EXPERIMENT-1

a) TCP Socket Programming (UNIX)

Aim: Implement concurrent echo client-server application.
Tools/ Apparatus: Unix/Linux C Programming Environment
Procedure:
1. Write a server (TCP) C Program that opens a listening socket and waits to serve client
2. Write a client (TCP) C Program that connects with the server program knowing IP address and port number.
3. Get the input string from console on client and send it to server, server echoes back that string to client.

Program:

ECHOTCPSERVER.C

```
#include<sys/types.h>
#include<sys/socket.h>
#include<stdio.h>
#include<netinet/in.h>
#include<stdlib.h>

#define MAXLINESIZE 100
#define SERV_PORT 5555

int listensd,clientsd;
char buffer[MAXLINESIZE+1];

struct sockaddr_in servaddr;
struct sockaddr_in peeraddr;
int noBytesRead=0;
void processClient(int);
int main()
{
	//create socket
	if((listensd=socket(AF_INET,SOCK_STREAM,0))<0)
	{
		fprintf(stderr,"Cannont create socket\n");
		exit(-1);
	}

	//Initialize socket address structure
	bzero(&servaddr,sizeof(servaddr));
	servaddr.sin_family=AF_INET;
	servaddr.sin_port=htons(SERV_PORT);
	servaddr.sin_addr.s_addr=htonl(INADDR_ANY);   //INADDR_ANY is wildcard returns
local address when not connected
```

}

```
    //bind socket
    if(bind(listensd,(struct sockaddr*)&servaddr,sizeof(servaddr))<0)
    {
        fprintf(stderr,"Error in bind\n");
        exit(-1);
    }

    //make socket listening socket
    if(listen(listensd,5)<0)
    {
        fprintf(stderr,"Error in listen\n");
        exit(-1);
    }

    //wait for client connection
    for(;;)
    {
        clientsd=accept(listensd,(struct sockaddr*)NULL,NULL);
        if(fork()==0)
        {
            int len = sizeof(peeraddr);
            int n=getpeername(clientsd,(struct sockaddr*)&peeraddr,&len);
            char ip[MAXLINESIZE];
            if(n==-1)
            {
                fprintf(stderr,"Peer Call Error!");
                exit(-1);
            }
            const char*
res=inet_ntop(AF_INET,&peeraddr.sin_addr,ip,MAXLINESIZE);
            fprintf(stdout,"IP:%s & Port: %d\n",ip,peeraddr.sin_port);
            //close listening socket in child, so that reference count remains one. child
serves the client, it doesn't need listening sockt to do this
            close(listensd);

            //server client
            processClient(clientsd);

            //close connected socket
            close(clientsd);
            exit(0);
        }
        close(clientsd);
    }
    return 0;
}

void processClient(int clientsd)
```

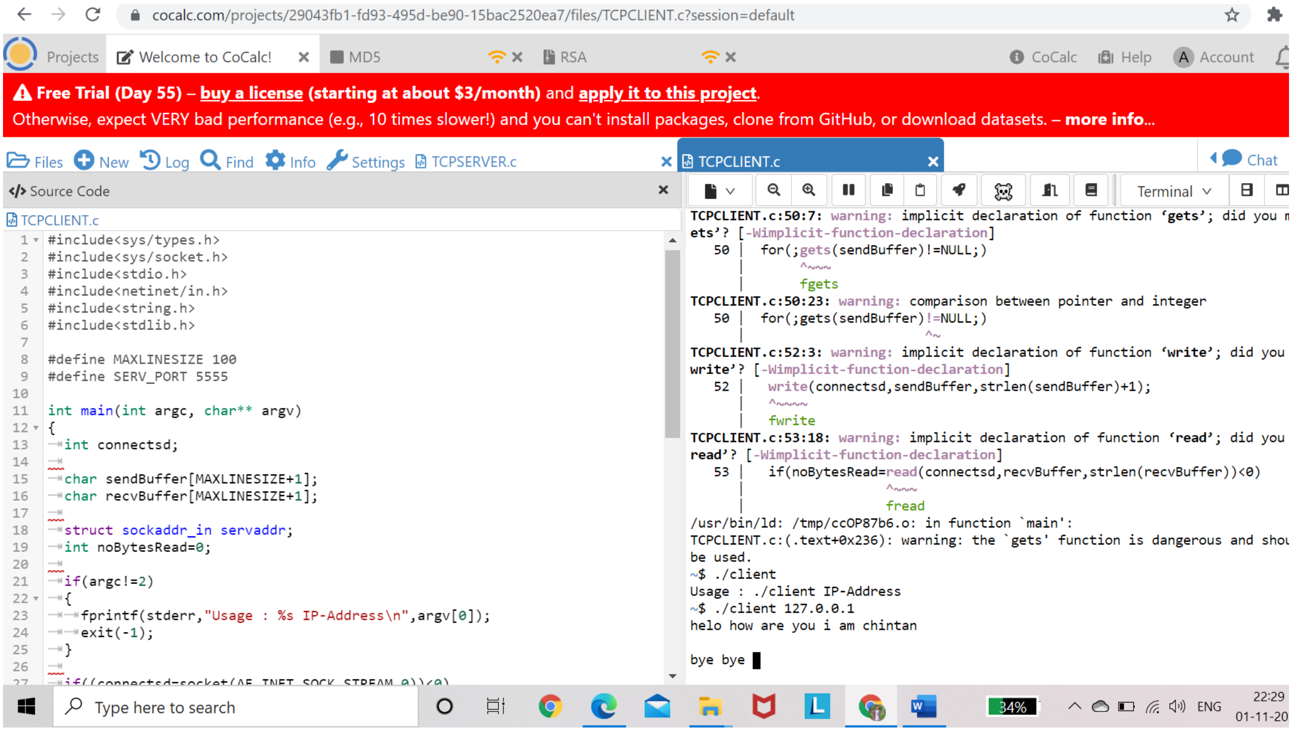
```
{
	while((noBytesRead=read(clientsd,buffer,sizeof(buffer)))>0){
		fprintf(stdout,"%s\n",buffer);
		write(clientsd,buffer,noBytesRead);
	}
}
```

ECHOTCPCLIENT.C

```
#include<sys/types.h>
#include<sys/socket.h>
#include<stdio.h>
#include<netinet/in.h>
#include<string.h>
#include<stdlib.h>

#define MAXLINESIZE 100
#define SERV_PORT 5555

int main(int argc, char** argv)
{
	int connectsd;

	char sendBuffer[MAXLINESIZE+1];
	char recvBuffer[MAXLINESIZE+1];

	struct sockaddr_in servaddr;
	int noBytesRead=0;

	if(argc!=2)
	{
		fprintf(stderr,"Usage : %s IP-Address\n",argv[0]);
		exit(-1);
	}

	if((connectsd=socket(AF_INET,SOCK_STREAM,0))<0)
	{
		fprintf(stderr,"Cannot create socket\n");
		exit(-1);
	}

	bzero(&servaddr,sizeof(servaddr));

	servaddr.sin_family=AF_INET;
	servaddr.sin_port=htons(SERV_PORT);
```

```
        if(inet_pton(PF_INET,argv[1],&servaddr.sin_addr)<=0)
        {
                fprintf(stderr,"Error in inet_pton");
                exit(-1);
        }

        if(connect(connectsd,(struct sockaddr*)&servaddr,sizeof(servaddr))<0)
        {
                fprintf(stderr,"Error in connect");
                exit(-1);
        }

        for(;gets(sendBuffer)!=NULL;)
        {
                write(connectsd,sendBuffer,strlen(sendBuffer)+1);
                if(noBytesRead=read(connectsd,recvBuffer,strlen(recvBuffer))<0)
                        exit(0);
                fprintf(stdout,"%s\n",recvBuffer);
        }
        return 0;
}
```

Output :



cocalc.com/projects/29043fb1-fd93-495d-be90-15bac2520ea7/files/TCPCLIENT.c?session=default

