

Remote Method Invocation in Java

Ajay Khatri

*Senior Assistant Professor, Department IT
Acropolis Institute of Technology & Research
ajay.acropolis@gmail.com*

What is RMI

- ❖ RMI is an API that provides a mechanism to create distributed application in java.
- ❖ The RMI allows an object to invoke methods on an object running in another JVM.
- ❖ The RMI provides remote communication between the applications using two objects *stub* and *skeleton*.

Understanding stub and skeleton

Stub

- ❖ The stub is an object, acts as a gateway for the client side. All the outgoing requests are routed through it. It resides at the client side and represents the remote object.

Skeleton

- ❖ The skeleton is an object, acts as a gateway for the server side object. All the incoming requests are routed through it.

Stub tasks

When the caller invokes method on the stub object, it does the following tasks

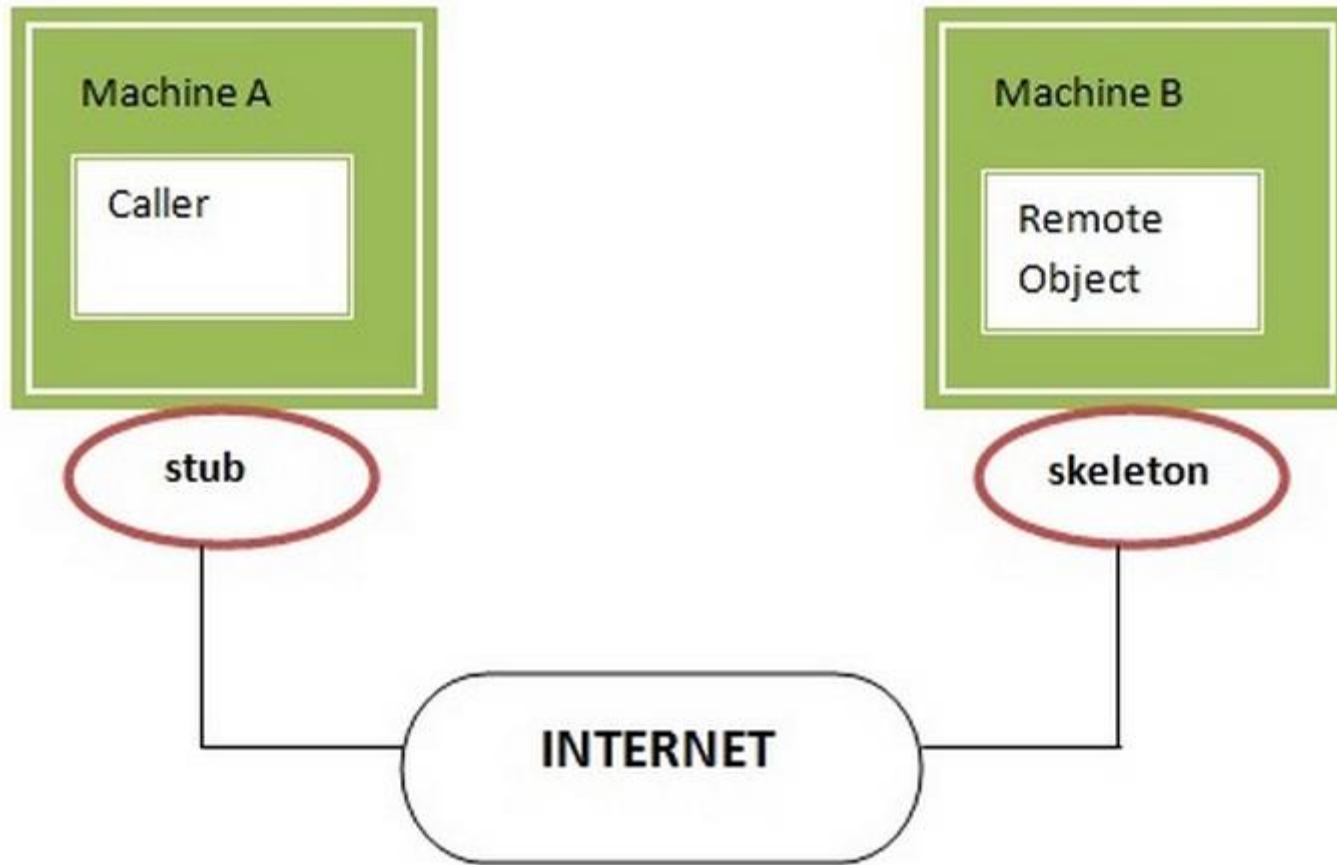
- ❖ It initiates a connection with remote Virtual Machine (JVM),
- ❖ It writes and transmits (marshals) the parameters to the remote Virtual Machine (JVM),
- ❖ It waits for the result
- ❖ It reads (unmarshals) the return value or exception, and
- ❖ It finally, returns the value to the caller.

Skeleton tasks

When the skeleton receives the incoming request, it does the following tasks

- ❖ It reads the parameter for the remote method
- ❖ It invokes the method on the actual remote object, and
- ❖ It writes and transmits (marshals) the result to the caller.

Stub and Skeleton



6 Steps to write the RMI program

1. Create the remote interface.
2. Provide the implementation of the remote interface.
3. Compile the implementation class and create the stub and skeleton objects using the rmic tool
4. Start the registry service by rmiregistry tool
5. Create and start the remote application
6. Create and start the client application

Step 1. create the remote interface

- ❖ For creating the remote interface, extend the **Remote** interface and declare the **RemoteException** with all the methods of the remote interface.

```
import java.rmi.*;  
public interface Adder extends Remote{  
public int add(int x,int y)throws RemoteException;  
}
```


Step 2. Implementation of the remote interface

For Implementation of the Remote interface.

- ❖ Either extend the UnicastRemoteObject class,
- ❖ or use the exportObject() method of the UnicastRemoteObject class
- ❖ In case, you extend the UnicastRemoteObject class, you must define a constructor that declares RemoteException.

Step 2. Implementation of the remote interface

For Implementation of the Remote interface.

```
import java.rmi.*;
import java.rmi.server.*;

public class AdderRemote extends UnicastRemoteObject implements Adder{
    AdderRemote()throws RemoteException{
super();
    }
    public int add(int x,int y){return x+y;}
}
```

Step 3 create the stub and skeleton

- ❖ Next step is to create stub and skeleton objects using the rmi compiler. The rmic tool invokes the RMI compiler and creates stub and skeleton objects.

```
rmic AdderRemote
```

Step 4. Start the registry service

- ❖ Now start the registry service by using the `rmiregistry` tool. If you don't specify the port number, it uses a default port number. In this example, we are using the port number 5000.

Start `rmiregistry 5000`

Step 5. Create and run the server application

- ❖ In this example, we are binding the remote object by the name sonoo.

```
import java.rmi.*;
import java.rmi.registry.*;

public class MyServer{

public static void main(String args[]){
try{

Adder stub=new AdderRemote();
Naming.rebind("rmi://localhost:5000/sonoo",stub);

}catch(Exception e){System.out.println(e);}
}
}
```

Step 6. Create and run the client application

```
import java.rmi.*;

public class MyClient{

public static void main(String args[]){
try{

Adder stub=(Adder)Naming.lookup("rmi://localhost:5000/sonoo"
);
System.out.println(stub.add(34,4));

}catch(Exception e){}

}
```

Java Learning Android App

❖ <https://play.google.com/store/apps/details?id=in.ajaykhatri.javatutorial>

References

- ❖ <http://www.javatpoint.com/RMI>
- ❖ <https://play.google.com/store/apps/details?id=in.ajaykhatri.javatutorial>