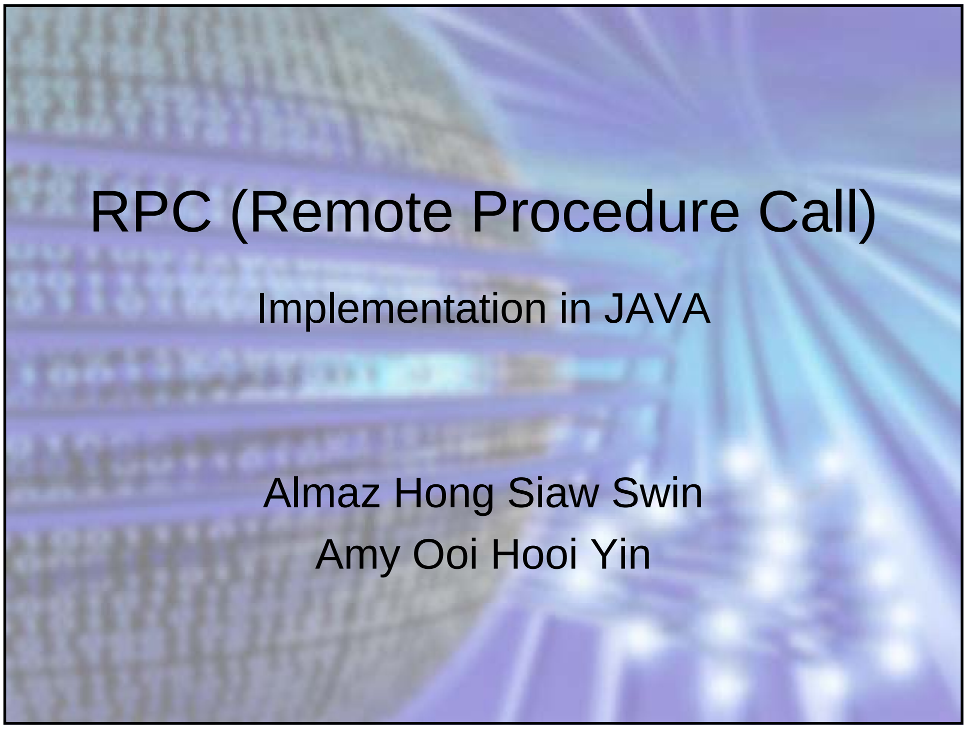
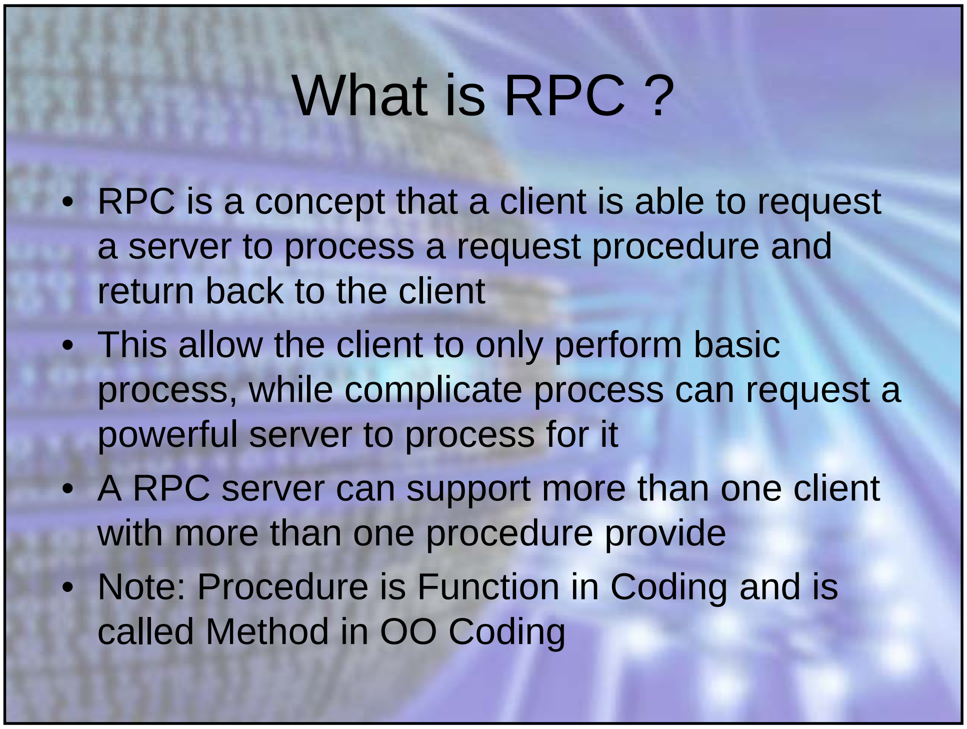