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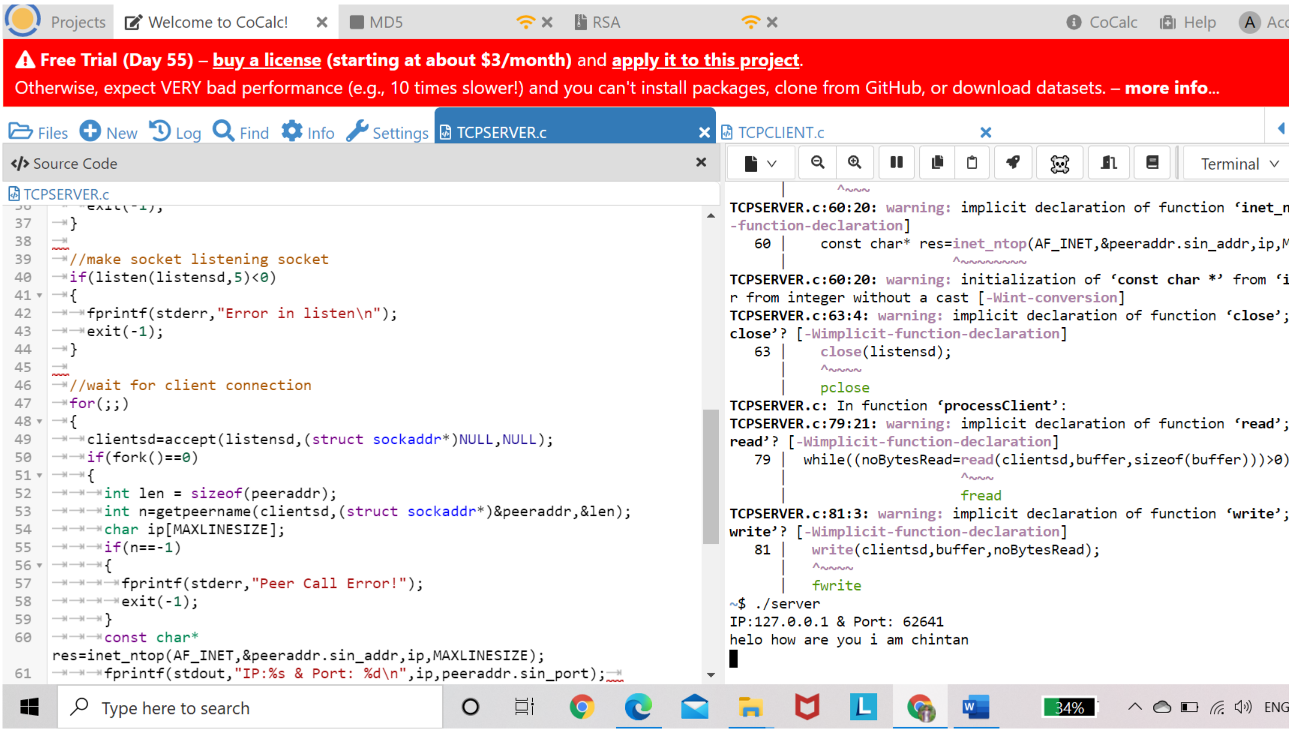
```
#include<sys/types.h>
#include<sys/socket.h>
#include<stdio.h>
#include<netinet/in.h>
#include<string.h>
#include<stdlib.h>

#define MAXLINESIZE 100
#define SERV_PORT 5555

int main(int argc, char** argv)
{
	int connectsd;

	char sendBuffer[MAXLINESIZE+1];
	char recvBuffer[MAXLINESIZE+1];

	struct sockaddr_in servaddr;
	int noBytesRead=0;

	if(argc!=2)
	{
		fprintf(stderr,"Usage : %s IP-Address\n",argv[0]);
		exit(-1);
	}

	if((connectsd=socket(AF_INET,SOCK_STREAM,0))<0)
```

```
TCPCLIENT.c:50:7: warning: implicit declaration of function ‘gets’; did you m
ets’? [-Wimplicit-function-declaration]
   50 |   for(;gets(sendBuffer)!=NULL;)
      |        ^~~~
      |        fgets
TCPCLIENT.c:50:23: warning: comparison between pointer and integer
   50 |   for(;gets(sendBuffer)!=NULL;)
      |                        ^~
TCPCLIENT.c:52:3: warning: implicit declaration of function ‘write’; did you
write’? [-Wimplicit-function-declaration]
   52 |    write(connectsd,sendBuffer,strlen(sendBuffer)+1);
      |    ^~~~~
      |    fwrite
TCPCLIENT.c:53:18: warning: implicit declaration of function ‘read’; did you
read’? [-Wimplicit-function-declaration]
   53 |    if(noBytesRead=read(connectsd,recvBuffer,strlen(recvBuffer))<0)
      |                   ^~~~
      |                   fread
/usr/bin/ld: /tmp/ccOP87b6.o: in function `main':
TCPCLIENT.c:(.text+0x236): warning: the `gets' function is dangerous and shou
be used.
~$ ./client
Usage : ./client IP-Address
~$ ./client 127.0.0.1
helo how are you i am chintan

bye bye
```



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```
		exit(-1);
	}
	
	//make socket listening socket
	if(listen(listensd,5)<0)
	{
		fprintf(stderr,"Error in listen\n");
		exit(-1);
	}
	
	//wait for client connection
	for(;;)
	{
		clientsd=accept(listensd,(struct sockaddr*)NULL,NULL);
		if(fork()==0)
		{
			int len = sizeof(peeraddr);
			int n=getpeername(clientsd,(struct sockaddr*)&peeraddr,&len);
			char ip[MAXLINESIZE];
			if(n==-1)
			{
				fprintf(stderr,"Peer Call Error!");
				exit(-1);
			}
			const char*
res=inet_ntop(AF_INET,&peeraddr.sin_addr,ip,MAXLINESIZE);
			fprintf(stdout,"IP:%s & Port: %d\n",ip,peeraddr.sin_port);
```

```
      |            ^~~~
TCPSERVER.c:60:20: warning: implicit declaration of function ‘inet_n
-function-declaration]
   60 |     const char* res=inet_ntop(AF_INET,&peeraddr.sin_addr,ip,M
      |                     ^~~~~~~~~
TCPSERVER.c:60:20: warning: initialization of ‘const char *’ from ‘i
r from integer without a cast [-Wint-conversion]
TCPSERVER.c:63:4: warning: implicit declaration of function ‘close’;
close’? [-Wimplicit-function-declaration]
   63 |     close(listensd);
      |     ^~~~~
      |     pclose
TCPSERVER.c: In function ‘processClient’:
TCPSERVER.c:79:21: warning: implicit declaration of function ‘read’;
read’? [-Wimplicit-function-declaration]
   79 |   while((noBytesRead=read(clientsd,buffer,sizeof(buffer)))>0)
      |                      ^~~~
      |                      fread
TCPSERVER.c:81:3: warning: implicit declaration of function ‘write’;
write’? [-Wimplicit-function-declaration]
   81 |    write(clientsd,buffer,noBytesRead);
      |    ^~~~~
      |    fwrite
~$ ./server
IP:127.0.0.1 & Port: 62641
helo how are you i am chintan
█
```

b) UDP Socket Programming (UNIX)

Aim: Implement concurrent day-time client-server application.
Tools/ Apparatus: Unix/Linux C Programming Environment
Procedure:
1. Write a server(UDP) C Program that waits in recvfrom
2. Write a client(UDP) C Program that calls sendto to send string to server program knowing IP address and port number.
3. Server replies current date and time (using time, and ctime calls) to client.

Program:

<u>DAYTIMESERVER.C</u>

```
 #include <sys/socket.h>
#include <netinet/in.h>
#include <arpa/inet.h>
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <errno.h>
```

```
#include <string.h>
#include <sys/types.h>
#include <time.h>

int main()
{

        struct sockaddr_in sa;
        int sockfd, coontfd;
        char str[1025];
        time_t tick;
        sockfd = socket(AF_INET, SOCK_STREAM, 0);
        if (sockfd < 0)
        {
                printf("Error in creating socket\n");
                exit(0);
        }
        else
        {
                printf("Socket Created\n");
        }
        printf("Socket created\n");
        bzero(&sa, sizeof(sa));

                        memset(str, '0', sizeof(str));
        sa.sin_family = AF_INET;
        sa.sin_port = htons(5600);
        sa.sin_addr.s_addr = htonl(INADDR_ANY);
        if (bind(sockfd, (struct sockaddr*)&sa, sizeof(sa))<0)
        {
                printf("Bind Error\n");
        }
        else
                printf("Binded\n");
        listen(sockfd, 10);
        while(1)
        {
                coontfd = accept(sockfd, (struct sockaddr*)NULL ,NULL); // Accept a request from
client
                printf("Accepted\n");

     tick = time(NULL);

     snprintf(str, sizeof(str), "%.24s\r\n", ctime(&tick)); // read sys time and write to buffer

     printf("sent\n");
     printf("%s\n", str);
                write(coontfd, str, strlen(str)); // send buffer to client
```

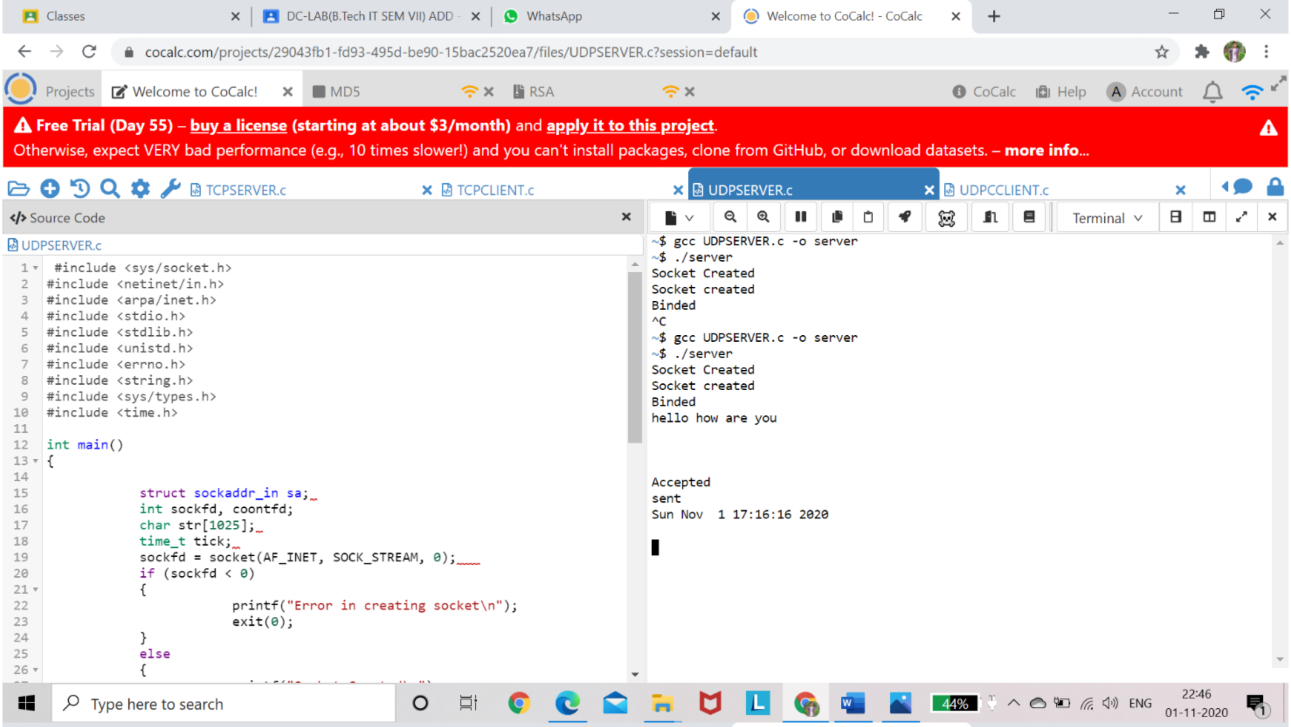
```
	}
	close(sockfd); // close the socket
	return 0;
}
```

DAYTIMECLIENT.C

