```

An `IllegalArgumentException` is thrown by this latest method if one of the queues parameters is not a valid Joram queue. An `AdminException` is thrown if one of the queues does not exist server side, or if the joining queue is already part of a cluster. A `ConnectException` is thrown if the connection with the server is lost.

\(^4\) Each queue can have a different configuration depending of the characteristics of the server, or the number of producer/consumer, etc.
Using clustered JNDI's object

An object representing the cluster, and which may be bound to a JNDI server, should be instantiated once the cluster is set server side. This object wraps the information allowing a given client application to access the right queue of the cluster according to the server it connects to.

The ClusteredQueue object may be handled either through the administration API or the XML scripting capabilities.

Let assume that there is three existing clustered queues queue0 (server 0), queue1 (server 1) and queue2 (server 2), and the corresponding ConnectionFactory cf0, cf1 and cf2. The ClusterConnectionFactory and ClusterQueue objects allow to handle the clustered objects as a whole through a single object; each object is registered in the clustered object with a property specific to its location.

```java
ClusterConnectionFactory clusterCF = new ClusterConnectionFactory();
clusterCF.addConnectionFactory("server0", cf0);
clusterCF.addConnectionFactory("server1", cf1);
clusterCF.addConnectionFactory("server2", cf2);
ictx.rebind("clusterCF", clusterCF);

ClusterQueue clusterQueue = new ClusterQueue();
clusterQueue.addDestination("server0", queue0);
clusterQueue.addDestination("server1", queue1);
clusterQueue.addDestination("server2", queue2);
```

These objects can be registered in JNDI, then retrieved by a JMS client. When the client creates the JMS connection through the clustered ConnectionFactory, the connection is established depending of the “location” JVM property\(^5\). Then the client can create the Session and the MessageConsumer; the physical queue used will also depend of the “location” property so the connection and the queue will formed a coherent pair.

```java
ConnectionFactory cf = ictx.lookup("clusterCF");
Queue queue = ictx.lookup("clusterQueue");
..
Connection cnx = cf.createConnection(...);
Session session = cnx.createSession(...);
MessageConsumer consumer = Session.createConsumer(queue);
```

Setting the access rights

Access rights to the cluster may be set individually, for each queue. They may also be set for the whole cluster, using the same methods. Simply, instead of manipulating `Queue` instances, simply manipulate the `ClusterQueue` instance. For example:

```java
clusterQueue.setFreeReading();
clusterQueue.setFreeWriting();
```

4.4.3. Running the “Clustered Queue” Sample

This sample illustrates the use of Joram’s clustered queues. A cluster queue is a group of queues deployed on different servers and handling the load-balancing.

This sample configuration is made of three servers, each server hosting a queue part of the cluster. The platform is run in persistent mode. The provided configuration locates all three servers on “localhost” host.

\(^5\) This property must be fixed according to the client needs; if it is not fixed the location is randomly set for later usage.
This sample code is located in the samples/src/joram/cluster/queue directory. In order to run the demo described below you must go to the samples/src/joram directory.

**Running the demo:**

- Starting the configuration:
  ```
  ant reset servers
  ```

- Running the administration code: `ant queue_cluster_admin`.
  - This target creates and configures a cluster with 3 queues as described above.

- Running the consumers using the target `queue_cluster_consumer`.
  - This target launches a message consumer connected to one of the server, it indefinitely consumes messages on the corresponding queue.

- Running the producers using the target `queue_cluster_producer`.
  - This target launches a message producer connected to one of the server, it sends 1000 messages to the corresponding queue.

- Using the `queue_cluster_consumer` or `queue_cluster_producer` targets you can either fix dynamically the server used for the connection (giving its identification 0, 1 or 2 when ant prompt for it) or use a randomly chosen server (directly press the return key at prompt).

In order to view the load-balancing mechanism we can run two different scenarios.

**Scenario 1:**
In this scenario there is three message consumers, one for each queue of the cluster. Messages are all sent to queue0, the load-balancing mechanism dispatches them between the queues, then the consumers.

- Launching three consumers on queue0, queue1 and queue2:
  ```
  "ant queue_cluster_consumer" then type '0'.
  "ant queue_cluster_consumer" then type '1'.
  "ant queue_cluster_consumer" then type '2'.
  ```

- Launching multiples producers on queue0:
  ```
  "ant queue_cluster_producer" then type '0'.
  "ant queue_cluster_producer" then type '0'.
  "ant queue_cluster_producer" then type '0'.
  ```

**Scenario 2:**
In this scenario there is only two message consumers listening on queue0 and queue1. Messages are sent on queue1 and queue2, messages produced to queue2 by the second producer are dispatched between the two consumers by the load-balancing mechanism.

- Launching two consumers on queue0 and queue1
  ```
  "ant queue_cluster_consumer" then type '0'.
  "ant queue_cluster_consumer" then type '1'.
  ```

- Launching two producers on queue1 and queue2
  ```
  "ant queue_cluster_producer" then type '1'.
  "ant queue_cluster_producer" then type '2'.
  ```
4.4.4. **Using XML Scripts**

The XML scripting facility allows to create and bind in JNDI clustered ConnectionFactory and Destination.

**ClusterConnectionFactory**

A ClusterConnectionFactory is defined through a ClusterCF element. It is made up of a set of predefined ConnectionFactory element pointed out by their names. It can be completed by a JNDI declaration.

```xml
<ConnectionFactory name="cf0">
    <tcp host="localhost" port="16010"/>
    <jndi name="cf0"/>
</ConnectionFactory>

<ConnectionFactory name="cf1">
    <tcp host="localhost" port="16011"/>
    <jndi name="cf1"/>
</ConnectionFactory>

<ConnectionFactory name="cf2">
    <tcp host="localhost" port="16012"/>
    <jndi name="cf2"/>
</ConnectionFactory>
```

The declaration below defines a ClusterConnectionFactory JNDI's object made up of three TcpConnectionFactory named cf0, cf1 and cf2. Each ConnectionFactory is bound in the cluster with a key depending of its location. The resulted ConnectionFactory is bound in JNDI with the name clusterCF.

```xml
<ClusterCF>
    <ClusterElement name="cf0" location="server0"/>
    <ClusterElement name="cf1" location="server1"/>
    <ClusterElement name="cf2" location="server2"/>
    <jndi name="clusterCF"/>
</ClusterCF>
```

**ClusterQueue**

A clustered destination is made up of a set of Queue or Topic elements; each destination needs to be created separately then linked. It can be completed by a JNDI declaration.

```xml
<Queue name="queue0" serverId="0"
    className="org.objectweb.joram.mom.dest.ClusterQueue">
    <property name="period" value="10000"/>
    <property name="producThreshold" value="50"/>
    <property name="consumThreshold" value="2"/>
    <property name="autoEvalThreshold" value="false"/>
    <property name="waitAfterClusterReq" value="1000"/>
    <jndi name="queue0"/>
</Queue>

<Queue name="queue1" serverId="1"
```
The declaration below defines a ClusteredQueue made up of three Queue objects named queue0, queue1 and queue2. Each queue is bound in the cluster with a key according to its location. The location property allows to associate each Topic object with the corresponding ConnectionFactory of the clusterCF object (see paragraph “Using clustered JNDI's object” above). The resulted queue is bound in JNDI with the name clusterQueue.

```xml
<ClusterQueue>
  <freeReader/>
  <freeWriter/>
  <ClusterElement name="queue0" location="server0"/>
  <ClusterElement name="queue1" location="server1"/>
  <ClusterElement name="queue2" location="server2"/>
  <jndi name="clusterQueue"/>
</ClusterQueue>
```

### 4.5. SchedulerQueue

#### 4.5.1. Introduction

A scheduler queue is a standard JMS queue extended with a timer behaviour. When a scheduler queue receives a message with a property called 'scheduleDate' (typed as a long) then the message is not available for delivery before the date specified by the property.

The scheduler queue feature is available since the Joram version 4.3.14.

#### 4.5.2. Using a schedulerQueue

**Create a scheduler queue**

A scheduler queue is created by using the Joram administration API, calling the Queue creation method `create` from the class `org.objectweb.joram.client.jms.Queue`.

---

6 This key must be the same that the key used for the corresponding ConnectionFactory.
Schedule a message

Scheduling a message requires to add a property called "scheduleDate" to the message. The value is the message delivery date typed as a long.

The following example shows how to schedule a message for 5 seconds later.

```java
long scheduleDate = System.currentTimeMillis() + 5000L;
TextMessage msg = session.createTextMessage("hello");
msg.setLongProperty("scheduleDate", scheduleDate);
producer.send(msg);
```

A scheduled message is visible in the list of message of the queue but it cannot be delivered before its schedule date is reached (it is close to the use of a selector on all the receive requests verifying that the scheduled date is less than the current one).

Cancel a scheduled message

You can cancel a previously scheduled message by removing it from the scheduler queue. This removal operation can be performed through the Joram administration API.

```java
queue.deleteMessage(msg.getJMSMessageID());
```

### 4.6. Mail queue and topic

#### 4.6.1. Introduction

Mail queue and topic are special destinations usable to interconnect Joram and Internet email system. They can be used to:

- forward Joram's messages to an external email account,
- import emails from external account and turn them in Joram's messages.

The mail queue and topic features are available since the Joram version 4.3.23.

**Mail queue**

A mail queue acts as a queue so each message sent will be delivered to a unique consumer; if an email receiver is defined all messages matching the selector will be delivered to this receiver. If the queue is configured to acquire messages from an email account, the account will be regularly scanned to get emails, each email will be turn into a Joram's message then delivered to a unique JMS receiver.

**Mail topic**

A mail topic acts as a topic, so each message sent will be delivered to each subscriber including the email receiver if defined. If the topic is configured to acquire messages from an email account, the account will be regularly scanned to get emails, each email will be turn into a Joram's message then delivered to all defined JMS subscribers.

#### 4.6.2. Managing a mail queue or topic

This following code comes from the mail sample.

**Setting the mail queue/topic parameters**

Prior to creating the mail queue (or topic), parameters must be set depending of the role of the destination. These parameters are set through a `Properties` object.
**Incoming destination**

If the destination is used to import email in the JMS world the following parameters must be set:

- "popServer": the DNS name or IP address of the POP server;
- "popUser": the login name for the email account;
- "popPassword": the password for the email account;
- "popPeriod": the period of activation of the mail retrieval mechanism;
- "expunge": allows to remove or not email on the server.

```java
Properties prop = new Properties();
prop.setProperty("popServer", popServer);
prop.setProperty("popUser", popUser);
prop.setProperty("popPassword", popPassword);
prop.setProperty("popPeriod", "30000");
prop.setProperty("expunge", "false");
```

Remark: The current mechanism does not allow the use of protocol other than POP. The transformation is currently hard-coded it should be interesting to configure it.

**Outgoing destination**

If the destination is used to export Joram's messages to the Email world the following parameters must be set:

- "smtpServer": the DNS name or IP address of the SMTP server;
- "from": the email address of the sender;
- "to", "cc", "bcc": a comma separated list of recipients;
- "subject": the subject of outgoing message;
- "selector": additionally a selector can be added to filter the forwarded messages.

```java
Properties prop = new Properties();
prop.setProperty("smtpServer", smtpServer);
prop.setProperty("to", to);
prop.setProperty("from", from);
prop.setProperty("subject", "JORAM MAIL");
prop.setProperty("selector", "");
```

Remark: The current mechanism does not allow the use of protocol other than SMTP. It could be interesting to allow the overloading of the default sending parameters by message properties.

### Creating the mail queue

A mail queue is created by using the Joram administration API, calling the Queue creation method `create` from the class `org.objectweb.joram.client.jms.Queue`.

```java
Queue queue = Queue.create(0, "mailQueue",
    "com.scalagent.joram.mom.dest.mail.JavaMailQueue",
    prop);
```

This method allow to specify the location server, an internal name, the implementation class and the configuration properties for the new queue.

### Creating the mail topic

A mail topic is created by using the Joram administration API, calling the Topic creation method `create` from the class `org.objectweb.joram.client.jms.Topic`.

```java
Topic topic = Topic.create(0, "mailTopic")
```
This method allows to specify the location server, an internal name, the implementation class and the configuration properties for the new topic.

**Administering a mail destination**

A mail destination can be handled through JMX. The associated MBean allows to watch and change the destination's parameters: add/change/remove the destination email account.

### 4.6.3. Using a mail queue or topic

**Sending a message**

When sending a message to a mail destination we can gently configure the produced email; if the `showProperties` property is defined to true, all properties will be added to the message. Anyway the body of the message will be added (be careful with non text message, it implies the availability server-side of the associated classes.