RPC (Remote Procedure Call)

Implementation in JAVA

Almaz Hong Siaw Swin

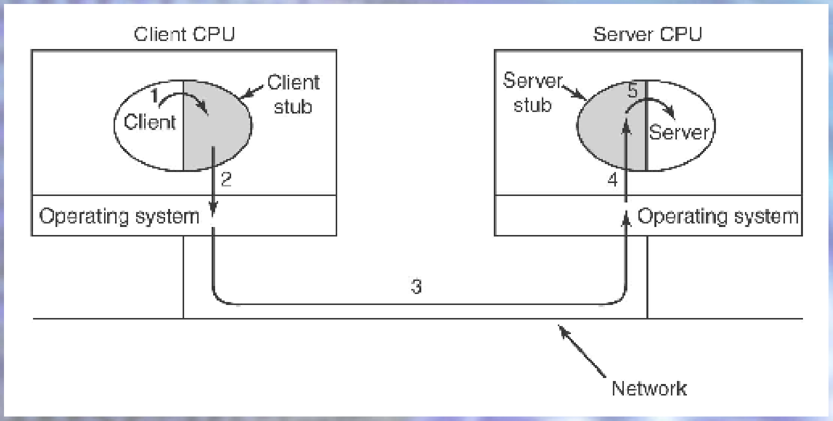
Amy Ooi Hooi Yin



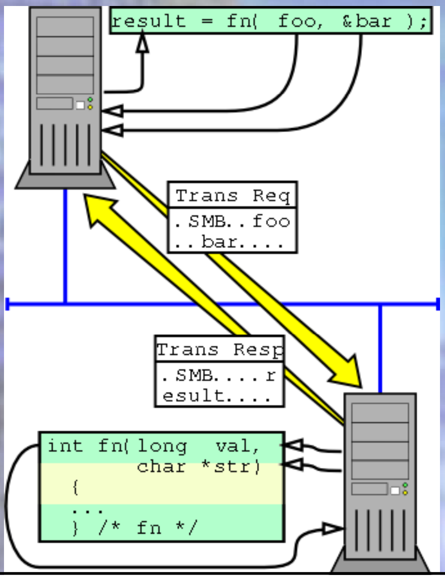
What is RPC ?

- RPC is a concept that a client is able to request a server to process a request procedure and return back to the client
- This allow the client to only perform basic process, while complicate process can request a powerful server to process for it
- A RPC server can support more than one client with more than one procedure provide
- Note: Procedure is Function in Coding and is called Method in OO Coding

RPC Concept

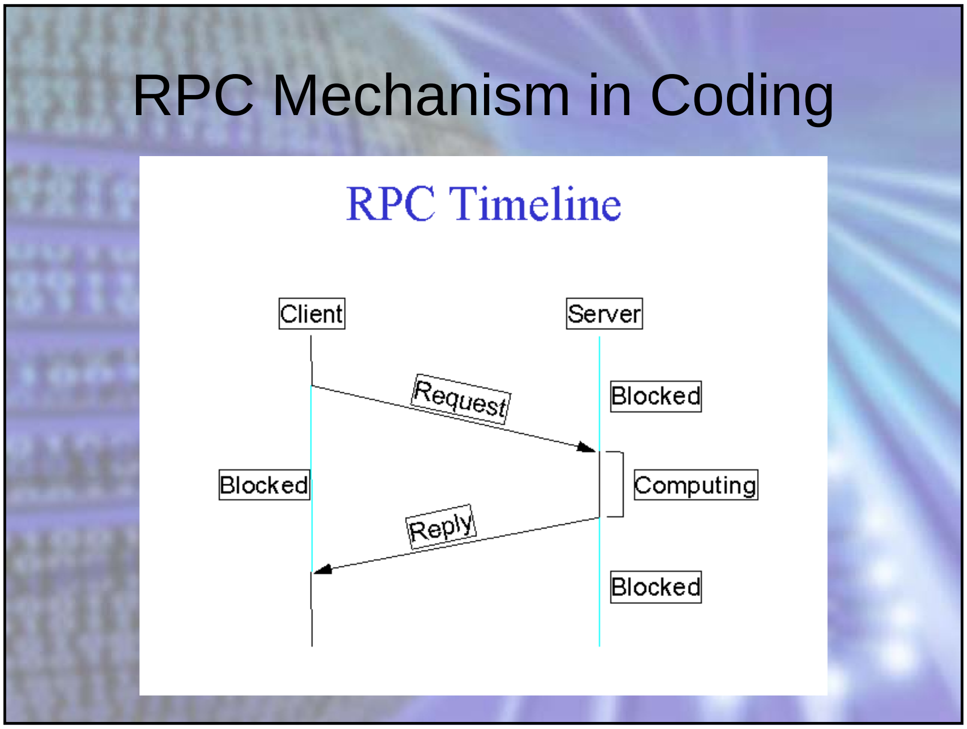


How RPC Works ?

