Research and Analysis (Remote Method Invocation: Mechanisms)

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Introduction

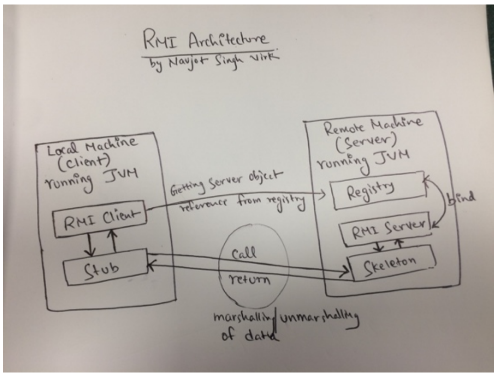
A Distributed system (DS) is a model/collection of independent computers linked together through a network which produce an integrated computing facility using software programs (middleware). Some widely used DS are Word Wide Web (WWW), Email, Cloud services like Google drive and Dropbox, teleconferencing services like Skype. In Distributed communication, services provided by a server can be accessed by multiple clients. The goals in mind while implementing distributed systems are – scalability, reliability, openness, transparency and performance. Inter-process communication is at the core of DS, and there are different ways to achieve that for example - Message Oriented or Stream Oriented communication but for the purpose of this research report will will focus primarily on Remote Method Invocation(RMI) which is a Java implementation of Remote Procedure Calls (RPC) that allows server and client software to communicate with each other.

Lets, look at high level details about RMI: Remote Method Invocation (RMI) is an object oriented Application Programming Interface which allows the creation of distributed applications using Java and this distributed environment supports/allows different computers running Java Virtual Machine(JVM) to communicate with each other using stub (on client side) and skeleton (on server side). Stub and Skeleton are responsible for marshalling and un-marshalling data, the RMI allow an object on client to invoke methods/services on an object (called servant) running on the server running JVM. RMI does this in a way that the client application thinks its invoking a local Java object's methods.

Remote Java Object communication in RMI occurs using the Java Remote Method Protocol (JRMP).
Or communication can happen over Internet Inter-Orb Protocol(IIOP) as well keeping in mind IIOP stubs are properly connected with ORB (Object Request Broker) before starting operations on IIOP stub whereas this is not required with JRMP. IIOP is an object oriented communication protocol for Common Request Broker Architecture(CORBA) it defines how bits are exchanged between CORBA's client and servers. Java implementation of CORBA/IIOP is known as Java IDL (Interface Definition Language) and supports mapping for Java. Which is Java IDL, helps to define, implement and access CORBA object using Java. Previously, Java developer's had to choose between RMI and Java IDL.

These days, RMI-IIOP is widely used to bring (CORBA) capabilities to Java platform with some limitations. RMI over IIOP provides Java developers the freedom to write CORBA applications without learning CORBA IDL.

So, far we understand that RMI allows communication between remote computers. Now, lets look at RMI Architecture Diagram and RMI mechanisms that allows back and forth communication between server and client.



Mechanism involves generation of stub on the client-side which takes care of marshalling of parameters (data) and passing arguments to Skelton over the network when invoking a remote object method and un-marshal's data when receiving data from the skeleton which is generated on the server-side and is responsible for un-marshalling incoming arguments and marshalling when returning values from the server object (servant) and passing it to client stub over network.

Next up let's look at some advantages and disadvantage of Java RMI over traditional –

Advantages	Disadvantages
Easy implementation.	Can be used only with Java. Strictly Java.
Automatic Marshalling and un-marshalling, puts developers at ease.	Can be slower especially when compared to CORBA.

Dynamic Interface creation is possible.	Remote methods are synchronous, which can cause problems when the network is down and the application may freeze.
Remote Objects look like they are local objects.	

Discussion

My opinion and view about the RMI.

Implementation

Brief explanation – How to implement RMI.

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