```java
TextMessage msg = sess.createTextMessage();
msg.setBooleanProperty("showProperties", true);
msg.setText("Queue : Test number "+ i);
producer.send(msg);
```

The above code will result in a multi-part email containing a first part with properties and a second part with the associated text. The email's subject, sender and recipients will be fixed by the configuration properties of the destination.

### 4.6.4. Running the sample

This sample illustrates the use of Joram's Mail destinations. It uses a mail topic to send email to a predefined account, and a mail queue to receive email from this identical account.

This sample configuration is made of a unique server located on "localhost" host. The platform is run in non-persistent mode.

Before to run the sample you must change two properties file defining the mail configuration. Theses files are `pop.properties` and `smtp.properties`, they are located in the `joram/samples/config` directory.
Running the demo: in the joram/samples/src/joram directory.

- Compiling the samples:
  ant clean compile
- Starting the configuration:
  ant reset servers
- Running the administration code: this target creates a TcpConnectionFactory, an 'anonymous' user, a mail topic for outgoing mail and a mail queue for incoming mail.
  ant mail_admin
- Running the producer: this target sends 5 messages on the mail topic. Theses messages will be forwarded using the SMTP protocol to the predefined mail account.
  ant mail_producer
- Running the consumers: this target launches a message listener on the mail queue. At defined interval the queue will scan the mail account to get new email, then forwards them to the listener.
  ant mail_consumer

4.7. Monitoring queue and topic

4.7.1. Introduction

A monitoring destination is a particular destination which allows to receive JMX informations through a JMS message.

It works in 2 modes:

- If the period attribute is set (value greater than 0) the destination periodically scans the selected JMX attributes and generates a message with the value of these attributes.
In the other case the user sends to the destination a message with the list of JMX attributes to scan and the destination fills this message with the value these attributes.

If the destination is a queue each message is delivered to a unique consumer, if it is a topic all subscribers receive it.

This topic is based on JMX monitoring so you must enable JMX monitoring to use it. See JMX administration of Joram in order to do it.

The monitoring queue and topic are available since the Joram 5.2 version.

### 4.7.2. Managing a MonitoringQueue or a MonitoringTopic

#### Setting the parameters

A monitoring destination can be configured at creation time using the `properties` parameter or by any incoming message. The following options are available:

- "period": defines the time in millisecond between two monitoring messages. By default this parameter is set to -1 (no periodic scan of JMX attributes).
- "persistent": tells if periodic produced messages are persistent. Default is false.
- "priority": shows the priority of periodic produced messages. Default value is default JMS priority, 4.
- "expiration": indicates how long the message will live before being considered as expired. Default value is -1 and periodic produced messages never expire.

Additionally, properties are used to indicate the list of JMX attributes that will be monitored. The property key is the name of the MBean and the value is a comma separated list of attributes to monitor for this MBean. The "*" character is allowed to monitor every parameter of the MBean.

Accessing multiple MBeans is possible using wildcard characters, as defined in the `javax.management.ObjectName` class. See here for JDK6 details.

Example at creation time:

```java
Properties properties = new Properties();
properties.put("period", "2000");
properties.put("Joram#0:type=Destination,*", "NbMsgsDeliverSinceCreation,
NbMsgsReceiveSinceCreation, NbMsgsSentToDMQSinceCreation");
properties.put("AgentServer:server=AgentServer#0,cons=Transaction", "*");
```

Example sending a message to the topic:

```java
Message msg = sessionp.createMessage();
msg.setStringProperty("AgentServer:server=AgentServer#0,cons=Transaction",
"LogMemorySize, GarbageRatio");
msg.setLongProperty("period", 10000);
producer.send(msg);
```

#### Creating a MonitoringQueue

A monitoring queue is created by using the Joram administration API, calling the Queue creation method `create` from the class `org.objectweb.joram.client.jms.Queue`.

```java
Queue queue = Queue.create(0, "MonitoringQueue",
Queue.MONITORING_QUEUE,
properties);
```

This method allows to specify the location server, an internal name, the implementation class and the configuration properties for the new queue.
The monitoring queue can also be created as a service in a3servers.xml with default monitoring options and a default name JoramMonitoringQueue.

```xml
<service class="org.objectweb.joram.mom.dest.MonitoringQueue" />
```

And to get the queue:

```java
Queue queue = Queue.create("JoramMonitoringQueue");
```

### Creating a MonitoringTopic

A monitoring topic is created by using the Joram administration API, calling the Topic creation method `create` from the class `org.objectweb.joram.client.jms.Topic`.

```java
Topic topic = Topic.create(0, "MonitoringTopic", Topic.MONITORING_TOPIC, properties);
```

This method allows to specify the location server, an internal name, the implementation class and the configuration properties for the new topic.

The monitoring topic can also be created as a service in a3servers.xml with default monitoring options and a default name JoramMonitoringTopic.

```xml
<service class="org.objectweb.joram.mom.dest.MonitoringTopic" />
```

And to get the topic:

```java
Topic topic = Topic.create("JoramMonitoringTopic");
```

### 4.7.3. Running the sample

The sample shows how to monitor a single queue, it uses the well-known classic sample.

Running the demo: in the joram/samples/src/joram directory.

- Compile the samples:
  ```
  ant clean compile
  ```

- Start the configuration:
  ```
  ant reset single_server
  ```

- Run the administration code of the classic sample. This target creates, configures and registers a ConnectionFactory, an 'anonymous' user, a queue and a topic:
  ```
  ant classic_admin
  ```

- Run the administration code of the monitoring sample. This target creates 2 monitoring destinations, a queue and a topic. The queue is configured to reply to request, the topic is configured to periodically sends JMX information about the queue and topic of the classic sample each 5 seconds.
  ```
  ant monitoring_admin
  ```

- The 'monitoring_monitor' target subscribes to the monitoring topic in order to be notified regularly about the parameters of the queue and the topic.
  ```
  ant monitoring_monitor
  ```

- The " target sends a message to the monitoring queue asking for the parameters of all destinations defined in the server.
  ```
  ant monitoring_diagnose
  ```
In the other hand you can use the ant targets of the classic sample to produce and consume messages on the 2 destinations (see the classic sample).

ant producer
ant consumer

You can launch multiple times the producer and the consumer to see the monitored parameters evolve.

4.8. Collector queue and topic

4.8.1. Introduction

Collector queue and topic are special destinations usable to collect file, object, ....

They can be used to periodically:

- import a file from an URL to a Joram's message and store in this queue.
- import a file from an URL to a Joram's message and forward to each subscribers.

Every message received by the collector destination's will be analysed for new collector options and dropped: it will not be store or forwarded to subscribers.

We provide an URL collector.

The collector queue and topic features are available since the Joram version 5.1.x (x>0).

4.8.2. Managing a Collector destination

Setting the configuration parameters

The options are set using properties at collector queue/topic creation time or by sending a message to the collector queue/topic or by Mbean collector queue/topic component. The following options are available:

- "collector.period": defines the time in millisecond between two wake up the collector. It is set to one minute by default.
- "collector.persistentMessage": tells if messages are persistent. Default is true.
- "collector.expirationMessage": indicates how long the message will live before being considered as expired.
- "collector.type": indicates the type of the generated message. Default is Message.BYTES.
- "collector.ClassName": defines the collector class to be instantiated. The default class is "com.scalagent.joram.mom.dest.collector.URLCollector".
- "collector.url": defines the file to keep and set as body message.

Additionally, properties can be used to indicate specific behaviour. Anything accessible with JMX is available.

Creating the destination

A collector queue/topic is created by using the Joram administration API, calling the Queue/Topic creation method `create from the class` org.objectweb.joram.client.jms.Queue/Topic.

```java
Properties props = new Properties();
prop.setProperty("collector.expirationMessage", "0");
```
prop.setProperty("collector.persistentMessage", "true");
prop.setProperty("collector.period", "300000");
prop.setProperty("collector.type", "" + Message.BYTES);
prop.setProperty("collector.ClassName",
    "com.scalagent.joram.mom.dest.collector.URLCollector");
prop.setProperty("collector.url", url);

Queue queue = Queue.create(0, "CollectorQueue",
    "com.scalagent.joram.mom.dest.CollectorQueue",
    props);

Topic topic = Topic.create(0, "CollectorTopic",
    "com.scalagent.joram.mom.dest.CollectorTopic",
    props);

This method allows to specify the location server, an internal name, the implementation class and
the configuration properties for the new collector queue/topic.

4.8.3. Using a collector destination

Sending a message

Send a message to the collector destination is only used to set new properties.

When destination receive the message, the destination implantation update the properties and
immediately run a new task and schedule a new task.

After update, the message is drop.

msg.setStringProperty("collector.expirationMessage", "0");
msg.setStringProperty("collector.persistentMessage", "true");
msg.setStringProperty("collector.period", "30000");
msg.setStringProperty("collector.url", url);
msg.setStringProperty("collector.type", "" + Message.BYTES);

producer.send(collectorQueue, msg);

Receiving a message

You receive periodically a message containing the file you specify with the URL.

4.8.4. Running the sample

The sample shows how to collect the "http://svn.forge.objectweb.org/cgi-
bin/viewcvs.cgi/*checkout*/joram/trunk/joram/history" file and store in the collector queue.

A consumer consume the message and print the file.

A producer send message to the collector queue to update some properties.

Running the demo: in the joram/samples/src/joram directory.

- Compiling the samples:
  ant clean compile
- Starting the configuration:
Running the administration code: this target creates a ConnectionFactory, an 'anonymous' user and a collector queue.

- \texttt{ant collector_admin}

Running the collector: this target connects to the collector queue in order to be notified regularly about the collected file.

- \texttt{ant collector_consumer}

Running the producer: this target update some properties on the collector queue.

- \texttt{ant collector_producer}

\section{4.9. FTPQueue}

\subsection{4.9.1. Introduction}

FTP queue is special destinations usable to transfer file by FTP.

The sender send the URL information file to the destination FTPQueue. This destination get the file, store in the local directory and generate a message who contain the URI localisation of the file.

The Consumer receive a message who contain the URI localisation of the file.
4.9.2. Managing a FTPQueue

Setting the FTPQueue parameters

The options are set using properties at FTPQueue creation time.

- **user**: the user name for the FTP.
- **pass**: the user password for FTP.
- **path**: the local directory to store the file transferred. Default is the running directory (path=null).
- **ftpImplName**: The implantation of FTP module. We provide tow implantations the first (default \( \text{com.scalagent.joram.mom.dest.ftp.TransferImplRef} \)) is the JDK URL and the second is based on JFTP \( \text{com.scalagent.joram.mom.dest.ftp.TransferImplJftp} \).

The user and pass options are optional, because you can set this information in the sender URL request, like this:

```java
msg.setStringProperty("url", "ftp://user:pass@host/file;type=i");
```

Creating the FTPQueue

A FTPQueue is created by using the Joram administration API, calling the Queue creation method `create` from the class `org.objectweb.joram.client.jms.Queue`.

```java
prop = new Properties();
prop.setProperty("user", "my_FTP_name"); // optional
prop.setProperty("pass", "my_FTP_pass"); // optional
prop.setProperty("path", "the_local_path"); // optional
Queue queue = Queue.create(0, "ftpQueue", "com.scalagent.joram.mom.dest.ftp.FtpQueue", prop);
```

This method allows to specify the location server, an internal name, the implementation class and the configuration properties for the new FTPQueue.
4.9.3. **Using a FTPQueue destination**

**Sending a message**

Specify the fileName and user / password if the administrator don't set.

```java
TextMessage msg = sess.createTextMessage();
msg.setText("transfer " + fileName);
if (user != null && pass != null)
  msg.setStringProperty("url", "ftp://user:pass@host/fileName;type=i");
else
  msg.setStringProperty("url", "ftp://host/fileName;type=i");
msg.setLongProperty("crc", new File(fileName).length());
msg.setBooleanProperty("ack", false);
```

When the FTPQueue destination receive the message, it run a task to get the file specify by the URL and store this file in a local directory. The sending message is drop and a new message containing the URI file location is generate and store in the FTPQueue.

4.9.4. **Running the sample**

The sample shows how to get the “welcome.msg” file from ftp.kernel.org.

**Running the demo:** in the joram/samples/src/joram directory.

- Compiling the samples:
  ```
  ant clean compile
  ```

- Starting the configuration:
  ```
  ant reset single_server
  ```

- Running the administration code: this target creates a ConnectionFactory, an 'anonymous' user and a FTPQueue with user=anonymous and pass=anonymous.
  ```
  ant ftp_admin
  ```

- Running the producer: this target send a message to the FTPQueue with this URL “ftp://ftp.kernel.org/welcome.msg”.
  ```
  ant ftp_producer
  ```

- Running the receiver: this target connects to the FTPQueue and consume the message and print the file URL, crc and ack..
  ```
  ant ftp_receiver
  ```
5. Using SOAP

The Joram client – server protocol may be based on SOAP. This allows clients to rely on HTTP rather than TCP for communicating with a JORAM platform.

The SOAP protocol (more info on [http://www.w3.org/TR/SOAP/](http://www.w3.org/TR/SOAP/)) defines a way to remotely access services methods by exchanging XML messages on HTTP connections. Supporting the SOAP protocol means that:

- server side, a proxy developed as a SOAP service provides an access to SOAP clients;
- client side, a specific client Connection relies on HTTP and XML/SOAP format for writing and routing requests and replies.

The SOAP implementation used by JORAM is Apache's ([http://ws.apache.org/soap/index.html](http://ws.apache.org/soap/index.html)) and works with the servlet container Tomcat ([http://jakarta.apache.org/tomcat/](http://jakarta.apache.org/tomcat/)). Developing a JORAM proxy as a SOAP service led to consider a specific platform configuration with a server running embedded in Tomcat's JVM (Figure 22), and acting as a router between Tomcat and the other servers of the platform.

This document presents how to set a JORAM platform providing an access to SOAP clients, and how to administer it. The configuration of Tomcat for this specific usage is explained in the last section of the doc.
5.1. Platform configuration

5.1.1. Configuration

Though it is possible to have a configuration made of a single embedded server, we will describe the configuration shown on figure 1. It is a reasonable situation, with a server embedded in Tomcat's JVM (server s1), and the s0 server providing a TCP proxy service and hosting a destination.

The following file describes this configuration. Server 0 and server 1 both provide access to external clients through their connection manager service. Server 0 also hosts a TCP proxy service listening on port 16010 and a JNDI service. Server 0 and server 1 accept administrator's connections with identification root – root.