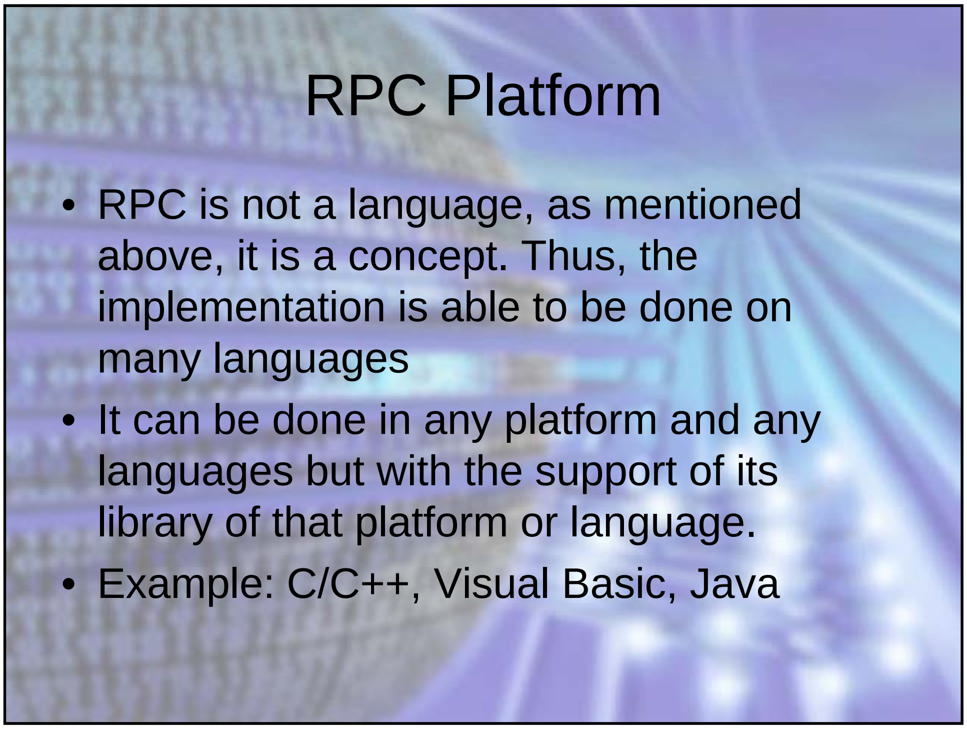


```
result = fn( foo, &bar );
```

```
int fn( long  val,
        char *str)
  {
  ...
  } /* fn */
```