```
#include <sys/socket.h>
#include <sys/types.h>
#include <netinet/in.h>
#include <netdb.h>
#include <stdio.h>
#include <string.h>
#include <stdlib.h>
#include <unistd.h>
#include <errno.h>
#include <arpa/inet.h>
int main()
{
	struct sockaddr_in sa;
	int n, sockfd;
	char buff[1025];
	sockfd = socket(PF_INET, SOCK_STREAM, 0);
	if (sockfd < 0) {
		printf("Error in creation\n");
		exit(0);
	}
	else
		printf("Socket created\n");

	bzero(&sa, sizeof(sa));
	sa.sin_family = AF_INET;
	sa.sin_port = htons(5600);
	if (connect(sockfd, (struct sockaddr_in*)&sa, sizeof(sa)) < 0)
	{
		printf("Connection failed\n");
		exit(0);
	}
	else
		printf("Connection made\n");

	if ( n = read(sockfd, buff, sizeof(buff))) {
	printf("Read message: %s\n", buff);
		printf("%s\n", buff);
      printf("Done with connection, exiting\n");

		exit(0); }
	else
```

```
        {
    printf("Read Error\n");
        }
        close(sockfd);
        return 0;
}
```

Output :



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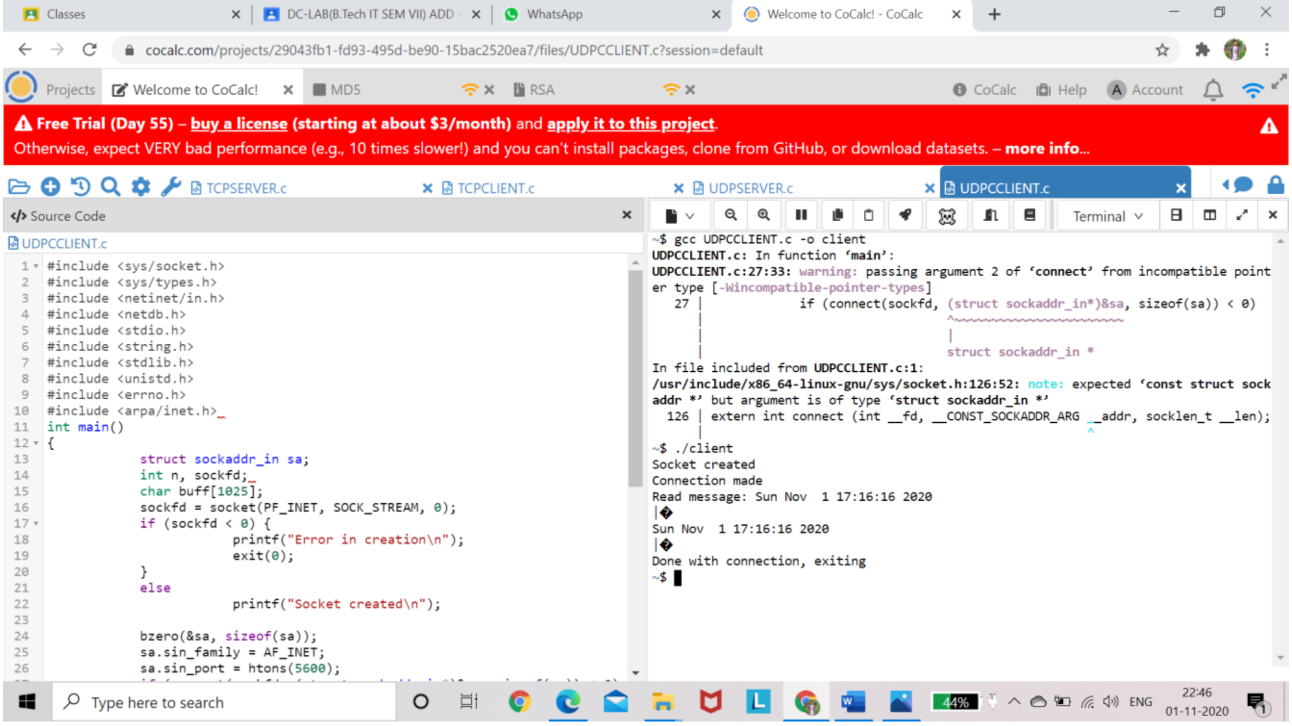
UDPSERVER.c

```
 #include <sys/socket.h>
#include <netinet/in.h>
#include <arpa/inet.h>
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <errno.h>
#include <string.h>
#include <sys/types.h>
#include <time.h>

int main()
{

            struct sockaddr_in sa;
            int sockfd, coontfd;
            char str[1025];
            time_t tick;
            sockfd = socket(AF_INET, SOCK_STREAM, 0);
            if (sockfd < 0)
            {
                        printf("Error in creating socket\n");
                        exit(0);
            }
            else
            {
```

```
~$ gcc UDPSERVER.c -o server
~$ ./server
Socket Created
Socket created
Binded
^C
~$ gcc UDPSERVER.c -o server
~$ ./server
Socket Created
Socket created
Binded
hello how are you



Accepted
sent
Sun Nov  1 17:16:16 2020

█
```



cocalc.com/projects/29043fb1-fd93-495d-be90-15bac2520ea7/files/UDPCCLIENT.c?session=default

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UDPCCLIENT.c

```
#include <sys/socket.h>
#include <sys/types.h>
#include <netinet/in.h>
#include <netdb.h>
#include <stdio.h>
#include <string.h>
#include <stdlib.h>
#include <unistd.h>
#include <errno.h>
#include <arpa/inet.h>
int main()
{
            struct sockaddr_in sa;
            int n, sockfd;
            char buff[1025];
            sockfd = socket(PF_INET, SOCK_STREAM, 0);
            if (sockfd < 0) {
                        printf("Error in creation\n");
                        exit(0);
            }
            else
                        printf("Socket created\n");

            bzero(&sa, sizeof(sa));
            sa.sin_family = AF_INET;
            sa.sin_port = htons(5600);
```

```
~$ gcc UDPCCLIENT.c -o client
UDPCCLIENT.c: In function ‘main’:
UDPCCLIENT.c:27:33: warning: passing argument 2 of ‘connect’ from incompatible point
er type [-Wincompatible-pointer-types]
   27 |              if (connect(sockfd, (struct sockaddr_in*)&sa, sizeof(sa)) < 0)
      |                                  ^~~~~~~~~~~~~~~~~~~~~~~~~
      |                                  |
      |                                  struct sockaddr_in *
In file included from UDPCCLIENT.c:1:
/usr/include/x86_64-linux-gnu/sys/socket.h:126:52: note: expected ‘const struct sock
addr *’ but argument is of type ‘struct sockaddr_in *’
  126 | extern int connect (int __fd, __CONST_SOCKADDR_ARG __addr, socklen_t __len);
      |                                                    ^
~$ ./client
Socket created
Connection made
Read message: Sun Nov  1 17:16:16 2020
|�
Sun Nov  1 17:16:16 2020
|�
Done with connection, exiting
~$ █
```

EXPERIMENT-2

Configuring Socket options
Aim: Configure following options on server socket and tests them: SO_KEEPALIVE, SO_LINGER, SO_SNDBUF, SO_RCVBUF, TCP_NODELAY
Tools/ Apparatus: Unix/Linux C Programming Environment
Procedure:
1) Write a server(TCP) C Program that sets the socket options using setsockopt on server one by one and displays the information using getsockopt.

Program:

1) SOKEEPALIVE.C

```
#include<sys/types.h>
#include<sys/socket.h>
#include<stdio.h>
#include<netinet/in.h>
#include<string.h>
#include<stdlib.h>

#define MAXLINESIZE 100
#define SERV_PORT 5877

int main(int argc, char** argv)
{
	int connectsd;
	char sendBuffer[MAXLINESIZE+1];
	char recvBuffer[MAXLINESIZE+1];

	struct sockaddr_in servaddr;
	int noBytesRead=0;

	if(argc!=2)
	{
		fprintf(stderr,"Usage : %s IP-Address\n",argv[0]);
		exit(-1);
	}