```xml
<?xml version="1.0"?>
<config>
  <domain name="D1"/>
  <server id="0" name="s0" hostname="localhost">
    <network domain="D1" port="16301"/>
    <service class="org.objectweb.joram.mom.proxies.ConnectionManager"
      args="root root"/>
    <service class="org.objectweb.joram.mom.proxies.tcp.TcpProxyService"
      args="16010"/>
    <service class="fr.dyade.aaa.jndi2.server.JndiServer"
      args="16400"/>
  </server>
  <server id="1" name="s1" hostname="localhost">
    <network domain="D1" port="16302"/>
    <service class="org.objectweb.joram.mom.proxies.ConnectionManager"
      args="root root"/>
  </server>
</config>
```

5.1.2. Running the platform

Starting the non embedded server

The non embedded server is started as any normal server (check administration documentation). It should be started in a transaction mode consistent with the embedded server's, that is persistent.

Starting Tomcat

Tomcat's bin/ directory contains the start scripts. Use one of them for starting Tomcat once it is correctly configured (check the installation chapter), and once the appropriate a3servers.xml and a3debug.cfg configuration files have been put in Tomcat's conf/ directory.

Starting the embedded server

The org.objectweb.joram.client.jms.soap.SoapServiceStarter utility class is provided for starting the embedded server. Its main() method takes for parameters the name of the host hosting Tomcat, Tomcat's HTTP port (generally 8080), the embedded server identifier and its name. It causes the instantiation of JORAM's SOAP service by Tomcat and requests the
starting of the embedded server. The embedded server successfully starts if the a3servers.xml platform configuration file has been put in the conf/ directory of Tomcat.

Server 1 of the above configuration would be launched that way:

```
java fr.dyade.aaa.joram.soap.SoapServiceStarter localhost 8080 1 S1
```

5.2. Administering

5.2.1. Introduction

Administering a platform providing a SOAP access is similar to administering a non SOAP platform. A user access must be created on the target server, and an appropriate ConnectionFactory object must be created so that the client will access the embedded server through the SOAP protocol.

5.2.2. Setting a user

Setting a user is done as explained in the administration document:

```
or.org.objectweb.joram.client.jms.admin.User user;
user = org.objectweb.joram.client.jms.admin.User.create("name", "pass", 1);
```

An AdminException is thrown if the user creation fails server side or if the server is not part of the platform. A ConnectException is thrown if the admin connection with the server is closed or lost.

5.2.3. SOAP ConnectionFactory object

SOAP connection factory objects are located in the org.objectweb.joram.client.jms.soap package.

The following creation methods are static methods:

- SoapConnectionFactory.create(String host, int port, int timer):
  - creates a ConnectionFactory instance for accessing a server embedded in a Tomcat JVM running on a given host and listening to a given port, with a given timer value in seconds for pending SOAP connections.

- SoapConnectionFactory.create(int timer):
  - creates a ConnectionFactory instance for accessing a server embedded in the Tomcat JVM the administrator is connected to, with a given timer value in seconds for pending SOAP connections.

```
ConnectionFactory cnxFact =
SoapConnectionFactory.create("localhost", 8080, 60);
```

- QueueSoapConnectionFactory.create(String host, int port, int timer) : creates a QueueConnectionFactory instance for accessing a server embedded in a Tomcat JVM running on a given host and listening to a given port, with a given timer value in seconds for pending SOAP connections.

- QueueSoapConnectionFactory.create(int timer):
  - creates a QueueConnectionFactory instance for accessing a server embedded in the Tomcat JVM the administrator is connected to, with a given timer value in seconds for pending SOAP connections.
javax.jms.QueueConnectionFactory cnxFact =
    admin.createQueueSoapConnectionFactory("localhost", 8080, 60);

- TopicSoapConnectionFactory.create(String host, int port, int timer): creates a TopicConnectionFactory instance for accessing a server embedded in a Tomcat JVM running on a given host and listening to a given port, with a given timer value in seconds for pending SOAP connections.
- CreateTopicSoapConnectionFactory.create(int timer):
  - creates a TopicConnectionFactory instance for accessing a server embedded in the Tomcat JVM the administrator is connected to, with a given timer value in seconds for pending SOAP connections.

javax.jms.TopicConnectionFactory cnxFact =
    admin.createTopicSoapConnectionFactory("localhost", 8080, 60);

### Pending SOAP connections

Contrary to a TCP connection which is opened by a connecting client (calling the ConnectionFactory.createConnection(…)) method), and closed by the closing client (calling the Connection.close() method), the HTTP connection the SOAP connection is based on is opened and closed for each client – platform request / reply exchange. Thus, it is impossible from the server point of view to detect a connection failure. If a given SOAP connection is never closed by the Connection.close() method, its context is kept forever server side, and this could lead to memory leaks.

This is why a timer parameter is set when creating a SOAP ConnectionFactory. It sets the duration in seconds between two “ping” requests sent by the client JMS connection to the server. If the server does not receive any “ping” request during timer * 2 seconds, it acts as it does when detecting a TCP connection failure: the connection’s resources are cleaned, its non acknowledged messages are rolled back, temporary destinations are deleted, temporary subscriptions are removed, etc.

Setting this value to 0 means that no timer is set. Such a factory’s connections never die, this is a dangerous situation.

#### 5.2.4. SOAP administrator

The above administration tasks might be performed by a TCP administrator or a SOAP administrator.

Connecting a TCP administrator to the server 0 of the platform would look like:

```java
AdminModule.connect("localhost", 16010, "root", "root", 60);
```

Connecting a SOAP administrator to the server 1 of the platform looks like:

```java
TopicSoapConnectionFactory cnxFact =
    TopicSoapConnectionFactory.create("localhost", 8080, 60);
AdminModule.connect(cnxFact, "root", "root");
```

#### 5.2.5. Accessing JNDI through SOAP

SOAP administrators and clients also need to access JNDI through the SOAP protocol. This does not change the way JNDI is set in the a3servers.xml configuration file, but the jndi.properties must be modified as follows:

```java
java.naming.factory.initial
    fr.dyade.aaa.jndi2.client.SoapExt_NamingContextFactory
java.naming.factory.soapservice.host localhost
```
This file says that the JNDI server is hosted on localhost and reachable through port 16400, and that SOAP clients access it through the fr.dyade.aaa.jndi2.client.SoapExt_NamingContextFactory class, the servlet container running on localhost and listening on port 8080.

5.3. Configuring Tomcat

The JORAM platform includes a SOAP proxy, accepting connection requests from SOAP clients. This proxy requires the installation and the setting of Apache servlet container, Tomcat.

JORAM has been successfully tested with tomcat-3-3, tomcat-4-0 and tomcat-4-1 and Tomcat-5.0. This section describes how those versions should be configured.

5.3.1. Getting Tomcat

Tomcat can be downloaded from http://jakarta.apache.org/tomcat/. Documentation is available at the same location.

5.3.2. Needed resources

Libraries and configuration files must be added in the Tomcat environment. The jar and war files must be taken from the lib/ directory of your JORAM installation. The configuration files must be taken from the samples/config directory of your JORAM installation.

5.3.3. Configuring Tomcat

**Tomcat 4.1**

- Files to modify in the bin/ directory:
  - catalina.bat or catalina.sh: add the conf/ directory in the classpath building.
- Libraries to add in the common/lib directory:
  - jms.jar,
  - joram-client.jar,
  - joram-shared.jar,
  - joram-mom.jar,
  - ow_monolog.jar.
  - jakarta-regexp-1.2.jar,
  - JCup.jar,
- Files to add in the conf/ directory:
  - a3debug.cfg and a3config.dtd,
  - soap_a3servers.xml renamed a3servers.xml.
- File to add in the webapps/ directory:
  - soap.war.

**Tomcat 5.0**

- Files to modify in the bin/ directory:
  - catalina.bat or catalina.sh: add the conf/ directory in the classpath building.
- Libraries to add in the common/lib directory:
  - jms.jar,
  - joram-client.jar,
  - joram-shared.jar,
  - joram-mom.jar,
  - ow_monolog.jar.
  - jakarta-regexp-1.2.jar,
  - JCup.jar,

- Libraries to add in the shared/lib directory:
  - mail.jar,
  - activation.jar.

- Files to add in the conf/ directory:
  - a3debug.cfg and a3config.dtd,
  - soap_a3servers.xml renamed a3servers.xml.

- File to add in the webapps/ directory:
  - soap.war.

### Tomcat 5.5

- Files to modify in the bin/ directory:
  - catalina.bat or catalina.sh: add the conf/ directory in the classpath building.

- Libraries to add in the shared/lib directory:
  - jms.jar,
  - joram-client.jar,
  - joram-shared.jar,
  - joram-mom.jar,
  - ow_monolog.jar.
  - jakarta-regexp-1.2.jar,
  - JCup.jar,
  - mail.jar,
  - activation.jar.

- Files to add in the conf/ directory:
  - a3debug.cfg and a3config.dtd,
  - soap_a3servers.xml renamed a3servers.xml.

- File to add in the webapps/ directory:
  - soap.war.

### 5.4. Running the Soap Sample

The SOAP samples are a simple message producer and consumer pair. Their goal is to show that JORAM successfully integrates and supports SOAP as an other communication protocol than TCP. Running these samples requires to have installed and configured Apache’s **Tomcat** servlet container (check above).

The following picture illustrates the platform architecture. Server 1 is embedded in **Tomcat**’s JVM and holds the proxy for the SOAP clients. Server 0 runs in an other JVM and hosts the destinations the clients actually interact with.
Running the demo:

- Starting a correctly configured **Tomcat** instance:
  - 4.1/5.0: in *tomcat/bin* remove any remaining persistence directory (*s1/*) and launch *startup.sh* or *startup.bat*.
  - 5.5: in *tomcat/bin* remove any remaining persistence directory (*s1/*) and launch *tomcat.exe*
- Launching the server 0 of the configuration:
  - Under *samples/src/*joram*: *ant soap_server*
- Launching the server 1, embedded in Tomcat’s JVM:
  - Under *samples/src/*joram*: *ant soap_start*
- Running the administration:
  - Under *samples/src/*joram*: *ant soap_admin*
- Launching the consumer:
  - Under *samples/src/*joram*: *ant soap_consumer*
- Launching the producer:
  - Under *samples/src/*joram*: *ant soap_producer*
6. Using a collocated server

6.1. Introduction

A collocated Joram server is a standard Joram server running inside the same process (JVM) as one or more Joram clients. If your Java application needs to start such an embedded server you must configure this server, start it inside your application and connect your JMS clients to it.

A collocated Joram server can be part of a distributed configuration of multiples collocated or not servers, it can eventually be reach by other client through the TCP protocol.

6.2. Configure a collocated server

A collocated server is configured exactly like a non-collocated server, i.e. you don't need to declare any extra services to use a collocated server.

A typical configuration would be:

```xml
<?xml version="1.0"?>
<config>
    <property name="Transaction" value="fr.dyade.aaa.util.NullTransaction"/>
    <server id="0" name="S0" hostname="localhost">
        <service class="org.objectweb.joram.mom.proxies.ConnectionManager"
            args="root root"/>
        <service class="org.objectweb.joram.mom.proxies.tcp.TcpProxyService"
            args="16010"/>
    </server>
</config>
```

Notice that:

- in the above configuration, the collocated server can also be accessed from remote clients through the TCP protocol. If you don't need the TCP access point you can remove the service TcpProxyService.
- you can include a collocated server inside a distributed Joram platform: a collocated server is a server just like any other.

6.3. Start a collocated server

A collocated server must be pro grammatically started inside the same process as your Java client application.

The following code starts the server #0:

```
fr.dyade.aaa.agent.AgentServer.init((short) 0, "./s0", null);
```
The method `init` initializes the server with three parameters:

1. its identifier: 0
2. the directory where its persistent state is stored: `./s0`
3. the monolog logger factory: leave it to `null` if you want the server to configure it itself.

The method `start` actually starts the server.

You can also initialize and start a server by calling the method `AgentServer.main` which aggregates the initialization and the start into a single operation:

```java
String args[] = {"0", "./s0"};
fr.dyade.aaa.agent.AgentServer.main(args);
```

### 6.4. Connect to the collocated server

#### 6.4.1. Create local connections

The class `LocalConnectionFactory` enables you to create local connections to the collocated server:

```java
import org.objectweb.joram.client.jms.local.*;
ConnectionFactory cnxFact = LocalConnectionFactory.create();
```

In the same package you can find several factories that you can use to create more specific connections: `<XA><Topic|Queue>LocalConnectionFactory`.

#### 6.4.2. Connect the administration module

The class `AdminModule` provides a method `collocatedConnect` that must be called before doing administration operations through the collocated server:

```java
import org.objectweb.joram.client.jms.admin.*;
AdminModule.collocatedConnect("root", "root");
```

### 6.5. Stop the collocated server

If you need to stop the collocated server without stopping the entire embedding Java application you must call the method `stop` provided by the class `AgentServer`:

```java
fr.dyade.aaa.agent.AgentServer.stop();
```

You can then restart the server with the following code:

```java
fr.dyade.aaa.agent.AgentServer.start();
```

### 6.6. Start the embedding Java application

You must ensure that the classpath contains:

- the jar files expected by a Joram server: `joram-mom.jar`, `Jcup.jar`, etc.
- the directory where the `a3servers.xml` configuration file is located.
7. High-Availability

7.1. Platform Configuration

A HA Joram server is launched on a cluster of ScalAgent servers. So the configuration of a HA Joram server implies to configure a clustered ScalAgent server.

7.1.1. Clustered ScalAgent server configuration

A clustered ScalAgent server is defined by the element “cluster”. A cluster owns an identifier and a name defined by the attributes “id” and “name” (exactly like a standard server). Two properties must be defined:

- “Engine” must be set to “fr.dyade.aaa.agent.HAEngine” which is the class name of the engine that provides high availability (set by default in a next version).
- “nbClusterExpected” defines the number of replicas that must be connected to the group communication channel used before this replica starts.

```xml
<?xml version="1.0"?>
<config>
  <domain name="D1"/>
  <cluster id="0" name="s0">
    <property name="Engine" value="fr.dyade.aaa.agent.HAEngine"/>
    <property name="nbClusterExpected" value="3"/>
  </cluster>
  <server id="0" hostname="localhost">
    <network domain="D1" port="16301"/>
  </server>
  <server id="1" hostname="localhost">
    <network domain="D1" port="16302"/>
  </server>
  <server id="2" hostname="localhost">
    <network domain="D1" port="16303"/>
  </server>
</config>
```

For each replica an element “server” must be added. The attribute “id” defines the identifier of the replica inside the cluster. The attribute “hostname” gives the address of the host where the replica is running. A server replica is defined exactly like a standard server. For example this one owns a network and two services. The network is used by the replica to communicate with external agent servers, i.e. servers located outside of the cluster and not replicas.

```xml
<server id="0" hostname="localhost">
  <network domain="D1" port="16301"/>
</server>
```

Two other replicas are defined in the clustered ScalAgent server s0. Notice that they define their network with a different port value because they work on the same host (localhost).