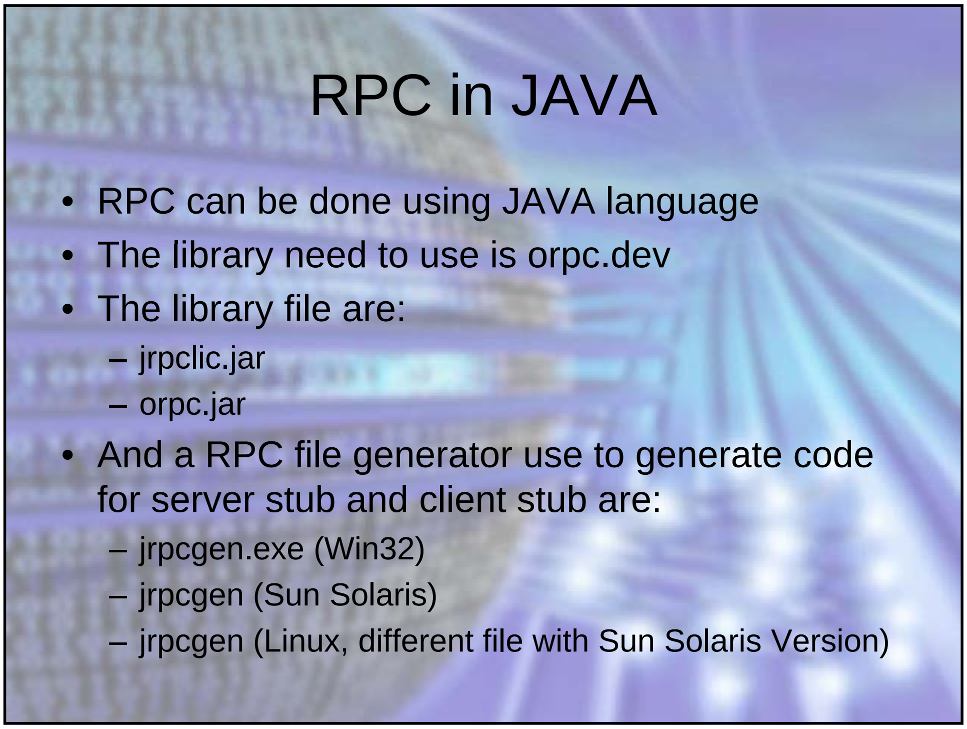


RPC Mechanism in Coding



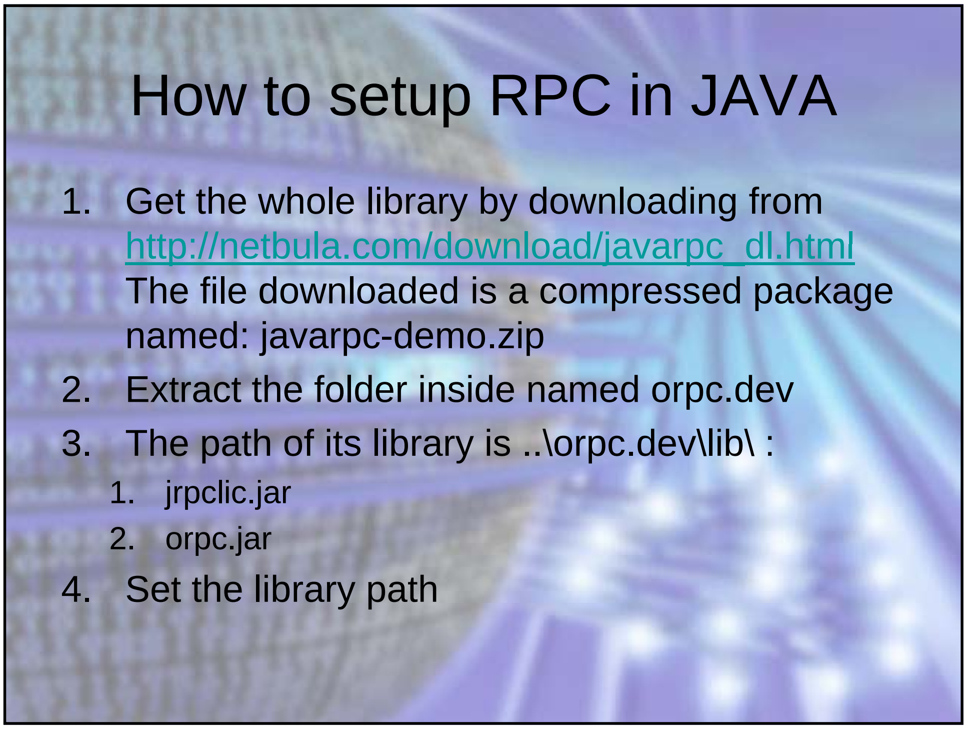
RPC Platform

- RPC is not a language, as mentioned above, it is a concept. Thus, the implementation is able to be done on many languages
- It can be done in any platform and any languages but with the support of its library of that platform or language.
- Example: C/C++, Visual Basic, Java



RPC in JAVA

- RPC can be done using JAVA language
- The library need to use is orpc.dev
- The library file are:
  - jrpclic.jar
  - orpc.jar
- And a RPC file generator use to generate code for server stub and client stub are:
  - jrpcgen.exe (Win32)
  - jrpcgen (Sun Solaris)
  - jrpcgen (Linux, different file with Sun Solaris Version)

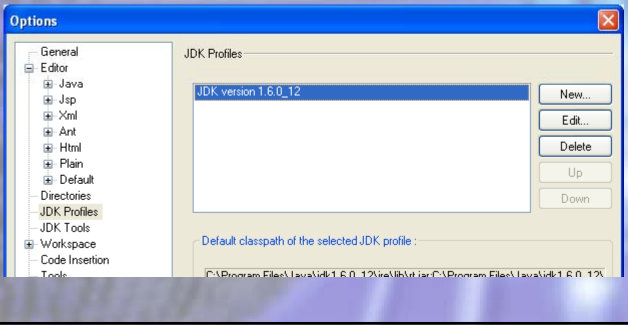


How to setup RPC in JAVA

1. Get the whole library by downloading from http://netbula.com/download/javarpc_dl.html The file downloaded is a compressed package named: javarpc-demo.zip
2. Extract the folder inside named orpc.dev
3. The path of its library is ..\orpc.dev\lib\ :
   1. jrpclic.jar
   2. orpc.jar
4. Set the library path