	if((connectsd=socket(AF_INET,SOCK_STREAM,0))<0)
	{
```

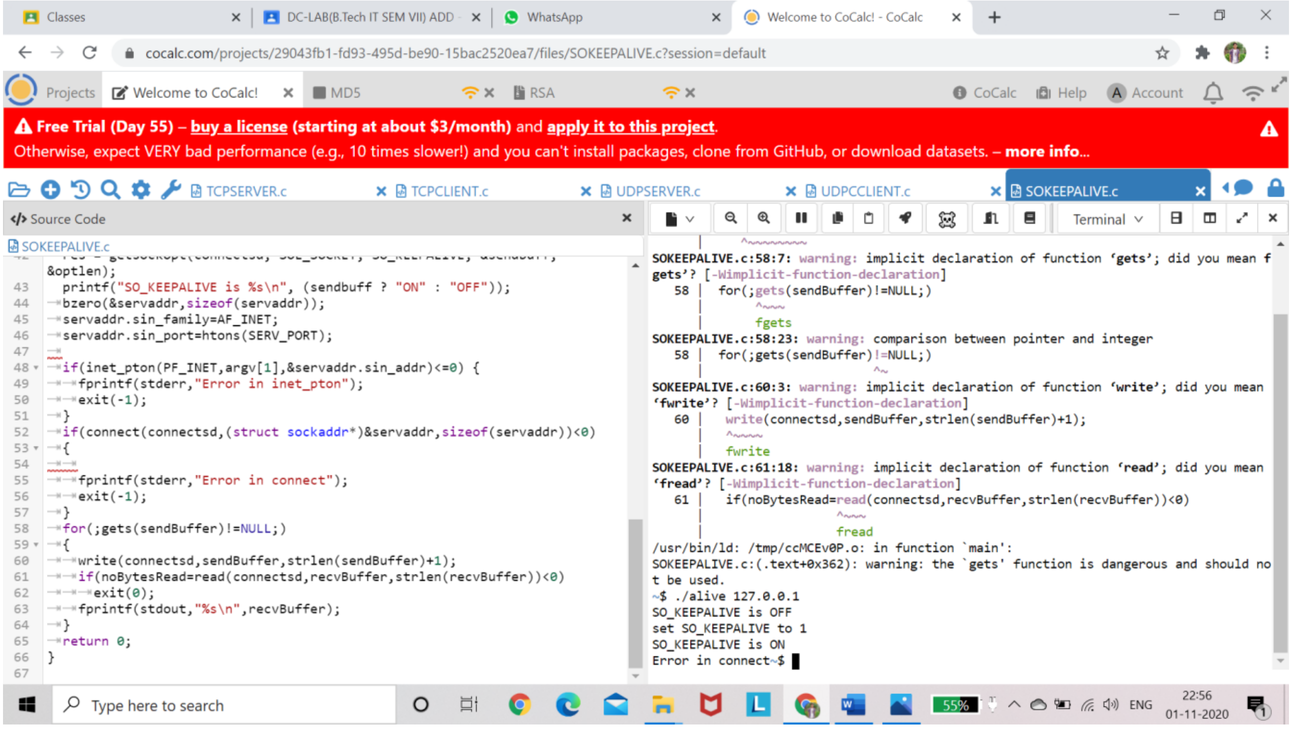
```
                fprintf(stderr,"Cannot create socket\n");
                exit(-1);
        }

 int res = 0, sendbuff, optlen;
 optlen = sizeof(sendbuff);
 res = getsockopt(connectsd, SOL_SOCKET, SO_KEEPALIVE, &sendbuff, &optlen);
  printf("SO_KEEPALIVE is %s\n", (sendbuff ? "ON" : "OFF"));
 sendbuff = 1;
 printf("set SO_KEEPALIVE to %d\n", sendbuff);
 res = setsockopt(connectsd, SOL_SOCKET, SO_KEEPALIVE, &sendbuff, sizeof(sendbuff));

 // Get flag
 optlen = sizeof(sendbuff);
 res = getsockopt(connectsd, SOL_SOCKET, SO_KEEPALIVE, &sendbuff, &optlen);
 printf("SO_KEEPALIVE is %s\n", (sendbuff ? "ON" : "OFF"));
        bzero(&servaddr,sizeof(servaddr));
        servaddr.sin_family=AF_INET;
        servaddr.sin_port=htons(SERV_PORT);

        if(inet_pton(PF_INET,argv[1],&servaddr.sin_addr)<=0) {
                fprintf(stderr,"Error in inet_pton");
                exit(-1);
        }
        if(connect(connectsd,(struct sockaddr*)&servaddr,sizeof(servaddr))<0)
        {

                fprintf(stderr,"Error in connect");
                exit(-1);
        }
        for(;gets(sendBuffer)!=NULL;)
        {
                write(connectsd,sendBuffer,strlen(sendBuffer)+1);
                if(noBytesRead=read(connectsd,recvBuffer,strlen(recvBuffer))<0)
                        exit(0);
                fprintf(stdout,"%s\n",recvBuffer);
        }
        return 0;
}
```



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```
  res = getsockopt(connectsd, SOL_SOCKET, SO_KEEPALIVE, &sendbuff,
&optlen);
  printf("SO_KEEPALIVE is %s\n", (sendbuff ? "ON" : "OFF"));
	bzero(&servaddr,sizeof(servaddr));
	servaddr.sin_family=AF_INET;
	servaddr.sin_port=htons(SERV_PORT);
	
	if(inet_pton(PF_INET,argv[1],&servaddr.sin_addr)<=0) {
		fprintf(stderr,"Error in inet_pton");
		exit(-1);
	}
	if(connect(connectsd,(struct sockaddr*)&servaddr,sizeof(servaddr))<0)
	{
		
		fprintf(stderr,"Error in connect");
		exit(-1);
	}
	for(;gets(sendBuffer)!=NULL;)
	{
		write(connectsd,sendBuffer,strlen(sendBuffer)+1);
		if(noBytesRead=read(connectsd,recvBuffer,strlen(recvBuffer))<0)
			exit(0);
		fprintf(stdout,"%s\n",recvBuffer);
	}
	return 0;
}
```

```
      |        ^~~~~~~~~~
SOKEEPALIVE.c:58:7: warning: implicit declaration of function ‘gets’; did you mean ‘f
gets’? [-Wimplicit-function-declaration]
   58 |   for(;gets(sendBuffer)!=NULL;)
      |        ^~~~
      |        fgets
SOKEEPALIVE.c:58:23: warning: comparison between pointer and integer
   58 |   for(;gets(sendBuffer)!=NULL;)
      |                        ^~
SOKEEPALIVE.c:60:3: warning: implicit declaration of function ‘write’; did you mean
‘fwrite’? [-Wimplicit-function-declaration]
   60 |    write(connectsd,sendBuffer,strlen(sendBuffer)+1);
      |    ^~~~~
      |    fwrite
SOKEEPALIVE.c:61:18: warning: implicit declaration of function ‘read’; did you mean
‘fread’? [-Wimplicit-function-declaration]
   61 |    if(noBytesRead=read(connectsd,recvBuffer,strlen(recvBuffer))<0)
      |                   ^~~~
      |                   fread
/usr/bin/ld: /tmp/ccMCEv0P.o: in function `main':
SOKEEPALIVE.c:(.text+0x362): warning: the `gets' function is dangerous and should no
t be used.
~$ ./alive 127.0.0.1
SO_KEEPALIVE is OFF
set SO_KEEPALIVE to 1
SO_KEEPALIVE is ON
Error in connect~$ 
```

2) SOLINGER.C

```
#include<sys/types.h>
#include<sys/socket.h>
#include<stdio.h>
#include<netinet/in.h>
#include<string.h>
#include<stdlib.h>

#define MAXLINESIZE 100
#define SERV_PORT 5555
int main(int argc, char** argv)
{
	int connectsd;
	char sendBuffer[MAXLINESIZE+1];
	char recvBuffer[MAXLINESIZE+1];
	struct sockaddr_in servaddr;
	int noBytesRead=0;
	if(argc!=2) {
		fprintf(stderr,"Usage : %s IP-Address\n",argv[0]);
		exit(-1);
	}

	if((connectsd=socket(AF_INET,SOCK_STREAM,0))<0) {
```

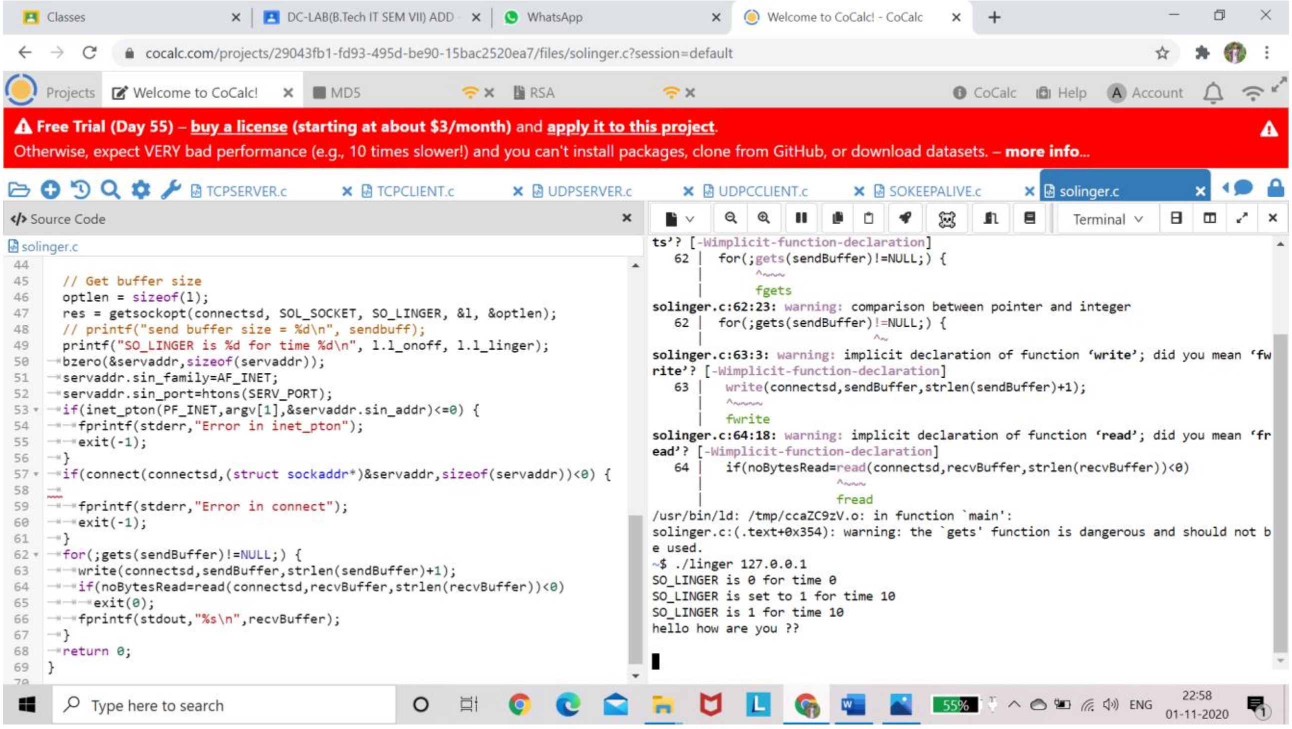
```
                fprintf(stderr,"Cannot create socket\n");
                exit(-1);
        }
  struct linger {
    int l_onoff;
    int l_linger;
  } l;
  socklen_t optlen;
  int res = 0;
  // Get buffer size
  optlen = sizeof(l);
  res = getsockopt(connectsd, SOL_SOCKET, SO_LINGER, &l, &optlen);

  // printf("send buffer size = %d\n", sendbuff);
  printf("SO_LINGER is %d for time %d\n", l.l_onoff, l.l_linger);

  // Set buffer size
  l.l_onoff = 1;
  l.l_linger = 10;
  printf("SO_LINGER is set to %d for time %d\n", l.l_onoff, l.l_linger);
  res = setsockopt(connectsd, SOL_SOCKET, SO_LINGER, &l, sizeof(l));

  // Get buffer size
  optlen = sizeof(l);
  res = getsockopt(connectsd, SOL_SOCKET, SO_LINGER, &l, &optlen);
  // printf("send buffer size = %d\n", sendbuff);
  printf("SO_LINGER is %d for time %d\n", l.l_onoff, l.l_linger);
        bzero(&servaddr,sizeof(servaddr));
        servaddr.sin_family=AF_INET;
        servaddr.sin_port=htons(SERV_PORT);
        if(inet_pton(PF_INET,argv[1],&servaddr.sin_addr)<=0) {
                fprintf(stderr,"Error in inet_pton");
                exit(-1);
        }
        if(connect(connectsd,(struct sockaddr*)&servaddr,sizeof(servaddr))<0) {

                fprintf(stderr,"Error in connect");
                exit(-1);
        }
        for(;gets(sendBuffer)!=NULL;) {
                write(connectsd,sendBuffer,strlen(sendBuffer)+1);
                if(noBytesRead=read(connectsd,recvBuffer,strlen(recvBuffer))<0)
                        exit(0);
                fprintf(stdout,"%s\n",recvBuffer);
        }
        return 0;
}
```