```xml
<server id="1" hostname="localhost">
  <network domain="D1" port="16302"/>
</server>
<server id="2" hostname="localhost">
  <network domain="D1" port="16303"/>
</server>
</cluster>
</config>
```
7.1.2. Group communication

There are two properties to configure the address and the port of the IP multicast used by JGroups: JGroups.MCastAddr and JGroups.McastPort.

The group communication semantic configuration requires to understand exactly how the replication algorithm works. However, you can change the Jgroups protocol stack using the JGroupsProps property; its default value is:

```
UDP(mcast_addr=224.0.0.35;mcast_port=25566;ip_ttl=32;mcast_send_buf_size=150000;mcast_recv_buf_size=80000);PING(timeout=2000;num_initial_members=3);MERGE2(min_interval=5000;max_interval=10000);FD.SOCK;VERIFY_SUSPECT(timeout=1500);pbcast.NAKACK(gc_lag=50;retransmit_timeout=300,600,1200,2400,4800);UNICAST(timeout=5000);pbcast.STABLE(desired_avg_gossip=20000);FRAG(frag_size=4096;down_thread=false;up_thread=false);pbcast.GMS(join_timeout=5000;join_retry_timeout=2000;shun=false;print_local_addr=true)
```

7.1.3. Joram server configuration

A Joram server is started by a ScalAgent service called “ConnectionManager” (see Joram documentation).

```
<service class="org.objectweb.joram.mom.proxies.ConnectionManager"
args="root root"/>
```

This service must be added to all the replicas. Some more services can be added to each replicas according to the entry points needed by the clients: Tcp, Soap and collocated.

**TCP entry point**

The service “TcpProxyService” starts a TCP entry point to the Joram server.

```
<service class="org.objectweb.joram.mom.proxies.tcp.TcpProxyService"
args="2560"/>
```

**Soap entry point**

*Not yet available (in HA mode)*

**Collocated entry point**

The service “HALocalConnection” provides a collocated entry point to the replica which is the master. On the other replicas, this service blocks the collocated connections until the local replica becomes the master.

```
<serviceclass="org.objectweb.joram.client.jms.ha.local.HALocalConnection"/>
```

**Configuration example**

The following configuration defines a HA Joram server “s0” that provides two entry points: Tcp and collocated. It is replicated three times on the same host (localhost).

```
<config>
<domain name="D1"/>
<cluster id="0" name="s0">
<property name="Engine" value="fr.dyade.aaa.agent.HAEngine"/>
<property name="nbClusterExpected" value="3"/>
<server id="0" hostname="localhost">
<network domain="D1" port="16301"/>
<service class="org.objectweb.joram.mom.proxies.ConnectionManager"
args="root root"/>
```

7.2. **Platform startup**

A server replica is started exactly like a standard agent server. The arguments are:

- server id: identifier of the clustered server (not the identifier of the replica)
- storage directory path: path of the directory where the persistence files are created
- replica id: identifier of the replica inside the clustered server

```
java fr.dyade.aaa.agent.AgentServer <server id> <storage directory path> <replica id>
```

The replicas can be started in any order. The first master replica elected is the first replica connected to the group communication channel.

7.2.1. **Host clock synchronization**

The clocks of the hosts from the cluster should be quite synchronized if the “heart beat” feature is used.

7.3. **Programming an external HA Joram client**

The only available protocol for an external client is TCP. *The protocol Soap is not yet available.*
7.3.1. Joram administration

Create a connection factory

There are several types of HA TCP connection factory depending on the destination reached (generic, queue or topic) and the transactional mode (XA or none):

- `<XA|none><Queue|Topic|none>HATcpConnectionFactory`

These connection factories belong to the package `org.objectweb.joram.client.jms.ha.tcp`. To instantiate a connection factory, call the static method `create` defined in the class of the connection factory to instantiate. A parameter must be given specifying the URL of the HA Joram server. This URL defines the list of the TCP entry points owned by each replicas of the HA Joram server.

For example to create a generic (neither Queue nor Topic, unified JMS1.1) non-transactional (no XA) connection factory you need to call:

```java
ConnectionFactory cf;

```

Configure the connection factory

It is also necessary to set the `connectionTimer` of the connection according to the switching time required by the Joram server cluster, i.e. the delay needed to elect a new master replica and to activate it. If the `connectionTimer` is too short, then the external client may not be able to connect to the new master replica. So the failure of a Joram server replica may break the HA connection between the external client and the HA Joram server.

```java
```

7.3.2. JMS programming

The JMS programming is completely standard. A HA server behaves exactly the same as a standard server. However there is a slight difference about the naming of the destination. Just like with a standard Joram, you can choose to use JNDI or the internal Joram naming. But if you use JNDI then you have to configure a replicated JNDI server. This operation is available but not documented here as it is simpler to use the Joram internal naming.

7.4. Programming a collocated Joram client

7.4.1. Joram administration

Create a connection factory

There are several types of HA local connection factory depending on the destination reached (generic, queue or topic) and the transactional mode (XA or none):

- `<XA|none><Queue|Topic|none>HALocalConnectionFactory`

These connection factories belong to the package `org.objectweb.joram.client.jms.ha.local`. To instantiate a connection factory, call the static method `create` defined in the class of the connection factory to instantiate.
For example to create a generic (not Queue either Topic) non-transactional (no XA) connection factory you need to call:

```java
ConnectionFactory cf;

cf = org.objectweb.joram.client.jms.ha.local.HALocalConnectionFactory.create();
```

### 7.4.2. Collocated client process

A collocated client must be instantiated inside the same JVM processes as the Joram server replicas. It also must use the same class loader (or a child) as the server’s class loader. A simple way to do this is to write a main class that starts an agent server replica and then creates one or more HA local connections.

In the following code example, an unified non-transactional (not XA) connection is opened. It is important to notice that the connection creation blocks until the server replica becomes master.

```java
public static void main(String[] args) throws Exception {
    ConnectionFactory cf;
    AgentServer.init(args);
    AgentServer.start();
    cf = org.objectweb.joram.client.jms.ha.local.HALocalConnectionFactory.create();

    // The next line blocks until the server replica becomes master
    Connection cnx = cf.createConnection("root", "root");
}
```

### 7.4.3. JMS programming

The JMS programming is completely standard. A HA server behaves exactly the same as a standard server. However there is a slight difference about the naming of the destination. Just like with a standard Joram, you can choose to use JNDI or the internal Joram naming. But if you use JNDI then you have to configure a replicated JNDI server. This operation is available but not documented here as it is simpler to use the Joram internal naming.

### 7.5. Running the “Joram H.A.” Sample

This sample illustrates the use of a Joram's H.A platform.

This sample configuration is made of a cluster of three servers. The platform is run in non-persistent mode as the reliability is provided by the replication mechanism. The provided configuration locates all three servers on “localhost” host.

Running the demo:

- Cleans and compiles:
  
  ```
  ant clean compile
  ```

- Resets the run directory, then starts 2 replicas:
  
  ```
  ant reset
  ant ha_server0
  ant ha_server1
  ```

- Runs the administration code: `ant ha_admin`
  
  - This target creates a user and a topic.
- Runs the subscriber using the target `ha_sub`.
  - This target launches a message consumer that indefinitely consumes messages on the corresponding topic.
- Runs the publisher using the target `ha_pub`.
  - This target launches a message producer that sends 1000 messages to the corresponding topic.

In order to view the high-availability mechanism we can play the scenario below:

- Starts the replica #2:
  
  ```
  ant ha_server2
  ```
  
The replica is initialized from the state of the master, the user and the topic are replicated.

- Stops the replica #0 (master), the replica #1 becomes the master, each client automatically reconnects to the new master and the application continue.

- Stops the replica #1, the replica #2 cannot be elected as the replication degree is not ensured. The application is frozen.

- Starts the replica #0
  
  ```
  ant ha_server0
  ```
  
The server is initialized from the state of the master, the user and the topic are replicated. The application restarts.
8. JNDI

8.1. Overview

The goals of the ScalAgent JNDI are to distribute and replicate the naming contexts among various servers in order to provide load balancing and fail over.

The chosen replication follows the master-copy scheme. The master copies are distributed among the servers. The following figure gives an overview of the ScalAgent JNDI architecture. The client sends requests to a server that may communicate with one or more servers of the JNDI configuration. This communication is handled by a control layer responsible for distribution and replication built on top of the ScalAgent platform.

8.2. Replication

8.2.1. Master ownership strategy

The naming contexts are replicated with a master copy replication scheme. Each naming context has one unique master server. Only the master can update the primary copy of the naming context. All other replicas are read-only. Other servers wanting to update the context (bind, rebind, create/destroySubcontext) request the master to do the update.
8.2.2. **Lazy propagation strategy**

All updates emanate from the master copy of a naming context. The updates are propagated in a lazy way. The master copy is updated in a local transaction that updates the copy and broadcasts the updating notifications to the replicas. Those updates are asynchronously propagated and performed in a separate transaction for each server.

8.2.3. **Replicas synchronization**

Once a client has done several write requests, he may see different naming data depending on the requested server because updates are asynchronous. The resulting errors are: name not found and stale (out of date) data.
However an explicit synchronization operation for a specific naming context (as described above) could be provided in a JNDI extension interface, enabling the client to get the latest naming data. This extension is still not available.

8.3. Distribution of the naming servers

The naming servers are completely interconnected through the ScalAgent platform. A server owns two entry points: a TCP entry point through which client requests are transmitted and an Agent entry point used to send and receive notifications from the other servers (request forwards, replica updates …).

The following figure displays a JNDI distributed configuration that includes 4 servers.

A new naming server is added into a JNDI configuration by assigning it one or more references of other servers already included into the configuration. When a naming server discovers another server, it sends to it an initialization notification containing its master copies and a list of the known servers. In this way a server discovers all the servers of a JNDI configuration.

The following figure displays a sequence diagram of the entrance of a new server into a JNDI configuration. The new server S3 initially knows S1, so it sends to it an initialization notification containing its master copies contexts[S3]. S1 replies with its contexts[S1] and the reference of the server S2. S3 stores the contexts[S1] as replicas, registers the reference of S2 and sends to it an initialization notification.
A JNDI configuration is wholly replicated. All the servers contain the same (differed) naming data. Some replication groups could be defined in order to reduce the number of updates.

The servers are implemented with the ScalAgent programming model which is asynchronous and reliable. This model is particularly well adapted for the loose coupling of a lazy replication strategy. Moreover this model simply controls the isolation by serializing the operations performed by a server.

### 8.4. Distribution of the naming contexts

#### 8.4.1. Context creation

When a server (called “local”) creates a subcontext of a naming context which master copy is owned by a remote server, it must ask the remote server to create the subcontext. But this subcontext is owned by the server that initiates the creation. So the master copy of this new context belongs to the local server.

#### 8.4.2. Context name resolution

A naming context is accessed by its name which is a path leading from the root naming context to the final name of the context.

Names are not resolved from their path but directly using an index that returns the identifier of the context from its name. In this way a server can handle JNDI requests which path cannot be resolved because of missing intermediate contexts (still not initialized), but which final context locally exists.

This feature is useful if a naming server is started whereas there is a network partition that prevents it from getting the root context. But it can receive some contexts from local surrounding servers and immediately begin to reply to its clients.

### 8.5. Configuration

A ScalAgent JNDI configuration gathers several JNDI servers. Each server is defined as a ScalAgent service. The class name is `DistributedJndiServer` from the package `fr.dyade.aaa.jndi2.distributed`. The argument line has the following syntax:

```
<listening port> <root owner id> [ <server id> ... ]
```

- **listening port:** the port used by the JNDI server to listen to clients requests
- **root owner id:** the identifier of the JNDI server that owns the root naming context
server id: the identifier of a JNDI server

- The listening port and the root owner identifier are mandatory. The list of server identifiers is optional.

A server needs to know the identifier of the root owner in order to compare this identifier with its own identifier. If it is the same, it means that the server is the root owner and must initially create the root naming context. If it is not the same, it means that the server is not the root owner and must register itself with the root owner in order to receive the copies of the naming data owned by the root owner.

The list of JNDI server identifiers is optional. It is useful if the root owner server is not available. In this case the naming data owned by those servers may be accessed (read and write) even if the root server is not available.

The following configuration includes three JNDI servers:

```xml
<?xml version="1.0"?>
<!DOCTYPE config SYSTEM "a3config.dtd">
<config>
  <domain name="D0" network="fr.dyade.aaa.agent.SingleCnxNetwork"/>
  <server id="0" name="s0" hostname="localhost">
    <network domain="D0" port="27300"/>
    <service class="fr.dyade.aaa.jndi2.distributed.DistributedJndiServer" args="16400"/>
  </server>
  <server id="1" name="s1" hostname="localhost">
    <network domain="D0" port="27301"/>
    <service class="fr.dyade.aaa.jndi2.distributed.DistributedJndiServer" args="16401 0"/>
  </server>
  <server id="2" name="s2" hostname="localhost">
    <network domain="D0" port="27302"/>
    <service class="fr.dyade.aaa.jndi2.distributed.DistributedJndiServer" args="16402 0 1"/>
  </server>
</config>
```

![Figure 29 - A 3 servers configuration](image)

The server 0 is the root owner (note that it could have another identifier), the server 1 only knows the root owner server and the server 2 knows both 0 and 1. In this way, if the server 0 is not available when the server 2 starts, it can get the naming data owned by the server 1 anyway.

Let's say that the servers 0 and 1 are first started. The client 0 asks the server 0 to create a subcontext A in the root context. Then the client 1 creates the context B in A. Notice that if the
client 1 creates B before the server 1 received the naming data from the server 0, the request is blocked. When the server 1 receives the copy of A, it retries all the requests waiting for this context (e.g. the creation of B).

If the server 2 is started when the server 0 is unavailable, it can’t receive the naming context A. So the client 1 can’t do any requests (read and write) in the context A. But the server 2 knows the server 1 so its receives the naming data owned by server 1 (context B). So the client 2 can do a request in B, e.g. create a sub context C.

The following figure shows the final states of the JNDI servers once the previous scenario has been executed. The server 2 will get the naming data from server 0 as soon as it is available. At this time the server 0 will also get the naming data owned by server 2 (context C).

### 8.6. Loose coupling configuration

In some cases it can be useful to inhibit the coherency mechanism. The default configuration of the distributed JNDI implies a master / slave behaviour: each JNDI context is controlled by a single server and this server must be alive and reachable in order to allow an insertion or a modification. Setting the `fr.dyade.aaa.jndi2.impl.LooseCoupling` property true allows to inhibit the master / slave behaviour, this property can be set either as a Java environment variable or in the a3servers.xml configuration file (see below).