How to setup RPC in JAVA

5. Set the library path in JCreator:
    1. Go to Configure -> Options…
    2. Choose JDKProfiles
    3. Select the JDK that using



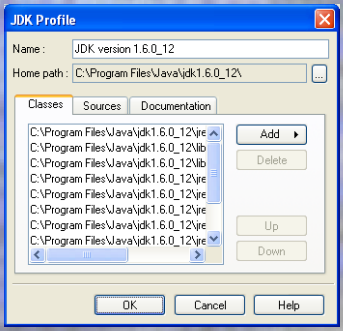
JDK version 1.6.0_12

Default classpath of the selected JDK profile :

C:\Program Files\Java\jdk1.6.0_12\jre\lib\rt.jar;C:\Program Files\Java\jdk1.6.0_12\

How to setup RPC in JAVA

4. Click Edit…



Name : JDK version 1.6.0_12

Home path : C:\Program Files\Java\jdk1.6.0_12\

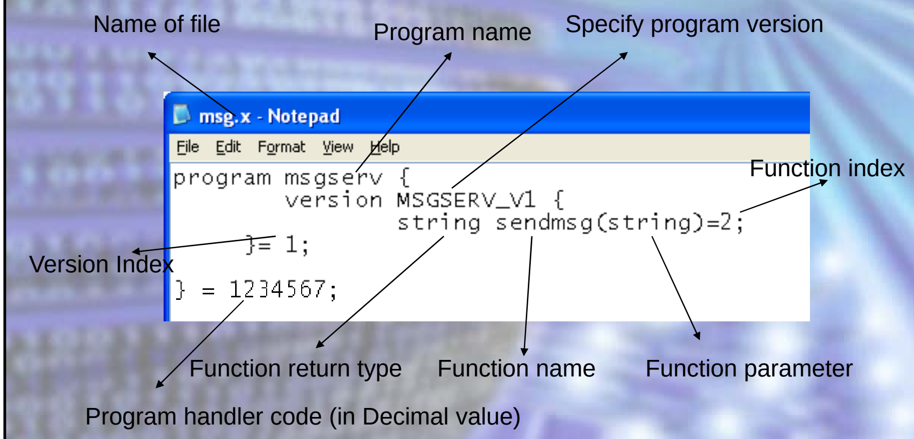
```
C:\Program Files\Java\jdk1.6.0_12\jre
C:\Program Files\Java\jdk1.6.0_12\lib
C:\Program Files\Java\jdk1.6.0_12\lib
C:\Program Files\Java\jdk1.6.0_12\jre
C:\Program Files\Java\jdk1.6.0_12\jre
C:\Program Files\Java\jdk1.6.0_12\jre
C:\Program Files\Java\jdk1.6.0_12\jre
C:\Program Files\Java\jdk1.6.0_12\jre
```

5. Click Add > and select Add Archive…
6. Then select the two libraries at the path mentioned above

How to Use RPC in JAVA

1. Create a text file named it as *.x (* is the name desired)
2. In the text file, specify the program name, and define the functions that are going to be use
3. The language use for RPC generate the *.x file is similar with C programming syntax

How to Use RPC in JAVA



```
program msgserv {
        version MSGSERV_V1 {
                string sendmsg(string)=2;
     }= 1;
} = 1234567;
```

How to Use RPC in JAVA

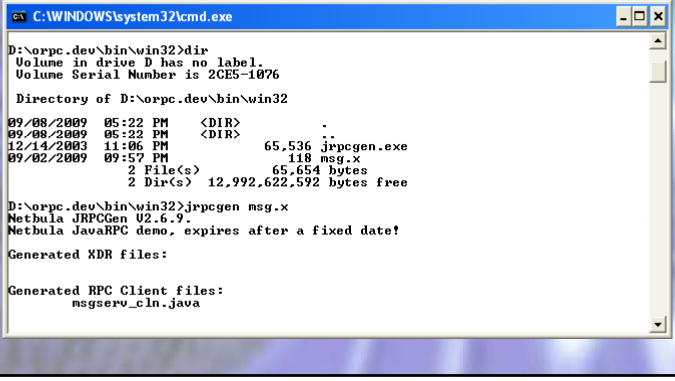
4. Each function only can have one parameter, if more than one parameter need to be use, use struct instead
5. The program handler code has a fixed range to set by user which is equivalent to int range, if the larger range is desired, need to modify the generated x.java manually for the declaration type:

   public static final int _def_pno = 1234567;