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Otherwise, expect VERY bad performance (e.g., 10 times slower!) and you can't install packages, clone from GitHub, or download datasets. – more info...

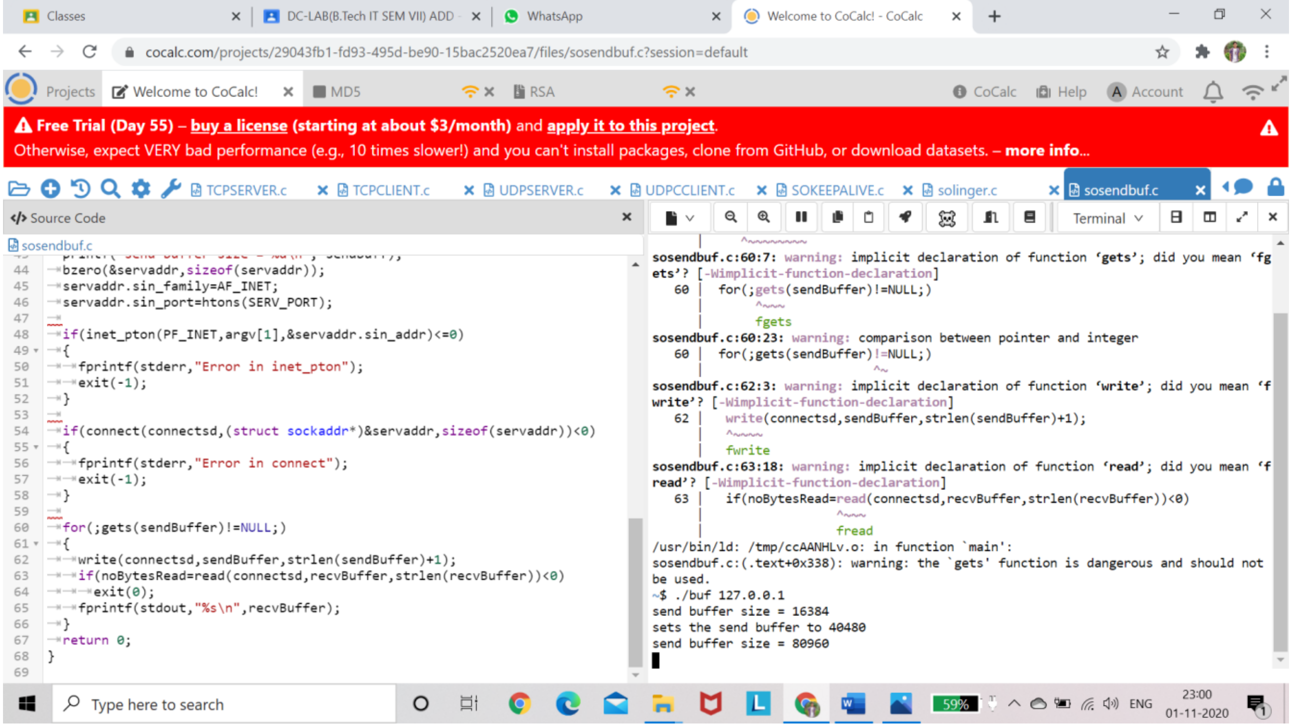
solinger.c

```

  // Get buffer size
  optlen = sizeof(l);
  res = getsockopt(connectsd, SOL_SOCKET, SO_LINGER, &l, &optlen);
  // printf("send buffer size = %d\n", sendbuff);
  printf("SO_LINGER is %d for time %d\n", l.l_onoff, l.l_linger);
	bzero(&servaddr,sizeof(servaddr));
	servaddr.sin_family=AF_INET;
	servaddr.sin_port=htons(SERV_PORT);
	if(inet_pton(PF_INET,argv[1],&servaddr.sin_addr)<=0) {
		fprintf(stderr,"Error in inet_pton");
		exit(-1);
	}
	if(connect(connectsd,(struct sockaddr*)&servaddr,sizeof(servaddr))<0) {
	
		fprintf(stderr,"Error in connect");
		exit(-1);
	}
	for(;gets(sendBuffer)!=NULL;) {
		write(connectsd,sendBuffer,strlen(sendBuffer)+1);
		if(noBytesRead=read(connectsd,recvBuffer,strlen(recvBuffer))<0)
			exit(0);
		fprintf(stdout,"%s\n",recvBuffer);
	}
	return 0;
}
```

```
ts'? [-Wimplicit-function-declaration]
   62 |   for(;gets(sendBuffer)!=NULL;) {
      |        ^~~~
      |        fgets
solinger.c:62:23: warning: comparison between pointer and integer
   62 |   for(;gets(sendBuffer)!=NULL;) {
      |                        ^~
solinger.c:63:3: warning: implicit declaration of function ‘write’; did you mean ‘fw
rite’? [-Wimplicit-function-declaration]
   63 |    write(connectsd,sendBuffer,strlen(sendBuffer)+1);
      |    ^~~~~
      |    fwrite
solinger.c:64:18: warning: implicit declaration of function ‘read’; did you mean ‘fr
ead’? [-Wimplicit-function-declaration]
   64 |    if(noBytesRead=read(connectsd,recvBuffer,strlen(recvBuffer))<0)
      |                   ^~~~
      |                   fread
/usr/bin/ld: /tmp/ccaZC9zV.o: in function `main':
solinger.c:(.text+0x354): warning: the `gets' function is dangerous and should not b
e used.
~$ ./linger 127.0.0.1
SO_LINGER is 0 for time 0
SO_LINGER is set to 1 for time 10
SO_LINGER is 1 for time 10
hello how are you ??

█
```

3) SOSENDBUF.C

```
#include<sys/types.h>
#include<sys/socket.h>
#include<stdio.h>
#include<netinet/in.h>
#include<string.h>
#include<stdlib.h>

#define MAXLINESIZE 100
#define SERV_PORT 5555

int main(int argc, char** argv)
{
        int connectsd;
        char sendBuffer[MAXLINESIZE+1];
        char recvBuffer[MAXLINESIZE+1];
        struct sockaddr_in servaddr;
        int noBytesRead=0;
        if(argc!=2) {
                fprintf(stderr,"Usage : %s IP-Address\n",argv[0]);
                exit(-1);
        }
        if((connectsd=socket(AF_INET,SOCK_STREAM,0))<0) {
                fprintf(stderr,"Cannot create socket\n");
                exit(-1);
        }

  int sendbuff;
  socklen_t optlen;
  int res = 0;
  // Get buffer size
  optlen = sizeof(sendbuff);
  res = getsockopt(connectsd, SOL_SOCKET, SO_SNDBUF, &sendbuff, &optlen);
  printf("send buffer size = %d\n", sendbuff);

  // Set buffer size
  sendbuff = 40480;
  printf("sets the send buffer to %d\n", sendbuff);
  res = setsockopt(connectsd, SOL_SOCKET, SO_SNDBUF, &sendbuff, sizeof(sendbuff));

  // Get buffer size
  optlen = sizeof(sendbuff);
  res = getsockopt(connectsd, SOL_SOCKET, SO_SNDBUF, &sendbuff, &optlen);
  printf("send buffer size = %d\n", sendbuff);
        bzero(&servaddr,sizeof(servaddr));
        servaddr.sin_family=AF_INET;
        servaddr.sin_port=htons(SERV_PORT);

        if(inet_pton(PF_INET,argv[1],&servaddr.sin_addr)<=0)
        {
                fprintf(stderr,"Error in inet_pton");
                exit(-1);
        }

        if(connect(connectsd,(struct sockaddr*)&servaddr,sizeof(servaddr))<0)
        {
                fprintf(stderr,"Error in connect");
                exit(-1);
        }

        for(;gets(sendBuffer)!=NULL;)
        {
                write(connectsd,sendBuffer,strlen(sendBuffer)+1);
                if(noBytesRead=read(connectsd,recvBuffer,strlen(recvBuffer))<0)
                        exit(0);
                fprintf(stdout,"%s\n",recvBuffer);
        }
        return 0;
}
```