```
<property name="fr.dyade.aaa.jndi2.impl.LooseCoupling" value="true" />
```
9. Joram in JBoss

This chapter describes how to connect JBoss to a Joram server.

This documentation has been tested with JBoss 4.0.1 and Joram 4.3.14.

9.1. Joram installation

You can either install Joram as a set of Jars or as a single RAR.

9.1.1. Libraries Joram JARs

Copy the following JARS into the directory jboss/server/<server name>/lib:

- joram/ship/lib/JCup.jar
- joram/ship/lib/ow_monolog.jar
- joram/ship/lib/joram-shared.jar
- joram/ship/lib/joram-client.jar
- joram/ship/lib/joram-config.jar

These JARs enables JBoss to be a client of a remote Joram server.

If you need to start an embedded Joram server into JBoss then you have to use the RAR.

9.1.2. Connector Joram RAR

If the Joram server is embedded into Jboss choose the exhaustive connector joram.rar (built with the Ant target ship.adapter).

If the Joram server is remote then choose the remote connector joram.rar (built with the Ant target ship.remoteadapter).

Copy the Joram RAR into the directory jboss/server/<server name>/deploy/joram:

- joram/ship/joram.rar

9.2. MDB activation

There are two ways to activate the MDBs:

- JMSClusterInvoker
- JCA ActivationSpec
9.2.1. **JMSContainerInvoker**

This container implements the JMS ASF interfaces (ServerSession and ServerSessionPool) in order to activate MDBs. It also provides some more activation features like the reconnection to the JMS server or the maximum delivery number.

First, link the MDB to an invoker called “joram-mdb-invoker” in the deployment descriptor jboss.xml:

```xml
<message-driven>
  <ejb-name>MyMDB</ejb-name>
  <destination-jndi-name>myDestination</destination-jndi-name>
  <invoker-bindings>
    <invoker>
      <invoker-proxy-binding-name>joram-mdb-invoker</invoker-proxy-binding-name>
    </invoker>
  </invoker-bindings>
</message-driven>
```

Then define the invoker into the JBoss configuration file jboss/server/<servername>/conf/standardjboss.xml.

```xml
<invoker-proxy-bindings>
  ...
  <invoker-proxy-binding>
    <name>joram-mdb-invoker</name>
    <invoker-mbean>does-not-matter</invoker-mbean>
    <proxy-factory>
      org.jboss.ejb.plugins.jms.JMSContainerInvoker
    </proxy-factory>
  </invoker-proxy-binding>
</invoker-proxy-bindings>
```

```xml
< MDBConfig >
  < ReconnectIntervalSec >10</ ReconnectIntervalSec >
  < DLQConfig >
    < DestinationQueue > collector-converter-queue </ DestinationQueue >
    < MaxTimesRedelivered > 10 </ MaxTimesRedelivered >
    < TimeToLive > 0 </ TimeToLive >
  </ DLQConfig >
</ MDBConfig >
```
The next step is to define the JMS provider “JoramJMSProvider” in the file jboss/server/<server name>/jms/joram-jms-ds.xml

<server>
  ...
  <mbean code="org.jboss.jms.jndi.JMSProviderLoader"
    name="jboss.mq:service=JoramJMSProviderLoader,name=JoramJMSProvider">
    <attribute name="ProviderName">JoramJMSProvider</attribute>
    <attribute name="ProviderAdapterClass">org.jboss.jms.jndi.JNDIProviderAdapter</attribute>
    <attribute name="FactoryRef">JoramXAConnectionFactory</attribute>
    <attribute name="QueueFactoryRef">JoramXAQueueConnectionFactory</attribute>
    <attribute name="TopicFactoryRef">JoramXATopicConnectionFactory</attribute>
    <attribute name="Properties">
      java.naming.factory.initial=fr.dyade.aaa.jndi2.client.NamingContextFactory
      java.naming.factory.host=localhost
      java.naming.factory.port=16400
    </attribute>
  </mbean>
</server>

It relies on the use of XA connection factories which are resolved through the Joram JNDI. These factories must have been created and bound into Joram JNDI before starting the Jboss server.

You can create and bind these factories either manually with the Joram administration GUI (JAMT) or automatically with the XML file joramAdmin.xml.

JoramAdmin.xml example:

<ConnectionFactory
  className="org.objectweb.joram.client.jms.tcp.XATcpConnectionFactory">
  <tcp host="localhost"
       port="16010"/>
  <jndi name="JoramXAConnectionFactory"/>
</ConnectionFactory>

<ConnectionFactory
  className="org.objectweb.joram.client.jms.tcp.XATopicTcpConnectionFactory">
  <tcp host="localhost"
       port="16010"/>
  <jndi name="JoramXATopicConnectionFactory"/>
</ConnectionFactory>

<ConnectionFactory
  className="org.objectweb.joram.client.jms.tcp.XAQueueTcpConnectionFactory">
  <tcp host="localhost"
       port="16010"/>
  <jndi name="JoramXAQueueConnectionFactory"/>
</ConnectionFactory>
Remarks:

• The default user/password is chosen by Joram connection factories: anonymous/anonymous. It seems that the JMSSContainerInvoker doesn't allow to modify the user identity.

9.2.2. Joram ActivationSpec

The JCA ActivationSpec is implemented by Joram resource connector (RAR). It provides the same basic functionalities as the JMSSContainerInvoker, i.e. threads and sessions pooling. The difference is that the ASF interfaces are implemented by the JCA connector and that the activation mechanisms (and roles) are specified by the JCA API.

It implies that you installed Joram with its RAR (exhaustive or remote) and not with the JARs.

However notice that the Jboss specific features (provided by the JMSSContainerInvoker) are not provided by the JCA ActivationSpec. For example the reconnection policy is currently not implemented by Joram connector. The DLQ mechanism is provided by Joram but is configured in another way.

First, link the MDB to an invoker called “joram-mdb-invoker” in the deployment descriptor jboss.xml:

```xml
<message-driven>
  <ejb-name>MyMDB</ejb-name>
  <destination-jndi-name>myDestination</destination-jndi-name>
  <resource-adapter-name>joram.rar</resource-adapter-name>
  <invoker-bindings>
    <invoker>
      <invoker-proxy-binding-name>joram-mdb-invoker</invoker-proxy-binding-name>
    </invoker>
  </invoker-bindings>
</message-driven>
```

The resource adapter used to activate the MDB is defined in the file jboss.xml.

Then define the invoker into the JBoss configuration file jboss/server/<server name>/conf/standardjboss.xml:

```xml
<invoker-proxy-binding>
  <name>joram-mdb-invoker</name>
  <invoker-mbean>default</invoker-mbean>
  <proxy-factory>
    org.jboss.ejb.plugins.inflow.JBossJMSMessageEndpointFactory
  </proxy-factory>
  <activation-config>
    <activation-config>
```

port="16010"/>
<jndi name="JoramXAQueueConnectionFactory"/>
</ConnectionFactory>

Remarks:

• The default user/password is chosen by Joram connection factories: anonymous/anonymous. It seems that the JMSSContainerInvoker doesn't allow to modify the user identity.
... 
</activation-config>
<endpoint-interceptors>
    <interceptor>org.jboss.proxy.ClientMethodInterceptor</interceptor>
    <interceptor>org.jboss.ejb.plugins.inflow.MessageEndpointInterceptor</interceptor>
    <interceptor>org.jboss.proxy.TransactionInterceptor</interceptor>
    <interceptor>org.jboss.invocation.InvokerInterceptor</interceptor>
</endpoint-interceptors>
</proxy-factory-config>
</invoker-proxy-binding>

The activation-config can be defined above or/and can be overridden into the MDB deployment descriptor ejb-jar.xml.

<activation-config-property>
    <activation-config-property-name>destinationType</activation-config-property-name>
    <activation-config-property-value>javax.jms.Topic</activation-config-property-value>
</activation-config-property>
<activation-config-property>
    <activation-config-property-name>messageSelector</activation-config-property-name>
    <activation-config-property-value></activation-config-property-value>
</activation-config-property>
<activation-config-property>
    <activation-config-property-name>acknowledgeMode</activation-config-property-name>
    <activation-config-property-value>Auto-acknowledge</activation-config-property-value>
</activation-config-property>
<activation-config-property>
    <activation-config-property-name>subscriptionName</activation-config-property-name>
    <activation-config-property-value>mySubscription</activation-config-property-value>
</activation-config-property>
<activation-config-property>
    <activation-config-property-name>subscriptionDurability</activation-config-property-name>
    <activation-config-property-value>Durable</activation-config-property-value>
</activation-config-property>
<activation-config-property>
  <activation-config-property-name>
    maxNumberOfWorks
  </activation-config-property-name>
  <activation-config-property-value>
    0
  </activation-config-property-value>
</activation-config-property>

<activation-config-property>
  <activation-config-property-name>
    userName
  </activation-config-property-name>
  <activation-config-property-value>
    foo
  </activation-config-property-value>
</activation-config-property>

<activation-config-property>
  <activation-config-property-name>
    password
  </activation-config-property-name>
  <activation-config-property-value>
    foo
  </activation-config-property-value>
</activation-config-property>

Remarks:

• The property 'maxMessages' is currently not provided by Joram connector (always set to 1).

• The property 'maxNumberOfWorks' is actually the maximum number of sessions (maxSessions) allowed in the pool.

9.2.3. Jboss ActivationSpec

The Jboss JCA connector can be used on top of a Joram client.

You just have to configure the MDB to be activated by the jms-ra.rar adapter and add the following property in the activation configuration:

<activation-config-property>
  <activation-config-property-name>
    providerAdapterJNDI
  </activation-config-property-name>
  <activation-config-property-value>
    JoramJMSProvider
  </activation-config-property-value>
</activation-config-property>

9.3. Send and receive JMS messages

If you need to send and receive (explicitly, in a synchronous way) JMS messages then you have to get a connection factory.
There are several ways to get a Joram connection factory. You can get a non-managed one by simply querying the Joram JNDI. You can also get a managed connection factory, i.e. A connection factory that handles a pool of connections.

A Joram connection can be managed by the Jboss connector or by the Joram connector.

### 9.3.1. Jboss managing Joram connections

You can define in the file deploy/jms/joram-jms-ds.xml an XA connection factory called “JoramJmsXA”. This is a Jboss managed connection factory (it uses Jboss jms-ra.rar). But it actually uses Joram as specified by the property ‘JmsProviderAdapterJNDI’.

```xml
<tx-connection-factory>
  <jndi-name>JoramJmsXA</jndi-name>
  <xa-transaction/>
  <track-connection-by-tx/>
  <rar-name>jms-ra.rar</rar-name>
  <connection-definition>
    org.jboss.resource.adapter.jms.JmsConnectionFactory
  </connection-definition>
  <config-property name="SessionDefaultType" type="java.lang.String">javax.jms.Topic</config-property>
  <config-property name="JmsProviderAdapterJNDI" type="java.lang.String">java:/JoramJMSProvider</config-property>
  <config-property name="UserName" type="java.lang.String">sqp</config-property>
  <config-property name="Password" type="java.lang.String">sqp</config-property>
  <max-pool-size>20</max-pool-size>
</tx-connection-factory>
```

### 9.3.2. Joram managed connection factory

You can define in the file deploy/jms/joram-jms-ds.xml an XA connection factory called “JoramJmsXA”. This is a Joram managed connection factory (it uses joram.rar).

```xml
<tx-connection-factory>
  <jndi-name>JoramJmsXA</jndi-name>
  <xa-transaction/>
  <track-connection-by-tx/>
  <rar-name>joram.rar</rar-name>
  <connection-definition>
    javax.jms.ConnectionFactory
  </connection-definition>
  <config-property name="UserName" type="java.lang.String">sqp</config-property>
  <config-property name="Password" type="java.lang.String">sqp</config-property>
  <max-pool-size>20</max-pool-size>
</tx-connection-factory>
```
9.3.3. **Resolving the connection factory**

You can resolve this connection factory with the following line code in your EJB:

```
ConnectionFactory cf = (ConnectionFactory)ctx.lookup("java:/JoramJmsXA");
```

9.3.4. **Resolving the destinations**

If the destinations have been bound into the Joram JNDI then you have to mount it into Jboss JNDI. The file `deploy/joram/joram-service.xml` defines a Joram JNDI external context.

```
<server>
...