   Change the int into some other data type

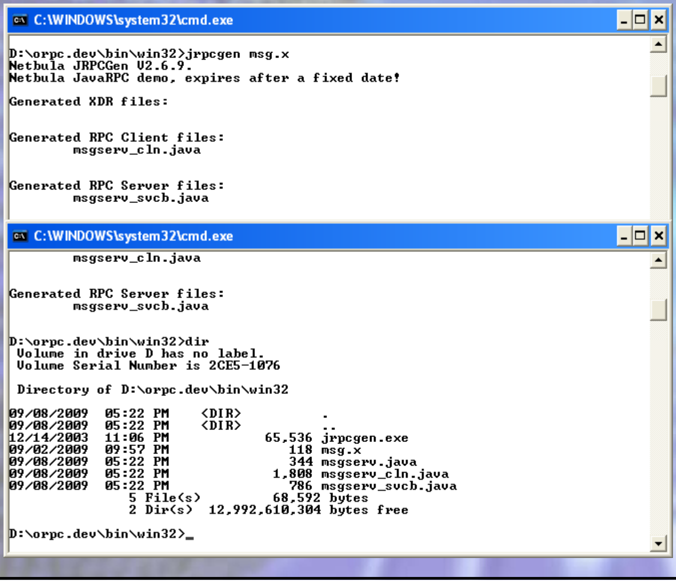
How to Use RPC in JAVA

6. After write the *.x file, compile it with jrpcgen.exe to generate all the client/server stub and the parent .java file



```
D:\orpc.dev\bin\win32>dir
 Volume in drive D has no label.
 Volume Serial Number is 2CE5-1076

 Directory of D:\orpc.dev\bin\win32

09/08/2009  05:22 PM    <DIR>          .
09/08/2009  05:22 PM    <DIR>          ..
12/14/2003  11:06 PM            65,536 jrpcgen.exe
09/02/2009  09:57 PM               118 msg.x
               2 File(s)         65,654 bytes
               2 Dir(s)  12,992,622,592 bytes free

D:\orpc.dev\bin\win32>jrpcgen msg.x
Netbula JRPCGen V2.6.9.
Netbula JavaRPC demo, expires after a fixed date!

Generated XDR files:


Generated RPC Client files:
        msgserv_cln.java
```

How to Use RPC in JAVA

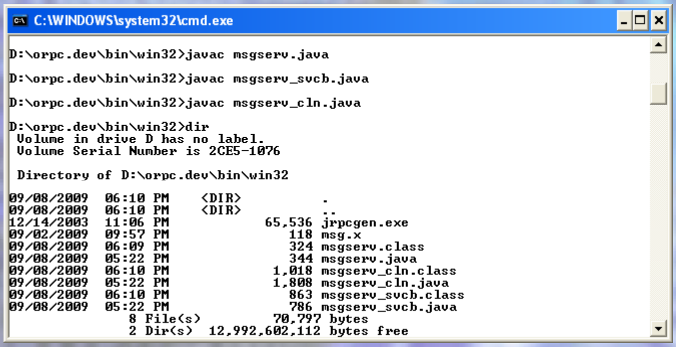


```
D:\orpc.dev\bin\win32>jrpcgen msg.x
Netbula JRPCGen V2.6.9.
Netbula JavaRPC demo, expires after a fixed date!

Generated XDR files:


Generated RPC Client files:
        msgserv_cln.java


Generated RPC Server files:
        msgserv_svcb.java
```

```
        msgserv_cln.java


Generated RPC Server files:
        msgserv_svcb.java


D:\orpc.dev\bin\win32>dir
 Volume in drive D has no label.
 Volume Serial Number is 2CE5-1076

 Directory of D:\orpc.dev\bin\win32

09/08/2009  05:22 PM    <DIR>          .
09/08/2009  05:22 PM    <DIR>          ..
12/14/2003  11:06 PM            65,536 jrpcgen.exe
09/02/2009  09:57 PM               118 msg.x
09/08/2009  05:22 PM               344 msgserv.java
09/08/2009  05:22 PM             1,808 msgserv_cln.java
09/08/2009  05:22 PM               786 msgserv_svcb.java
               5 File(s)         68,592 bytes
               2 Dir(s)  12,992,610,304 bytes free

D:\orpc.dev\bin\win32>_
```

How to Use RPC in JAVA

7. Compile all the generated java files, but the first to compile must the parent program java file, then only follow by the client/server stub file.