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Otherwise, expect VERY bad performance (e.g., 10 times slower!) and you can't install packages, clone from GitHub, or download datasets. – more info...

sosendbuf.c

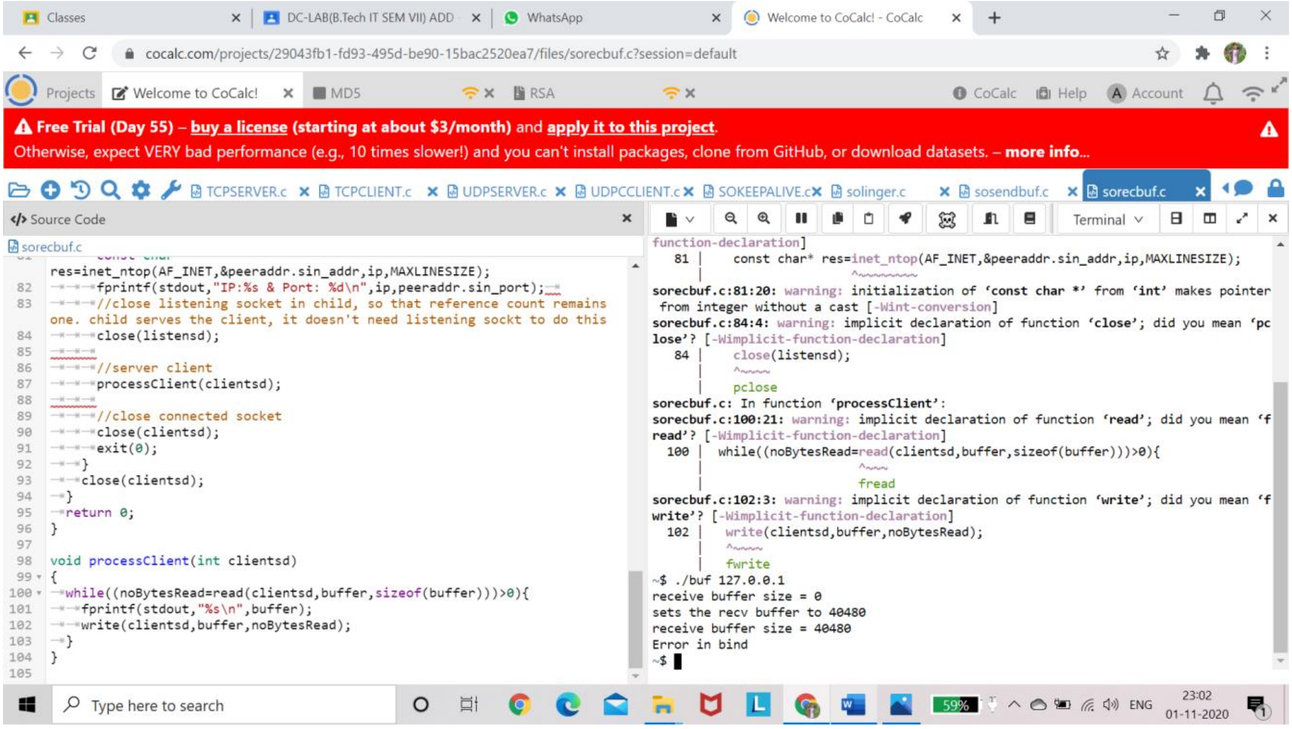
```
	bzero(&servaddr,sizeof(servaddr));
	servaddr.sin_family=AF_INET;
	servaddr.sin_port=htons(SERV_PORT);
	
	if(inet_pton(PF_INET,argv[1],&servaddr.sin_addr)<=0)
	{
		fprintf(stderr,"Error in inet_pton");
		exit(-1);
	}
	
	if(connect(connectsd,(struct sockaddr*)&servaddr,sizeof(servaddr))<0)
	{
		fprintf(stderr,"Error in connect");
		exit(-1);
	}
	
	for(;gets(sendBuffer)!=NULL;)
	{
		write(connectsd,sendBuffer,strlen(sendBuffer)+1);
		if(noBytesRead=read(connectsd,recvBuffer,strlen(recvBuffer))<0)
			exit(0);
		fprintf(stdout,"%s\n",recvBuffer);
	}
	return 0;
}
```

```
      |         ^~~~~~~~~~
sosendbuf.c:60:7: warning: implicit declaration of function ‘gets’; did you mean ‘fg
ets’? [-Wimplicit-function-declaration]
   60 |  for(;gets(sendBuffer)!=NULL;)
      |       ^~~~
      |       fgets
sosendbuf.c:60:23: warning: comparison between pointer and integer
   60 |  for(;gets(sendBuffer)!=NULL;)
      |                       ^~
sosendbuf.c:62:3: warning: implicit declaration of function ‘write’; did you mean ‘f
write’? [-Wimplicit-function-declaration]
   62 |   write(connectsd,sendBuffer,strlen(sendBuffer)+1);
      |   ^~~~~
      |   fwrite
sosendbuf.c:63:18: warning: implicit declaration of function ‘read’; did you mean ‘f
read’? [-Wimplicit-function-declaration]
   63 |   if(noBytesRead=read(connectsd,recvBuffer,strlen(recvBuffer))<0)
      |                  ^~~~
      |                  fread
/usr/bin/ld: /tmp/ccAANHLv.o: in function `main':
sosendbuf.c:(.text+0x338): warning: the `gets' function is dangerous and should not
be used.
~$ ./buf 127.0.0.1
send buffer size = 16384
sets the send buffer to 40480
send buffer size = 80960
```

4) SORECBUF.C

```
#include<sys/types.h>
#include<sys/socket.h>
#include<stdio.h>
#include<netinet/in.h>
#include<stdlib.h>

#define MAXLINESIZE 100
#define SERV_PORT 5555

int listensd,clientsd;
char buffer[MAXLINESIZE+1];

struct sockaddr_in servaddr;
struct sockaddr_in peeraddr;
int noBytesRead=0;
//
void processClient(int);

int main()
{
        //create socket
        if((listensd=socket(AF_INET,SOCK_STREAM,0))<0)
        {
                fprintf(stderr,"Cannont create socket\n");
                exit(-1);
        }

  int sockfd, recvbuff;
  socklen_t optlen;

  int res = 0;

  // Get buffer size
  optlen = sizeof(recvbuff);
  res = getsockopt(sockfd, SOL_SOCKET, SO_RCVBUF, &recvbuff, &optlen);

  printf("receive buffer size = %d\n", recvbuff);

  // Set buffer size
  recvbuff = 40480;

  printf("sets the recv buffer to %d\n", recvbuff);
  res = setsockopt(sockfd, SOL_SOCKET, SO_RCVBUF, &recvbuff, sizeof(recvbuff));
  // Get buffer size
  optlen = sizeof(recvbuff);
  res = getsockopt(sockfd, SOL_SOCKET, SO_RCVBUF, &recvbuff, &optlen);

  printf("receive buffer size = %d\n", recvbuff);

	//Initialize socket address structure
	bzero(&servaddr,sizeof(servaddr));
	servaddr.sin_family=AF_INET;
	servaddr.sin_port=htons(SERV_PORT);

	servaddr.sin_addr.s_addr=htonl(INADDR_ANY);   //INADDR_ANY is wildcard returns
local address when not connected

	//bind socket
	if(bind(listensd,(struct sockaddr*)&servaddr,sizeof(servaddr))<0) {
		fprintf(stderr,"Error in bind\n");
		exit(-1);
	}

	//make socket listening socket
	if(listen(listensd,5)<0) {
		fprintf(stderr,"Error in listen\n");
		exit(-1);
	}
	//wait for client connection
	for(;;) {
		clientsd=accept(listensd,(struct sockaddr*)NULL,NULL);
		if(fork()==0) {
			int len = sizeof(peeraddr);
			int n=getpeername(clientsd,(struct sockaddr*)&peeraddr,&len);
			char ip[MAXLINESIZE];
			if(n==-1) {
				fprintf(stderr,"Peer Call Error!");
				exit(-1);
			}

			const char*
res=inet_ntop(AF_INET,&peeraddr.sin_addr,ip,MAXLINESIZE);
			fprintf(stdout,"IP:%s & Port: %d\n",ip,peeraddr.sin_port);
			//close listening socket in child, so that reference count remains one. child
serves the client, it doesn't need listening sockt to do this
			close(listensd);

			//server client
			processClient(clientsd);

			//close connected socket
```

```
                        close(clientsd);
                        exit(0);
                }
                close(clientsd);
        }
        return 0;
}

void processClient(int clientsd)
{
        while((noBytesRead=read(clientsd,buffer,sizeof(buffer)))>0){
                fprintf(stdout,"%s\n",buffer);
                write(clientsd,buffer,noBytesRead);
        }
}
```


Classes
DC-LAB(B.Tech IT SEM VII) ADD
WhatsApp
Welcome to CoCalc! - CoCalc
cocalc.com/projects/29043fb1-fd93-495d-be90-15bac2520ea7/files/sorecbuf.c?session=default
Projects
Welcome to CoCalc!
MD5
RSA
CoCalc
Help
Account