<mbean code="org.jboss.naming.ExternalContext"
    name="jboss.jndi:service=ExternalContext,jndiName=external/joram">
    <attribute name="JndiName">external/joram</attribute>
    <attribute name="CacheContext">true</attribute>
    <attribute name="Properties">
        java.naming.factory.initial=fr.dyade.aaa.jndi2.client.NamingContextFactory
        java.naming.factory.host=localhost
        java.naming.factory.port=16400
    </attribute>
    <attribute name="InitialContext">javax.naming.InitialContext</attribute>
    <attribute name="RemoteAccess">true</attribute>
</mbean>
```

Remark:

- If you installed Joram with the RAR then you will have to add the Joram JNDI client JAR into jboss libraries. If you installed Joram with the JARs then the JNDI client is already packaged into joram-client.jar.

If the destination is bound in Joram JNDI with the name 'myDestination' (at the root context) then you can resolve it with the following code line:

```
Queue q = (Queue)ctx.lookup("/external/joram/myDestination");
```
10. Using Joram in WebLogic

This chapter describes how to use a Joram server with a BEA WebLogic server, it has been tested with WebLogic 9.2 MP2 and Joram 4.3.32.

10.1. Integrating WebLogic server with Joram

This chapter shows how to create a new WebLogic domain and to connect it to a Joram’s JMS provider.

10.1.1. Installation

Create a simple WebLogic domain by using the wizard:

- Click Start > All Programs > BEA Products > tools > Configuration Wizard.
- The first form of the wizard allows to create a new domain or to extend an existing one. Choose Create a new WebLogic domain (default choice) then click the Next button.
- In the next form choose Generate a domain configured automatically to support the following BEA products, keep all the default options (see figure below) then click the Next button.
The next form asks you to configure the administrator role. Enter the user name and password then click the **Next** button.

The following form allows to configure server start mode and JDK: choose **Development mode** in the left pane, and select a JDK in the list of the right pane.
The next form (see figure above) allows to customize environment and services settings of the created domain. Select No then click the Next button.

The last form will create the WebLogic domain. Enter the name and the location where you want to install the server, in our example the domain name is `<DOMAIN_NAME>` ('`base_domain`' in our example) and the base directory `<DOMAIN_DIR>` ('`G:\bea\user_projects\domains`' in the example) then click the Create button.
After the above command has completed click the **Done** button, then execute the following actions:

1. Create the directory `<DOMAIN_DIR>\<DOMAIN_NAME>\lib\joram`.
   - In our example ‘G:\bea\user_projects\domains\base_domain\lib\joram’.
2. Unzip the file `joram.rar` in the created directory.
3. Edit the file `<DOMAIN_DIR>\<DOMAIN_NAME>\lib\joram\META-INF\MANIFEST.MF` file and remove the following lines:
   
   ```
   Implementation-Title: Joram
   Implementation-Version: 5.0.6
   Implementation-Vendor: ScalAgent D.T.
   Specification-Version: 1.1
   ```

4. Copy the following files needed for Joram administration in the directory `<DOMAIN_DIR>\<DOMAIN_NAME>`.
   1. `a3config.dtd`
   2. `a3debug.cfg`
   3. `a3servers.xml`
   4. `joramAdmin.xml`

   You are now ready to start the Joram server in WebLogic.

### 10.1.2. Administration and Deployment

Start the new WebLogic domain:

- Click **Start > All Programs > BEA Products > User Projects** > `<DOMAIN_NAME>`. Then connect to the administration console with your usual browser:
- Connect to [http://localhost:7001/console/console.portal](http://localhost:7001/console/console.portal), enter the user name and password defined at the previous stage, then click **Log In**.
  - In the **Domain Configurations** panel select **Deployments** (under **Your Deployed Resources** subtitle).
  - Click **Lock & Edit** button in the left panel of the Administration Console.
  - Then in the **Control** tab pane of the right panel (**Summary of Deployments**) click the **Install** button; the right panel displays the **Install Application Assistant** (figure below).

  ![Install Application Assistant](image)

- In the Right panel select the file path of the created domain:
  - `<DOMAIN_DIR><DOMAIN_NAME>` directory.
  - In our example `G:\bea\user_projects\domains\base_domain\lib` directory.
  - Then select joram, and click **Next**.

- In the next form choose “**Install this deployment as an application**” then click **Next**.
- The next form (see figure below) allows to fix optional settings, accept the defaults clicking **Next**, Then click **Finish**.
● The right panel displays basic information about the resource adapter deployment, click the **Activate Change** button in the left panel.

● In the right panel a message indicates "All changes have been activated. No restarts are necessary", at the top of this panel select **Summary of Deployments** in the path **Home > Summary of Deployments > joram**.

● The right panel displays (see Figure below) a summary of all modules that have been installed to this domain, select **joram** then click the **Start > servicing all requests** button.

● A confirmation is asked click the **Yes** button.
In the right panel a message indicates "Start requests have been sent to the selected Deployments". The Joram Resource Adapter is now Active, we will try to test it.

In the control tabpane select select joram.

The right panel now displays a summary of settings for the joram Deployments, choose the testing tab (see figure below), then select each outbound connection in the list and click the Test button. Normally the 'Test Result' column should display 'Passed' for each outbound connection.
In order to allow a MDB to consume from a remote JMS provider we have to configure it with foreign JMS server definitions. We will now create a Foreign Server in "JMS Module" to wrap foreign factories and destinations.

You do use wrappers, specify the Foreign Connection Factory and the Foreign Destination you set up in your local JNDI tree that corresponds the foreign JMS provider's connection factory.

- In the right panel the history path is displayed at the top of this panel: Home > Summary of Deployments > joram..., select home.
- In the Domain Configurations panel select JMS Modules (under Messaging subtitle).
- The next page summarizes the JMS system resources of the domain, click the Lock & Edit button in the left panel, then click the New button in the JMS Modules panel.
- The next page (figure below) shows the creation of a new JMS System Module Resource. Specify a name (SMJoram in our example) for the module then click the Next button.
Creation of a new JMS module

- Follow the wizard selecting AdminServer then click the Finish button. At the top of the right panel a message indicates “The JMS module was created successfully”.

- The messages at the top of the right panel indicates “All changes have been activated. No restarts are necessary”. In the JMS Modules array select the created JMS Module (SMJoram) then click the Lock & Edit button in the left panel.

- The next page displays information about the JMS Module and its resources, in the right panel click the New button in Summary of Resources.

- In the new window select “Foreign Server” (see Figure below) and click the Next button.

- Give the name of the module you want to create (ForeignServer-Joram in our example) then click again the Next button, then the Finish one.

- The next page displays the message “The foreign server was created successfully”, click the Activate Change button in the left pane.
Configuration of a JMS module – step 1

The next view resumes the information about the new created JMS module. Now you are ready to create and configure the ConnectionFactory and Destination objects in the newly created foreign JMS provider.

- The message at the top of the next page indicates “All changes have been activated. No restarts are necessary”, select ForeignServer-Joram in the summary of resources then click the Lock & Edit button (see figure below).
Configuration of a JMS module – step 2

- In the **Configuration** tabpane (general submenu) specify the JNDI Initial Context Factory and the JNDI connection URL, then click the **Save** button:
  - fr.dyade.aaa.jndi2.client.NamingContextFactory
  - scn://localhost:16400

- The next page displays the message “**Settings updated successfully**”, click the **Activate Change** button in the left pane.

- The message indicates now “**All changes have been activated. No restarts are necessary**”.

- Select **Destinations** at the top of the tabpane **Configuration** then click the **Lock & Edit** button. Click the New button in the **Foreign Destinations** array, enter the following values and click the **Ok** button:
  - **Name** = ForeignQueue
  - **Local JNDI Name** = eis/foreignQueue
Remote JNDI Name = queue

- Select Connection Factories at the top of the tabpane Configuration then click the New button in the Foreign Connection Factories array, enter the following values and click the Ok button:
  - Name = ForeignCF
  - Local JNDI Name = eis/foreignCF
  - Remote JNDI Name = cf

- click the Activate Change button in the left pane. The message indicates now “All changes have been activated. No restarts are necessary”.

10.1.4. JNDI view

You can now see in JNDI the Joram Factories and Destinations (eis context). Use your usual Web browser and connect to the following URL:


The figure above shows the administered objects at this step.
For testing MDB sample with Weblogic 9.2 MP2, you must apply the patch 7KCW:

```
BEA_HOME\utils\bsu> bsu -prod_dir=BEA_HOME\weblogic92 -patchlist=7KCW -patch_download_dir=BEA_HOME\utils\bsu\cache_dir -verbose -install
```

You can also use the 'Smart Update' wizard:

- Click Start > All Programs > BEA Products > Smart Update.
- Then follow the instructions.

10.2. Test with a simple MDB

In order to test the Joram JMS module we will create and deploy a sample MDB. There is three steps:
1. Build and compile the MDB.
2. Deploy the MDB.
3. Send messages to observe the MDB behavior.

### 10.2.1. Build the Message-Driven Bean

This simple MDB prints the JMS message content (JMS Message ID and text message) for each onMessage invocation. The code of this sample MDB is in the figure below.

```java
package mdb;

import javax.ejb.CreateException;
import javax.ejb.MessageDrivenBean;
import javax.ejb.MessageDrivenContext;
import javax.jms.Message;
import javax.jms.MessageListener;
import javax.jms.TextMessage;

public class SimpleMDB implements MessageDrivenBean, MessageListener {
    private MessageDrivenContext context;

    // Required - public constructor with no argument
    public SimpleMDB() {
        System.out.println("=== SimpleMDB");
    }

    // Required - ejbRemove
    public void ejbRemove() {
        System.out.println("=== ejbRemove");
        context = null;
    }

    public void setMessageDrivenContext(MessageDrivenContext mycontext) {
        System.out.println("=== setMessageDrivenContext(" + mycontext + ")");
        context = mycontext;
    }

    // Required - ejbCreate() with no arguments
    public void ejbCreate() throws CreateException {
        System.out.println("=== ejbCreate");
    }

    // Implementation of MessageListener - throws no exceptions
    public void onMessage(Message msg) {
        try {
            System.out.println("SimpleMDB got JMS message: " + msg.getJMSMessageID());
            if (msg instanceof TextMessage)
                System.out.println("  msg = " + ((TextMessage) msg).getText());
        } catch (Exception e) {
            System.out.println("Error handling message: " + e.getMessage());
        }
    }
}
```

7 When a JMS Queue or Topic receives a message, the WebLogic Server calls the associated message-driven bean onMessage() method.
SimpleMDB.java

To write and compile this MDB you can use the Eclipse IDE for BEA WebLogic:

- Start > All Programs > BEA Products > Workshop for Weblogic Platform

The figures below display the XML descriptors 'ejb-jar.xml' and weblogic-ejb-jar.xml'

```xml
<?xml version="1.0" encoding="UTF-8"?>
<ejb-jar
  xmlns="http://java.sun.com/xml/ns/j2ee"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://java.sun.com/xml/ns/j2ee "
  http://java.sun.com/xml/ns/j2ee/ejb-jar_2_1.xsd" version="2.1">
  <enterprise-beans>
    <message-driven>
      <ejb-name>SimpleMDB</ejb-name>
      <ejb-class>mdb.SimpleMDB</ejb-class>
      <transaction-type>Container</transaction-type>

      <activation-config>
        <activation-config-property>
          <activation-config-property-name>destination</activation-config-property-name>
          <activation-config-property-value>eis/foreignQueue</activation-config-property-value>
        </activation-config-property>
        <activation-config-property>
          <activation-config-property-name>destinationType</activation-config-property-name>
          <activation-config-property-value>javax.jms.Queue</activation-config-property-value>
        </activation-config-property>
      </activation-config>
    </message-driven>
  </enterprise-beans>
</ejb-jar>
```
10.2.2. **Deploy SimpleMDB**

We have now to deploy the MDB in the server:

- Copy SimpleMDB.class in `<DOMAIN_DIR><DOMAIN_NAME>\lib\simpleMDB\mdb`, in our example: `G:\bea\user_projects\domains\base_domain\lib\simpleMDB\mdb`.
- Copy `ejb-jar.xml` and `weblogi-ejb-jar.xml` in `<DOMAIN_DIR><DOMAIN_NAME>\lib\simpleMDB\META-INF`, in our example: `G:\bea\user_projects\domains\base_domain\lib\simpleMDB\META-INF`.

You can then connect to the administration console with your usual browser using the following URL: [http://localhost:7001/console/console.portal](http://localhost:7001/console/console.portal)

- In the **Domain Configurations** panel select **Deployments** (under **Your Deployed Resources** subtitle).
In the left panel, click the Lock & Edit button, then in the right panel click the Install button in the Control tabpane.

In the Install Application Assistant panel select the installation path of the MDB:
- `<DOMAIN_DIR>/<DOMAIN_NAME>/lib` directory,
- `G:\bea\user_projects\domains\base_domain\lib` in our example.

select `simpleMDB` and click the Next button.

In the next form choose Install this deployment as an application then click Next.

The next form (see figure below) allows to fix optional settings, accept the defaults clicking Next, Then click Finish.

The right panel displays basic information about the resource adapter deployment, click the Activate Change button in the left panel.

In the right panel a message indicates "All changes have been activated. No restarts are necessary", at the top of this panel select Summary of Deployments in the path Home > Summary of Deployments > simpleMDB.

The right panel displays a summary of all modules that have been installed to this domain, select `simpleMDB` then click the Start > servicing all requests button.

A confirmation is asked click the Yes button.

Now the simpleMDB waits messages from the Joram Destination named queue.

10.2.3. Results

You can use the sample classic to send 10 messages to this queue (see chapter 2.2.1).

10 messages sent.

**Result from Classic.Sender**

The console of the WebLogic server will display:

```
...
SimpleMDB got JMS message: ID:0.0.1026c5m0
  msg = Test number 0
SimpleMDB got JMS message: ID:0.0.1026c5m1
  msg = Test number 1
SimpleMDB got JMS message: ID:0.0.1026c5m2
  msg = Test number 2
SimpleMDB got JMS message: ID:0.0.1026c5m3
  msg = Test number 3
SimpleMDB got JMS message: ID:0.0.1026c5m4
  msg = Test number 4
SimpleMDB got JMS message: ID:0.0.1026c5m5
  msg = Test number 5
SimpleMDB got JMS message: ID:0.0.1026c5m6
  msg = Test number 6
SimpleMDB got JMS message: ID:0.0.1026c5m7
  msg = Test number 7
SimpleMDB got JMS message: ID:0.0.1026c5m8
  msg = Test number 8
SimpleMDB got JMS message: ID:0.0.1026c5m9
  msg = Test number 9
```
Results from SimpleMDB
## 11. Using JMS Bridge

### 11.1. Bridging Joram 5 and XMQ

The JORAM 5 release has introduced a bridge feature. This bridge allows a JORAM client application to communicate with a JMS destination hosted by a foreign JMS server (let’s call it XMQ) in a completely standard way.

The link between the JORAM and XMQ heterogeneous platforms is provided by a specifically configured JORAM destination (a queue or a topic), connected to a XMQ destination as a standard (JMS 1.1) client application (as illustrated by Figure 31).

![Diagram](image)

**Figure 31 - A JORAM client communicating with a XMQ client**

When the JORAM client sends a message on the JORAM bridge destination, the message is actually forwarded to the XMQ destination. If the JORAM client requests a message from the JORAM bridge destination, the request is forwarded to the XMQ destination. The XMQ destination answers by returning a JMS message, which is stored in the JORAM bridge destination and eventually consumed by the JORAM client.

From the JORAM client perspective, the target destination is a JORAM destination accessed through the JMS interfaces. It is a fully standard client. The facts that the messages it produces finally reach the XMQ destination, and that the messages it consumes originally come from the XMQ destination, are totally transparent to the JORAM user.
This document presents how the JORAM bridge feature works, how to use it, and finally shows sample codes for bridging JORAM with IBM’s WebSphere MQ platform and another with JORAM.

11.2. Concepts and implementation

As said in the introduction, the JORAM JMS bridge feature is provided by specialized JORAM destinations. The communication between a JORAM client and a JORAM bridge destination is standard. It is the processing of the client requests within the bridge destination that is specialized.

A bridge destination has 3 main roles:

- as a JORAM destination, it receives messages sent by JORAM JMS producers, and requests sent by JORAM JMS consumers;
- as a XMQ JMS producer, it forwards the received messages to the XMQ destination; as a XMQ JMS consumer, it requests messages from the XMQ destination;
- as a XMQ JMS consumer, it consumes messages coming from the XMQ destination; as a JORAM destination, it delivers those messages to the JORAM JMS consumers.

The JMS resources involved in the JORAM client – XMQ client communication are illustrated by the next picture.

![Bridge communication diagram](image)

Figure 32 - Bridge communication diagram

11.2.1. Message exchange

Communication modes

The JORAM bridge destination may either be a queue or a topic. And in both cases it may either communicate with a foreign queue or a foreign topic. A JORAM client application may then interact with a XMQ destination normally incompatible with the communication mode. For example, a JORAM client can interact with a XMQ queue in a Publish/Subscribe way.
**Message sending**

A message sent by a JORAM client application first reaches the bridge destination. It is then forwarded to the XMQ destination. Once successfully delivered to the XMQ platform, it is removed from the bridge destination. While the message was hosted by the JORAM bridge destination (between its arrival and its delivery to the foreign platform), it has never been available for delivery to a JORAM client. Even if the bridge destination had pending consumers requests, they wouldn’t have been answered with this message. Messages arriving on a bridge destination and coming from a JORAM client application are only deliverable to a foreign JMS destination.

**Message consumption**

A consuming request sent by a JORAM client application first reaches the bridge destination. It is then forwarded to the XMQ destination. When the XMQ target destination is a topic, the JORAM bridge destination, when receiving the first consuming request, durably subscribes to the XMQ topic. This for not loosing messages if the JMS connection between the bridge destination and the XMQ platform fails (connection failures handling is addressed section 2.4). Messages delivered by the XMQ platform are consumed by the JORAM bridge destination. At that point they are converted into JORAM JMS messages (if the conversion fails, the delivery is rolled back, see section 2.2). Finally, those messages are consumed by the JORAM client applications.

**Queue browsing**

The JMS API allows a client application to browse the messages available for delivery on a queue. When requesting to browse a JORAM queue bridge, the “browse” request is forwarded to the XMQ destination if it is a queue. It eventually returns an enumeration of messages, converted into JORAM JMS messages. The enumeration is finally forwarded to the original requester. If the bridge destination is connected to a XMQ topic, the request is directly answered by an empty enumeration.

### 11.2.2. Acknowledgment policy

Acknowledgements are managed between the JORAM client and the JORAM bridge destination, and between the JORAM bridge destination and the XMQ destination, independently.

Figure 33 shows a first scenario of message rollback. In fact, it is the only possible case of message denying between the JORAM bridge destination and the XMQ platform. It occurs when the JMS message delivered by the XMQ destination appears not to be readable and thus can not be converted into a JORAM JMS message.
This situation will likely evolve towards the "poison" message scenario, where a JMS client rolls back its session each time it receives the redelivered failing message. In order to avoid this, it is hoped that XMQ provides a way to log such messages into a dead message queue. If yes, XMQ should be configured for doing so.

Once a message delivered by the XMQ destination has been successfully converted into a JORAM JMS message, the delivery is acknowledged. XMQ does not hold the message any more, it is JORAM which is now responsible for safely distributing it.

Figure 34 shows the second possible scenario involving a rollback or message denying. It occurs when the JORAM client application, which finally consumes the message, either fails before acknowledging the message or explicitly rolls back its session.
The consequence of this message denying is the same as between any JORAM client and JORAM destination. The message is available again for delivery, or logged to a dead message queue if any. In all cases the message stays on the JORAM platform, the XMQ destination is not notified of the JORAM client acknowledgements or denials.

### 11.2.3. Message selection

As for acknowledgements, message selection is handled separately between a JORAM client and the JORAM bridge destination it interacts with, and between the JORAM bridge destination and the XMQ destination. Selectors set-up is done at different times. The selector used for filtering the messages on the XMQ destination is set at administration time, when configuring the JORAM bridge destination. It can not be changed once the bridge destination has been created. The selector used by the JORAM client is set as a standard selector, when creating the `MessageConsumer` instance.

Figure 35 shows how those selectors operate. The bridge’s selector selects messages with a given property value above 2. As a consequence, only the messages which property value is above 2 will actually be transferred from XMQ to JORAM.
The JORAM client application selects messages with the same property value above 4. It then consumes the corresponding messages available on the bridge destination. Other clients may consume the other messages by setting different selectors.

### 11.2.4. Connection failure handling

From an architectural point of view, the XMQ server might be seen as a JORAM server of a JORAM distributed configuration. It might happen that the JMS connection between the JORAM bridge destination and the XMQ platform breaks. This case is processed as any connection failure case between two JORAM servers. An automatic reconnection process is launched when the failure is detected (through the setting of a `javax.jms.ExceptionListener` by the JORAM bridge destination). When the JORAM bridge destination finally reconnects, the pending messages or requests are re-routed to the XMQ platform.

As a consequence, disconnections between JORAM and XMQ are totally transparent to the user, as disconnections between JORAM servers of a distributed JORAM platform.

The reconnection process is as follows:

1. first step: 30 connection trials, one per second;
2. second step: 55 connection trials, one every 5 seconds;
3. last step: infinite connection trials, one every minute.

### 11.3. User manual

A JORAM bridge client is a fully standard JMS client which has no visibility of the foreign XMQ platform. Of course achieving this requires to properly configure and administer the JORAM and XMQ platforms.
11.3.1. Configuring the foreign platform

Prerequisites
The prerequisites on the foreign JMS server to bridge with JORAM are as follows:
- full implementation of the JMS 1.1 API;
- particularly, the javax.jms.ExceptionListener must be supported.

Configuration and administration
The foreign XMQ platform should be appropriately configured for hosting a destination, and authorizing the connection of an external client.

JMS administered objects (javax.jms.ConnectionFactory or javax.jms.XAConnectionFactory and javax.jms.Destination) that will be used by the JORAM bridge to connect to the XMQ platform and access the right destination should be created and bound to a JNDI compliant naming server.

11.3.2. Configuring JORAM

Configuration
JORAM’s server classpath must provide access to the following libraries:
- all XMQ client jars;
- a jms.jar library compatible with the XMQ JMS implementation;
- the client jars of the used JNDI server;
- a jndi.jar library compatible with the naming server used for binding the XMQ administered objects.

Administration
Creating a JORAM bridge destination is done through the org.objectweb.joram.client.jms.Queue.create and org.objectweb.joram.client.jms.Topic.create static methods.

The parameters of these methods are:
- int serverId: identifier of the server on which deploying the destination;
- String className: name of the bridge’s class:
  o “org.objectweb.joram.mom.dest.jmsbridge.JMSBridgeQueue” for a queue,
  o “org.objectweb.joram.mom.dest.jmsbridge.JMSBridgeTopic” for a topic;
- java.util.Properties prop: properties configuring the bridge destination.

The following properties are required for setting the bridge destination:
- “connectionFactoryName”: JNDI name used to bound the XMQ JMS ConnectionFactory or XA ConnectionFactory object;
- “destinationName”: JNDI name used to bound the XMQ JMS Destination object;

The following properties are optional:
- “userName”: user identification that should be used by the bridge destination for opening a connection to XMQ; if not provided, the connection will be opened with no identification.
- “password”: user password that should be used by the bridge destination for opening a connection to XMQ; if not provided, the connection will be opened with no identification.
### 11.3.3. Steps

In order to be able to bind the foreign JMS provider administered objects, a naming server is the first thing to start. And in order to be able to successfully deploy a JORAM bridge destination, the foreign JMS administered objects must have been bound. As a consequence, the start-up steps are as follows:

1. starting a JNDI server;
2. creating the foreign JMS administered objects, binding them to the JNDI server;
3. starting and administering JORAM.

If the JNDI server used is hosted by the JORAM server, then the JORAM server is the first thing to start (in order to start the JNDI service). Then the XMQ JMS administered objects should be created and bound. Finally, the JORAM server should be administered, and particularly the bridge destination should be created.

### 11.3.4. Failures

If one of the mandatory configuration properties is missing, the bridge destination creation will fail (the static `create` method will throw an `AdminException`).

If the provided properties do not allow to successfully set a link with the foreign JMS server, the bridge won’t be usable. But as the initialisation process is asynchronous, the administrator won’t get any information about this failure.

Simply, when sending or requesting messages to/from this bridge, ERROR messages will be logged. The possible error cases are:

- JNDI server not reachable (due to invalid “jndiFactory” or “jndiUrl” values);
- the administered objects could not be retrieved from the JNDI server (invalid “cnxFactoryName” or “destinationName” values);
- missing XMQ client libraries in JORAM server’s classpath, preventing the successful reconstruction of the retrieved administered objects;
- incorrect JMS user identification (“userName and “password” values).

### 11.4. WebSphere-MQ example

This example links JORAM with IBM’s WebSphere MQ platform (formerly MQ Series). It shows a JORAM topic bridge linked to a WebSphere MQ queue.
11.4.1. Configuring and starting JORAM

Configuring JORAM

We will consider a simple JORAM platform made of one standard server (hosting a JNDI service). It is described by the following a3servers.xml file:

```xml
<?xml version="1.0"?>
<config>
  <property name="Transaction" value="fr.dyade.aaa.util.NTransaction"/>
  <server id="0" name="S0" hostname="localhost">
    <service class="org.objectweb.joram.mom.proxies.ConnectionManager" args="root root"/>
    <service class="org.objectweb.joram.mom.proxies.tcp.TcpProxyService" args="16010"/>
    <service class="fr.dyade.aaa.jndi2.server.JndiServer" args="16400"/>
  </server>
</config>
```

The following WebSphere MQ libraries must be added to JORAM's server lib/ directory:

- com.ibm.mqjms.jar
- com.ibm.mqbind.jar
- com.ibm.mq.jar
- connector.jar
- fscontext.jar

The JORAM distribution already provides the needed jms.jar, jndi.jar and jndi.properties. No need to add those in the lib/ directory.

Starting JORAM

Starting JORAM is required first because the JORAM server provides the JNDI service needed for binding WebSphereMQ's administered objects.

Launching the JORAM server is done as usual:

```
java fr.dyade.aaa.agent.AgentServer 0 ./s0
```

11.4.2. WebSphere MQ setup

The WebSphere MQ administration tool should be used for creating a queue. Let's call this queue "foreignQueue".

JMS administered objects should then be created. They will eventually be bound to JORAM's JNDI. For that, WebSphere MQ JMSAdmin.config file must be edited as follows:

```ini
INITIAL_CONTEXT_FACTORY=fr.dyade.aaa.jndi2.client.NamingContextFactory
PROVIDER_URL=scn://localhost:16400
```

The JMSAdmin command should then be launched and the JMS objects created and bound to JNDI (with names "foreignCF" and "foreignDest"):

```
InitCtx> DEFINE QCF(foreignCF)
```
11.4.3. Administering JORAM

Administering JORAM consists in creating and configuring the required bridge destination, and authorizing a client access to it. The following code is proposed:

```java
public class AdminSample
{
    public static void main(String[] args) throws Exception
    {
        AdminModule.connect("root", "root", 60);

        Properties prop = new Properties();
        // Setting the JNDI names of the WebSphere MQ
        // administered objects
        prop.setProperty("connectionFactoryName", "foreignCF");
        prop.setProperty("destinationName", "foreignDest");

        // Creating the bridge topic on JORAM server 0
        String className = "org.objectweb.joram.mom.dest.jmsbridge.JMSBridgeTopic";
        Topic bridgeTopic = Topic.create(0, className, prop);

        // Providing free access to it
        bridgeTopic.setFreeReading();
        bridgeTopic.setFreeWriting();

        // Creating an anonymous user access on JORAM server 0
        javax.jms.ConnectionFactory cf =
            TcpConnectionFactory.create("localhost", 16010);
        User user = User.create("anonymous", "anonymous", 0);

        // Binding the JORAM administered objects
        javax.naming.Context jndiCtx =
            new javax.naming.InitialContext();
        jndiCtx.bind("bridgeDest", bridgeDest);
        jndiCtx.bind("cf", cf);

        jndiCtx.close();

        AdminModule.disconnect();
    }
}
```

11.4.4. The JORAM subscriber

The development of the JORAM subscriber is fully standard. The JORAM application is apparently in relationship with a pure JORAM topic destination, but in fact it consumes messages coming from the WebSphere MQ queue destination, in a JMS 1.1 way, through the Publish/Subscribe communication mode.
The following code is proposed:

```java
public class ConsumerSample
{
    public static void main(String[] args) throws Exception
    {
        // Retrieving the JORAM administered objects
        javax.naming.Context jndiCtx =
            new javax.naming.InitialContext();
        Destination dest = (Destination) jndiCtx.lookup("bridgeDest");
        ConnectionFactory cnxFact =
            (ConnectionFactory) jndiCtx.lookup("cf");
        jndiCtx.close();

        Connection cnx = cnxFact.createConnection();
        Session sess =
            cnx.createSession(false, Session.AUTO_ACKNOWLEDGE);
        MessageConsumer cons = sess.createConsumer(dest);
        cons.setMessageListener(new MsgListener());
        cnx.start();
        System.in.read();
        cnx.close();
    }
}
```

11.4.5. The WebSphere MQ sender

The WebSphere MQ sender is a JMS 1.1 standard sender, sending messages to the WebSphere MQ queue through a `MessageProducer` resource.

The following code is proposed:

```java
public class SenderSample
{
    public static void main(String[] args) throws Exception
    {
        // Retrieving the WebSphere MQ administered objects
        javax.naming.Context jndiCtx =
            new javax.naming.InitialContext();
        Queue queue = (Queue) jndiCtx.lookup("foreignDest");
        ConnectionFactory cnxFact =
            (ConnectionFactory) jndiCtx.lookup("foreignCF");
        jndiCtx.close();

        Connection cnx = cnxFact.createConnection();
        Session sess =
            cnx.createSession(true, 0);
        MessageProducer sender = sess.createProducer(queue);
        TextMessage msg = sess.createTextMessage();

        // Sending 10 messages to the queue
        for (int i = 1; i < 11; i++) {
            // Code for sending messages
        }
    }
}
```
11.5. Running the bridge sample

This sample provides an administration code configuring a single JORAM server with a bridge topic, linked to a foreign JMS queue. A JORAM producer and a JORAM consumer actually interact with this foreign JMS destination through the JORAM bridge.

The sample requires then a foreign JMS server to be running and to have been administered so that the JORAM bridge is usable. How to achieve this is explained in the bridge documentation.

The next picture shows the bridge configuration. The configuration used is centralized and the server run in non persistent mode. The bridge is a topic with which application interact through the JMS 1.1 unified interfaces. This topic is linked with a foreign queue with which it interacts through the JMS 1.1 PTP specific interfaces.

Running the demo:
1. Starting JORAM:
   `ant reset single_server`
2. Administering the foreign JMS server, binding its administered objects.
3. Administering JORAM:
   `ant bridge_admin`
4. Sending messages to the foreign JMS destination:
   `ant bridge_producer`
5. Consuming messages on the foreign JMS destination:
11.6. JORAM – XMQ JORAM example

Configuring and starting JORAM

Configuring JORAM servers

We will consider a JORAM platform made of two server (hosting a JNDI service). It is described by the following a3servers.xml file:

```xml
<config>
  <property name="java.naming.factory.initial" value="fr.dyade.aaa.jndi2.client.NamingContextFactory"/>
  <property name="java.naming.factory.port" value="16400"/>
  <property name="java.naming.factory.host" value="localhost"/>
  <property name="Transaction" value="fr.dyade.aaa.util.NTransaction"/>
  
  <domain name="D1" network="fr.dyade.aaa.agent.SimpleNetwork"/>

  <server hostname="localhost" id="0" name="S0">
    <network domain="D1" port="16301"/>
  </server>
</config>
```

Figure 37: Bridge Joram-Joram sample
The JORAM distribution already provides the needed jms.jar, jndi.jar and jndi.properties. No need to add those in the lib/ directory.

Starting JORAM servers

Starting JORAM server 0 is required first because the JORAM server 0 provides the JNDI service needed for binding administered objects.

Launching the JORAM server 0 is done as usual:

```
java fr.dyade.aaa.agent.AgentServer 0 ./s0
```

Launching the JORAM server 1 is done as usual:

```
java fr.dyade.aaa.agent.AgentServer 1 ./s1
```

11.6.2. Administering JORAM

Administering JORAM consists in creating and configuring the required bridge destination (Queue) server 0, and authorizing a client access to it. Creating and configuring JORAM Queue on server 1, and authorizing a client access to it. The following code is proposed:

```java
public class XABridgeAdmin {
    public static void main(String[] args) throws Exception {
        System.out.println();
        System.out.println("XA Bridge administration...");

        AdminModule.connect("root", "root", 60);

        User.create("anonymous", "anonymous", 0);
        User.create("anonymous", "anonymous", 1);

        javax.naming.Context jndiCtx = new javax.naming.InitialContext();

        // create The foreign destination and connectionFactory
```
Queue foreignQueue = Queue.create(1, "foreignQueue");
foreignQueue.setFreeReading();
foreignQueue.setFreeWriting();
System.out.println("foreign queue = " + foreignQueue);

javax.jms.XAConnectionFactory foreignCF =
    XATcpConnectionFactory.create("localhost", 16011);

// bind foreign destination and connectionFactory
jndiCtx.rebind("foreignQueue", foreignQueue);
jndiCtx.rebind("foreignCF", foreignCF);

// Setting the bridge properties
Properties prop = new Properties();
// Foreign QueueConnectionFactory JNDI name: foreignCF
prop.setProperty("connectionFactoryName", "foreignCF");
// Foreign Queue JNDI name: foreignDest
prop.setProperty("destinationName", "foreignQueue");
// automaticRequest
prop.setProperty("automaticRequest", "true");

// Creating a Queue bridge on server 0:
Queue joramQueue =
    Queue.create(0,
        "org.objectweb.joram.mom.dest.jmsbridge.JMSBridgeQueue",
        prop);
joramQueue.setFreeReading();
joramQueue.setFreeWriting();
System.out.println("joram queue = " + joramQueue);

javax.jms.ConnectionFactory joramCF = TcpConnectionFactory.create();
jndiCtx.rebind("joramQueue", joramQueue);
jndiCtx.rebind("joramCF", joramCF);
jndiCtx.close();
AdminModule.disconnect();
System.out.println("Admin closed.");
}

11.6.3. The XMQ JORAM producer

The JORAM (server 1) sender is a JMS 1.1 standard sender, sending messages to the JORAM foreignQueue through a MessageProducer resource with XA transaction.

The following code is proposed:

```java
public class XAForeignProducer {
```
```java
public static void main(String[] args) throws Exception {
    javax.naming.Context jndiCtx = new javax.naming.InitialContext();
    Destination foreignDest = (Destination) jndiCtx.lookup("foreignQueue");
    XAConnectionFactory foreignCF =
        (XAConnectionFactory) jndiCtx.lookup("foreignCF");
    jndiCtx.close();

    XAConnection foreignCnx = foreignCF.createXAConnection();
    XASession foreignSess = foreignCnx.createXASession();
    MessageProducer foreignSender = foreignSess.createProducer(foreignDest);
    XAResource producerRes = foreignSess.getXAResource();

    // Creating Xid.
    Xid xid =
        new XidImpl(new byte[0],
                    1,
                    new String(""+System.currentTimeMillis()).getBytes());

    // start XA resource
    producerRes.start(xid, XAResource.TMNOFLAGS);

    TextMessage foreignMsg = foreignSess.createTextMessage();

    for (int i = 1; i < 11; i++) {
        foreignMsg.setText("Foreign message number " + i);
        System.out.println("send msg = " + foreignMsg.getText());
        foreignSender.send(foreignMsg);
    }

    // resource end, prepare and commit.
    producerRes.end(xid, XAResource.TMSUCCESS);
    producerRes.prepare(xid);
    producerRes.commit(xid, false);

    foreignCnx.close();
}
```

### 11.6.4. The JORAM consumer

The JORAM (server 0) consumer is a JMS 1.1 standard consumer, consume messages to the JORAM bridgeQueue through a MessageConsumer resource.

The following code is proposed:

```java
public class BridgeConsumer {
    public static void main(String[] args) throws Exception {
        javax.naming.Context jndiCtx = new javax.naming.InitialContext();
        Destination joramDest = (Destination) jndiCtx.lookup("joramQueue");
        ConnectionFactory joramCF = (ConnectionFactory) jndiCtx.lookup("joramCF");
```
jndiCtx.close();

Connection joramCnx = joramCF.createConnection();
Session joramSess = joramCnx.createSession(false, Session.AUTO_ACKNOWLEDGE);
MessageConsumer joramCons = joramSess.createConsumer(joramDest);
joramCons.setMessageListener(new MsgListener("joram"));
joramCnx.start();

System.in.read();
joramCnx.close();
}

public class MsgListener implements MessageListener {
    String who;

    public MsgListener(String who) {
        this.who = who;
    }

    public void onMessage(Message msg) {
        try {
            if (msg instanceof TextMessage)
                System.out.println(who + " receive : " + ((TextMessage) msg).getText());
        } catch (JMSException exc) {
            System.err.println("Exception in listener: " + exc);
        }
    }
}
12. Working with sources distribution

12.1. Getting Joram sources

12.1.1. Getting a packaged version of Joram

The packages are downloadable from the following location:

For release x.y.z, the following tar file is provided:
   - joram-x.y.z-src.tgz, including the client and server sources, as well as the graphical
tool sources, the J2ME client sources and the samples sources.

A package is expanded by UNIX users with the **gunzip** and **tar** commands; Windows
developers can use the **Winzip** utility.

12.1.2. Getting Joram from SVN

The module to extract is joram. A nightly snapshot is generated each day at 00:00 AM CEST and
can be downloaded at ???.

12.1.3. Directory structure and description

**Joram sources distribution**

The distribution is expanded in a joram-x.y.z-src/ directory. It includes the following
directories:
   - lib/
   - licenses/
   - samples/
     - bin/
     - config/
     - src/
       - joram/
       - kjoram/
   - src/
     - com/scalagent/
     - fr/dyade/aaa/
12.2. Compiling and shipping Joram

JORAM distribution is ready for compiling with Apache Ant utility. Ant can be downloaded from http://jakarta.apache.org/ant/. Documentation is available at the same location.

In the src/ directory the build.xml files provides the main targets for convenience. The available Ant targets can be listed by typing:

```
$ ant -projecthelp
Buildfile: build.xml
Main targets:
```
clean        cleans the generated shipments
javadoc      generates the Joram javadoc
ship.joram   builds and ships Joram

Default target: ship.joram

The default target creates a ship/ directory with a typical Joram binary distribution.

JORAM distribution is ready for compiling with Apache Ant utility. Ant can be downloaded from http://jakarta.apache.org/ant/. Documentation is available at the same location. In the src/ directory, 3 build files are provided:

- build.xml specifies the main targets for convenience, it has been described in 12.2.
- joram.xml specifies the targets for compiling and shipping the MOM classes, the Joram client classes and the graphical admin tool classes;

The available Ant targets for joram.xml can be listed for each build files by typing:

$ ant -buildfile joram.xml -projecthelp

Buildfile: joram.xml
Main targets:

build.joram    --> Builds Joram server and client jars.
build.kjoram   --> Builds kjoram jars.
compile        --> Compiles sources.
javadoc        --> Generates the Joram's client and server JavaDoc.
javadoc.all    --> Generates the complete JavaDoc.
release.jar    --> Builds a Joram binary distribution.
release.src    --> Builds a Joram source distribution.
releases       --> Builds a Joram complete distribution.
ship           --> Creates a Joram shipment.
ship.adapter   --> Ships a JORAM JCA adapter
ship.jonasadapter --> Ships a JORAM JCA adapter for JOnAS
ship.remoteadapter --> Ships a JORAM JCA adapter for non collocated use

Default target: ship

The main targets are:

- ship builds from src/ and lib/ directories a directory ship/ with all the jars needed to launch Joram's client and server.
- javadoc builds a doc/ directory with Joram's client and server javadoc.
- release;jar, release.src and release respectively build a binary distribution (joram-x.y.z.tgz), a source distribution (joram-x.y.z-src.tgz) and a complete distribution (all files available for download on ObjectWeb). Theses files are produced in releases/ directory.

12.2.1. Compiling Joram

The best way to build Joram is:

- ant -f joram.xml ship (see below)

$ ant -f joram.xml ship
Buildfile: joram.xml
The release number (in our case Joram 4.3.11) is printed at starting; this number is fixed in the src/build.properties file, you can overload it with a -Dversion=x.y.z in the command line.

This creates the classes/, build/ and doc/ directories when compiling is requested for the first time or after a clean. The classes/ directory holds the compiled classes, the build/ directory contains jar files related to joram, then the ship/ directory contains a binary distribution of Joram with all needed jars:

- joram-client.jar, needed by Joram's client, it contains all classes implementing the JMS API.
- joram-mom.jar, needed by Joram's server, it contains all classes to launch a MOM instance.
The classes specific to the administration tool are in a separate jar's file:

- joram-gui.jar

And there is 3 jars related to the JCA adapter:

- joram-config.jar
- joram-connector.jar
- joram-raconfig.jar

It contains also all 'external' jars needed to execute Joram's client or server.

You can also, either choose to build separately each component or directly the release files as available for download (see below).

### 12.2.2. Compiling kJoram

Building kJoram requires to use a 1.3 or 1.4 JDK, and to generates 1.1 bytecode. Then, type:

```
ant -buildfile kjoram.xml build.kjoram
```

It creates the classes/, build/ and doc/ directories when compiling is requested for the first time or after a clean. The classes/ directory holds the compiled classes, the joram-kclient.jar library is created in the build/ directory.

### 12.2.3. Compiling the administration tool

Compiling the administration tool requires to use jdk 1.4. It is done by typing:

```
ant -buildfile joram.xml ship.gui
```

This creates the classes/ and javadoc/ directories when compiling is requested for the first time or after a clean. The generated joramgui.jar library is created in the lib/ directory, the classes/ directory holds the compiled classes.

### 12.2.4. Generating the javadoc

Simply type:

```
ant -buildfile joram.xml javadoc
```

This creates the classes/, build/ and apidoc/ directories when generating the javadoc is requested for the first time or after a clean. The classes/ and build/ directories stays empty, javadoc/ holds the doc.

The javadoc.all target allows to produce the documentation for all classes, not only Joram's client and server (org.objectweb.joram packages), but also the agent platform's (fr.dyade.aaa packages) or the additional features (com.scalagent packages).

### 12.2.5. Generating a distribution

You can build source, binary or complete distribution of Joram using release.src, release.jar and release target. The related files are copied in the releases directory, they are equivalent to the one available for download on Joram's web server.
12.2.6. Cleaning

To remove the generated classes and libraries:

    ant clean  (equivalent to ant -buildfile joram.xml clean and ant
                -buildfile kjoram.xml clean)

This removes the classes/ and javadoc/ directories if they exist, the joram.jar,
kjoram.jar, joramgui.jar and mom.jar libraries from the lib/ directory if they exist.