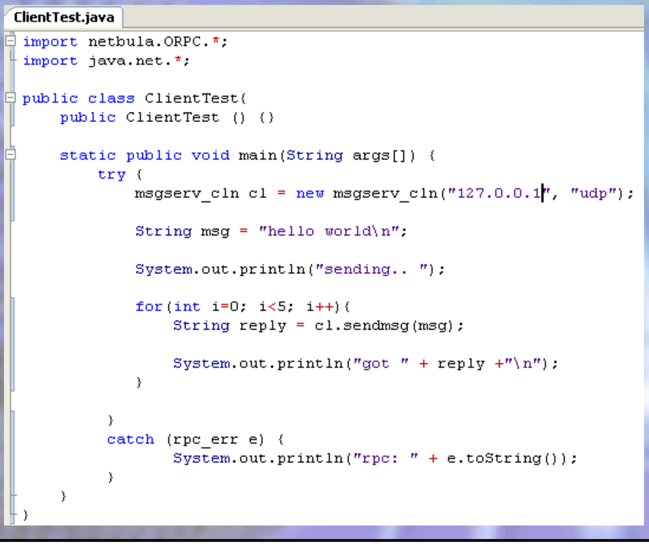
```
D:\orpc.dev\bin\win32>javac msgserv.java

D:\orpc.dev\bin\win32>javac msgserv_svcb.java

D:\orpc.dev\bin\win32>javac msgserv_cln.java

D:\orpc.dev\bin\win32>dir
 Volume in drive D has no label.
 Volume Serial Number is 2CE5-1076

 Directory of D:\orpc.dev\bin\win32

09/08/2009  06:10 PM    <DIR>          .
09/08/2009  06:10 PM    <DIR>          ..
12/14/2003  11:06 PM            65,536 jrpcgen.exe
09/02/2009  09:57 PM               118 msg.x
09/08/2009  06:09 PM               324 msgserv.class
09/08/2009  05:22 PM               344 msgserv.java
09/08/2009  06:10 PM             1,018 msgserv_cln.class
09/08/2009  05:22 PM             1,808 msgserv_cln.java
09/08/2009  06:10 PM               863 msgserv_svcb.class
09/08/2009  05:22 PM               786 msgserv_svcb.java
               8 File(s)         70,797 bytes
               2 Dir(s)  12,992,602,112 bytes free
```

How to Use RPC in JAVA

7. Now you’re all set to design your client and server program.
8. Server must define how the function work
9. Client must set the server IP and choose the protocol to use (TCP or UDP)
10. Client must declare an object of the client_stub in order to connect to server

How to Use RPC in JAVA

11. Sample Code for Client:

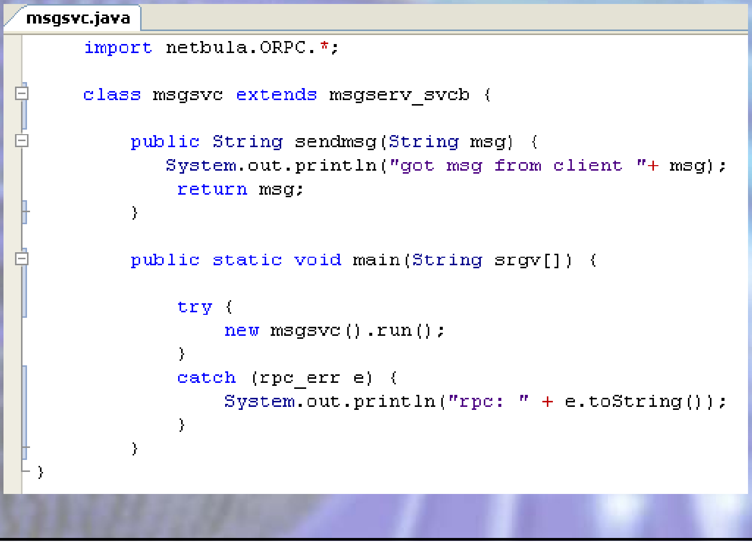


ClientTest.java

```
import netbula.ORPC.*;
import java.net.*;

public class ClientTest{
    public ClientTest () {}

    static public void main(String args[]) {
        try {
            msgserv_cln cl = new msgserv_cln("127.0.0.1", "udp");

            String msg = "hello world\n";

            System.out.println("sending.. ");

            for(int i=0; i<5; i++){
                String reply = cl.sendmsg(msg);

                System.out.println("got " + reply +"\n");
            }

        }
        catch (rpc_err e) {
                System.out.println("rpc: " + e.toString());
        }
    }
}
```