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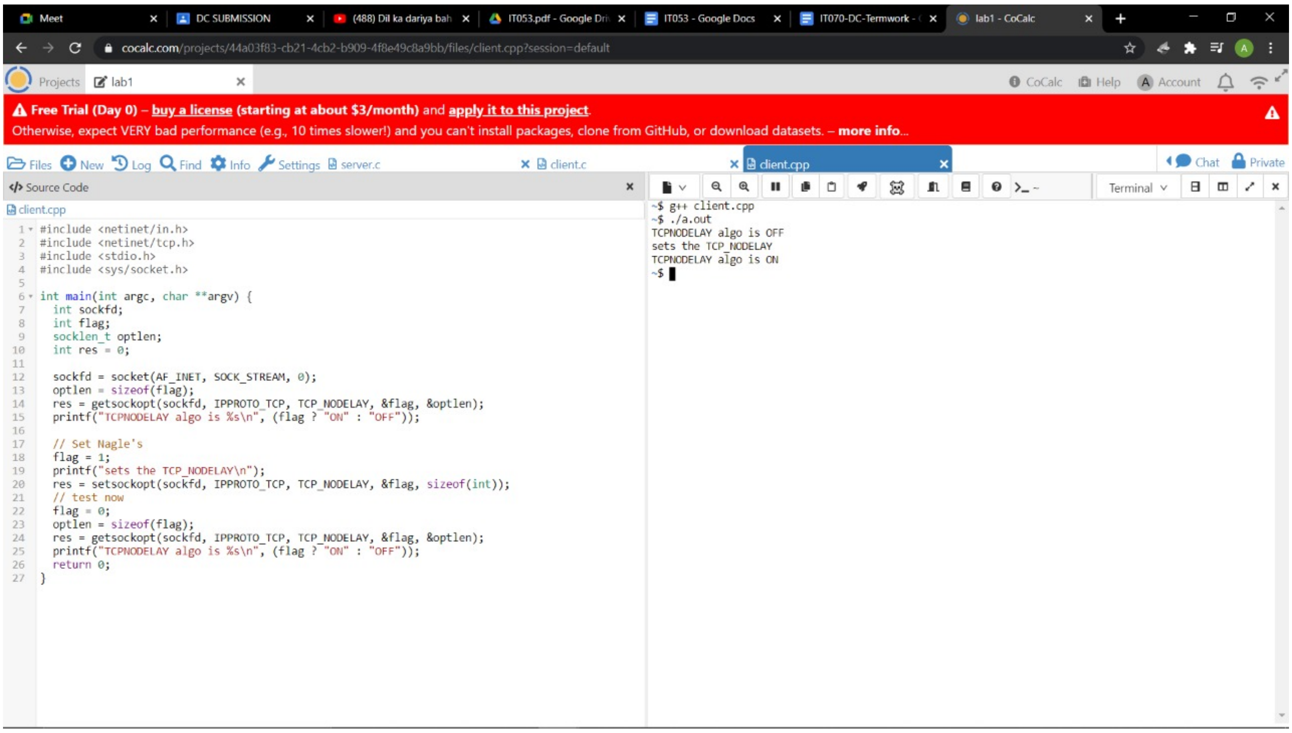
Otherwise, expect VERY bad performance (e.g., 10 times slower!) and you can't install packages, clone from GitHub, or download datasets. – **more info...**

```
    const char*
res=inet_ntop(AF_INET,&peeraddr.sin_addr,ip,MAXLINESIZE);
        fprintf(stdout,"IP:%s & Port: %d\n",ip,peeraddr.sin_port);
        //close listening socket in child, so that reference count remains one. child serves the client, it doesn't need listening sockt to do this
        close(listensd);

        //server client
        processClient(clientsd);

        //close connected socket
        close(clientsd);
        exit(0);
    }
    close(clientsd);
  }
  return 0;
}

void processClient(int clientsd)
{
  while((noBytesRead=read(clientsd,buffer,sizeof(buffer)))>0){
    fprintf(stdout,"%s\n",buffer);
    write(clientsd,buffer,noBytesRead);
  }
}
```

```
function-declaration]
   81 |     const char* res=inet_ntop(AF_INET,&peeraddr.sin_addr,ip,MAXLINESIZE);
      |                     ^~~~~~~~~
sorecbuf.c:81:20: warning: initialization of ‘const char *’ from ‘int’ makes pointer
 from integer without a cast [-Wint-conversion]
sorecbuf.c:84:4: warning: implicit declaration of function ‘close’; did you mean ‘pc
lose’? [-Wimplicit-function-declaration]
   84 |     close(listensd);
      |     ^~~~~
      |     pclose
sorecbuf.c: In function ‘processClient’:
sorecbuf.c:100:21: warning: implicit declaration of function ‘read’; did you mean ‘f
read’? [-Wimplicit-function-declaration]
  100 |   while((noBytesRead=read(clientsd,buffer,sizeof(buffer)))>0){
      |                      ^~~~
      |                      fread
sorecbuf.c:102:3: warning: implicit declaration of function ‘write’; did you mean ‘f
write’? [-Wimplicit-function-declaration]
  102 |    write(clientsd,buffer,noBytesRead);
      |    ^~~~~
      |    fwrite
~$ ./buf 127.0.0.1
receive buffer size = 0
sets the recv buffer to 40480
receive buffer size = 40480
Error in bind
~$ 
```

5) TCPNODELAY.C

```
#include <netinet/in.h>
#include <netinet/tcp.h>
#include <stdio.h>
#include <sys/socket.h>

int main(int argc, char **argv) {
  int sockfd;
  int flag;
  socklen_t optlen;
  int res = 0;

  sockfd = socket(AF_INET, SOCK_STREAM, 0);
  optlen = sizeof(flag);
  res = getsockopt(sockfd, IPPROTO_TCP, TCP_NODELAY, &flag, &optlen);
  printf("TCPNODELAY algo is %s\n", (flag ? "ON" : "OFF"));

  // Set Nagle's
  flag = 1;
  printf("sets the TCP_NODELAY\n");
  res = setsockopt(sockfd, IPPROTO_TCP, TCP_NODELAY, &flag, sizeof(int));
  // test now
  flag = 0;
  optlen = sizeof(flag);
  res = getsockopt(sockfd, IPPROTO_TCP, TCP_NODELAY, &flag, &optlen);
  printf("TCPNODELAY algo is %s\n", (flag ? "ON" : "OFF"));
  return 0;
}
```



Free Trial (Day 0) – buy a license (starting at about $3/month) and apply it to this project.
Otherwise, expect VERY bad performance (e.g., 10 times slower!) and you can't install packages, clone from GitHub, or download datasets. – more info...

client.cpp

```
#include <netinet/in.h>
#include <netinet/tcp.h>
#include <stdio.h>
#include <sys/socket.h>

int main(int argc, char **argv) {
  int sockfd;
  int flag;
  socklen_t optlen;
  int res = 0;

  sockfd = socket(AF_INET, SOCK_STREAM, 0);
  optlen = sizeof(flag);
  res = getsockopt(sockfd, IPPROTO_TCP, TCP_NODELAY, &flag, &optlen);
  printf("TCPNODELAY algo is %s\n", (flag ? "ON" : "OFF"));

  // Set Nagle's
  flag = 1;
  printf("sets the TCP_NODELAY\n");
  res = setsockopt(sockfd, IPPROTO_TCP, TCP_NODELAY, &flag, sizeof(int));
  // test now
  flag = 0;
  optlen = sizeof(flag);
  res = getsockopt(sockfd, IPPROTO_TCP, TCP_NODELAY, &flag, &optlen);
  printf("TCPNODELAY algo is %s\n", (flag ? "ON" : "OFF"));
  return 0;
}
```

```
~$ g++ client.cpp
~$ ./a.out
TCPNODELAY algo is OFF
sets the TCP_NODELAY
TCPNODELAY algo is ON
~$
```

EXPERIMENT-3

Aim: Data Representation and Data Validation: XML Schema and XML instance document, JSON.

Tools/ Apparatus:GUI-IDE Tool NetBeans 6.0

Procedure:

1. Design a schema for student list. A student has information such as name, semester, roll no, email-ids, phone-nos, etc.
2. Write an XML instance document for the designed schema and validate this instance document against the schema.

bookxml.xsd

```
<?xml version="1.0"?>
<xs:schema version="1.0"
           xmlns:xs="http://www.w3.org/2001/XMLSchema"
           elementFormDefault="qualified">

   <xs:element name="bookissue">
  <xs:complexType>
    <xs:sequence>
     <xs:element name="issueto">
        <xs:complexType>
          <xs:sequence>
            <xs:element name="name" type="xs:string"/>
            <xs:element name="idnumber" type="xs:string"/>
            <xs:element name="semester">
          <xs:simpleType>
                 <xs:restriction base="xs:integer">
                      <xs:minInclusive value="1"/>
                 <xs:maxInclusive value="8"/>
                 </xs:restriction>
             </xs:simpleType>

            </xs:element>
          </xs:sequence>
        </xs:complexType>

      </xs:element>

      <xs:element name="book">
        <xs:complexType>
          <xs:sequence>
            <xs:element name="title" type="xs:string"/>
            <xs:element name="auther" type="xs:string"/>
            <xs:element name="dateofissue" type="xs:date"/>
          </xs:sequence>
        </xs:complexType>
      </xs:element>
         </xs:sequence>
     </xs:complexType>
   </xs:element>
</xs:schema>
```

bookxmldoc.xml

```
<?xml version="1.0" encoding="UTF-8"?>

<bookissue
    xmlns:xsi='http://www.w3.org/2001/XMLSchema-instance'
    xsi:noNamespaceSchemaLocation='BookXML.xsd'>

    <issueto>
        <name>Chintan</name>
        <idnumber>17<ITUSF125/idnumber>
        <semester>7</semester>
    </issueto>
    <book>
        <title>Java</title>
        <auther>Joshua bloch</auther>
        <dateofissue>2019-10-26</dateofissue>
    </book>

</bookissue>
```

Experiment – 4

Aim: WSDL based webservice and its monitoring: Implement ArithmeticService that implements add and subtract operations / Java based: Implement TrigonometricService that implements sin, and cos operations. Monitor SOAP request and response packets. Analyze parts of it and compare them with the operations (java functions) headers.