How to Use RPC in JAVA

12. Sample Code for Server:



msgsvc.java

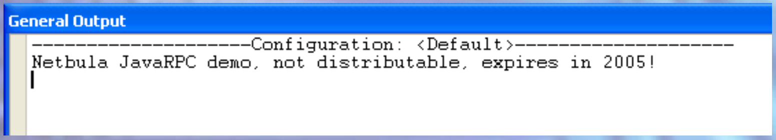
```java
    import netbula.ORPC.*;

    class msgsvc extends msgserv_svcb {

        public String sendmsg(String msg) {
           System.out.println("got msg from client "+ msg);
            return msg;
        }

        public static void main(String srgv[]) {

            try {
                new msgsvc().run();
            }
            catch (rpc_err e) {
                System.out.println("rpc: " + e.toString());
            }
        }
}
```

How to Use RPC in JAVA

13. After both client and server coded, before running any of them, there's another code need to be run first, which is the port mapper
14. The port mapper is already provided by the library which is in the ..\orpc.dev\portmapper\pmapsvc.class
15. The code is also provided as pmapsvc.java, but it has the compiled ready in the form of .class file

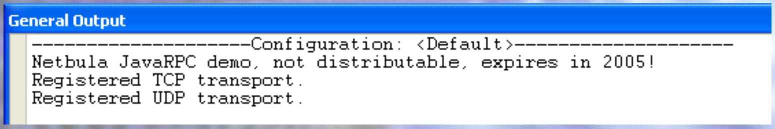
How to Use RPC in JAVA

16. After portmapper, server must be run follow by client.



```
---------------------Configuration: <Default>--------------------
Netbula JavaRPC demo, not distributable, expires in 2005!
```

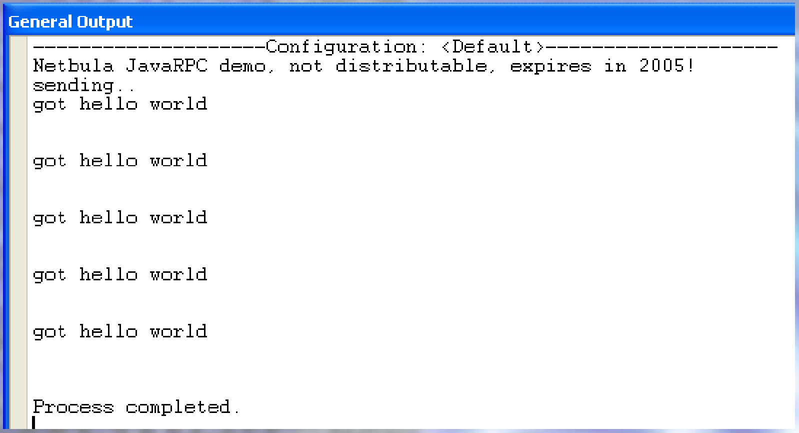
Output of Portmapper - pmapsvc.class



```
---------------------Configuration: <Default>--------------------
Netbula JavaRPC demo, not distributable, expires in 2005!
Registered TCP transport.
Registered UDP transport.
```

Server output before a client connect – msgsvc.class

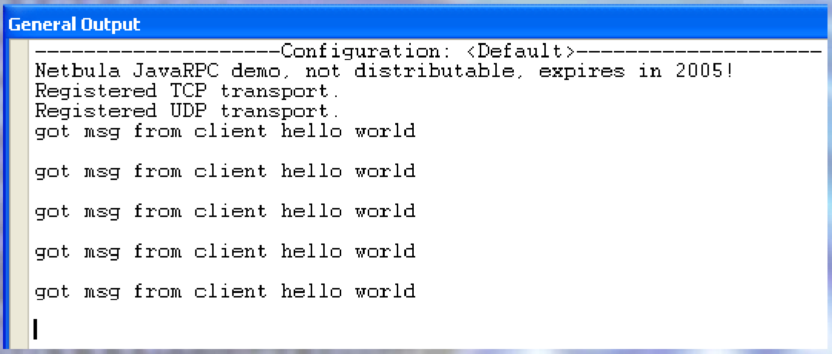
How to Use RPC in JAVA



```
---------------------Configuration: <Default>--------------------
Netbula JavaRPC demo, not distributable, expires in 2005!
sending..
got hello world


got hello world


got hello world


got hello world


got hello world



Process completed.
```

Client output after connected to server – ClientTest.class

How to Use RPC in JAVA



```
---------------------Configuration: <Default>---------------------
Netbula JavaRPC demo, not distributable, expires in 2005!
Registered TCP transport.
Registered UDP transport.
got msg from client hello world

got msg from client hello world

got msg from client hello world

got msg from client hello world

got msg from client hello world

```

Server output after get request from client