Tools/ Apparatus: Web service, BPEL Runtime Environment: GlassFish Server, GUI-IDE Tool: NetBeans 6.0, WSMonitor

Procedure:

Steps for creation of ArithmeticService web service:

1. Create a Project of type Web application. Give it name Arithmetic.
2. Right click on Project folder, select New, select a Web service. A dialog box will appear. Specify Name of Web service (ArithmeticService), package name(websvc), and select option “Create Web service from scratch”
3. .java source file can be seen in Source view or Design view. From design view, you will be able to add operations. While adding operations, you have to specify name of operation, return type, names and types of input parameters.
4. Go in source view, and provide definition of Web service operations.

Steps for creation of web service Client:

1. Create a new project of type Java application. Give it name ArithmeticClient.
2. Right click on project folder and select New Web service client.
3. A dialog box will appear asking location of WSDL and client. For WSDL specify Http://localhost:8080/Arithmetic/ArithmeticServiceService?WSDL and for client specify websvcclient in package option. Make sure Style is JAX-WS.
4. Right click in source code of Main class. Select option “Web service client resource” □ Call web service operation.
5. A new dialog box will appear asking for selecting name of operation. Select “add” operation.

Steps for Monitoring SOAP Messages:

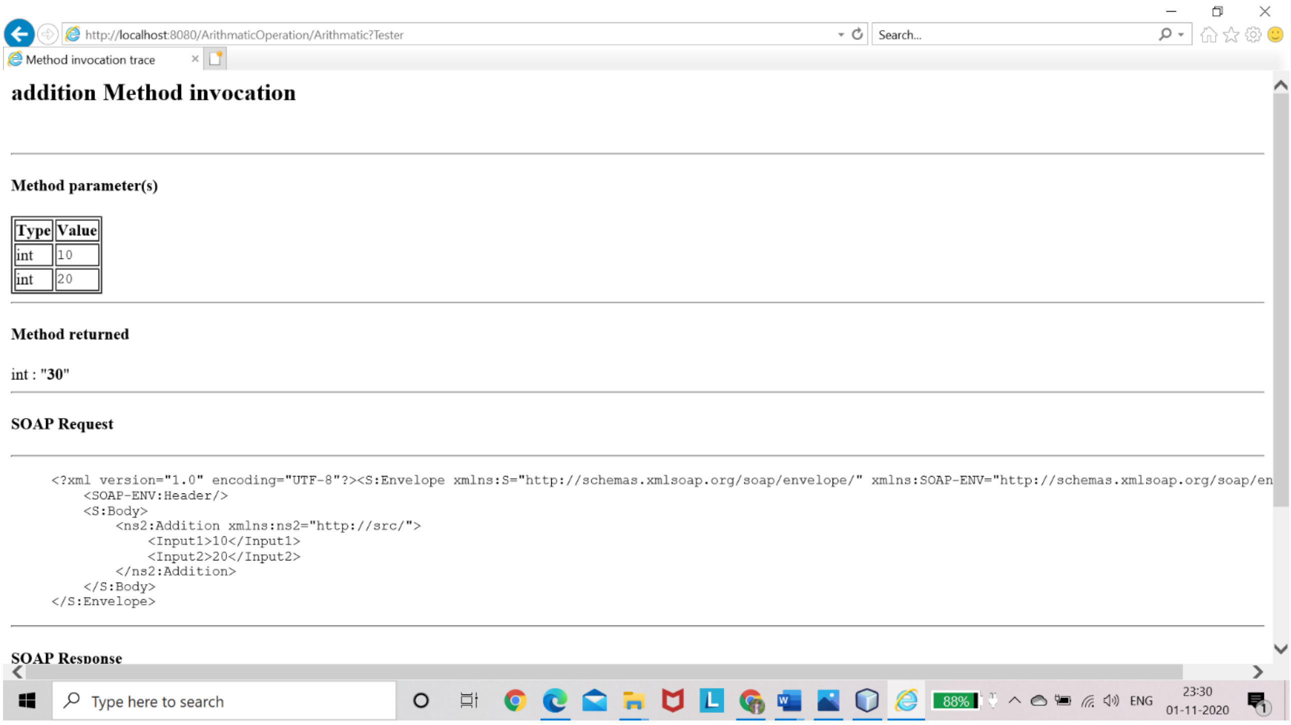
1. Start WS-Monitor on port 4040 and forwarding port 8080
2. Change the service target port from 8080 to 4040
3. WS-Monitor will capture SOAP request and SOAP response.
4. Study request and response packets and try to relate them with operation name, service name, namespace, etc.

<u>Arithmetic.java :</u>

```
package src;
```

```
import javax.jws.WebService;
import javax.jws.WebMethod;
import javax.jws.WebParam;

/**
 *
 * @author CHINTAN
 */
@WebService(serviceName = "Arithmatic")
public class Arithmatic {


    /**
     * Web service operation
     * @param Input1
     * @param Input2
     * @return
     */
    @WebMethod(operationName = "Addition")
    public int Addition(@WebParam(name = "Input1") int Input1, @WebParam(name = "Input2") int
Input2) {
        //TODO write your implementation code here:
        int result = Input1 + Input2;
        return result ;
    }

    /**
     * Web service operation
     * @param SInput1
     * @param SInput2
     * @return
     */
    @WebMethod(operationName = "Substraction")
    public int Substraction(@WebParam(name = "SInput1") int SInput1, @WebParam(name =
"SInput2") int SInput2) {
        //TODO write your implementation code here:
        int result = SInput1 - SInput2 ;
        return result ;
    }

    /**
     * Web service operation
     * @param MInput1
     * @param MInput2
     * @return
     */
    @WebMethod(operationName = "Multiplication")
    public int Multiplication(@WebParam(name = "MInput1") int MInput1, @WebParam(name =
"MInput2") int MInput2) {
        //TODO write your implementation code here:
        int result = MInput1 * MInput2 ;
        return result;
    }

    /**
     * Web service operation
     * @param DInput1
     * @param DInput2
     * @return
     */
    @WebMethod(operationName = "Division")
    public int Division(@WebParam(name = "DInput1") int DInput1, @WebParam(name =
"DInput2") int DInput2) {
        //TODO write your implementation code here:
        int result = DInput1 / DInput2 ;
        return result ;
    }
}
```

Output :



addition Method invocation

Method parameter(s)

Type	Value
int	10
int	20

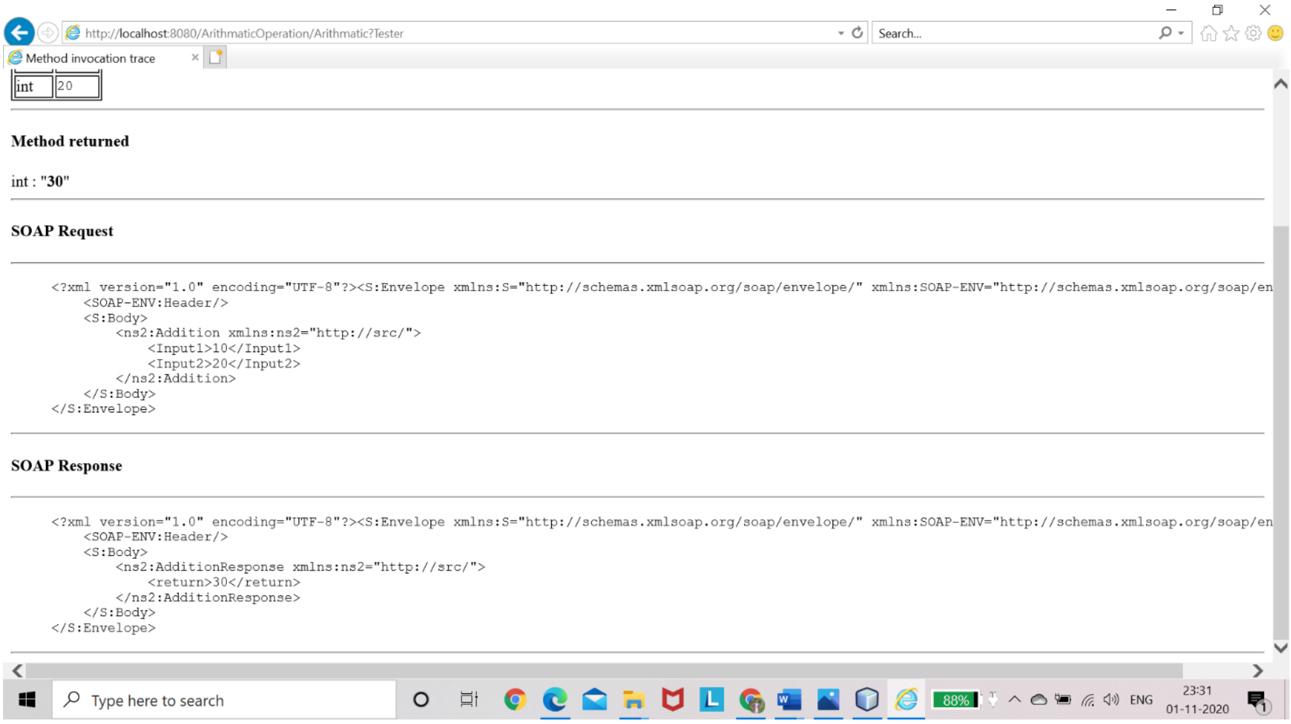
Method returned

int : **"30"**

SOAP Request

```
<?xml version="1.0" encoding="UTF-8"?><S:Envelope xmlns:S="http://schemas.xmlsoap.org/soap/envelope/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/en
    <SOAP-ENV:Header/>
    <S:Body>
        <ns2:Addition xmlns:ns2="http://src/">
            <Input1>10</Input1>
            <Input2>20</Input2>
        </ns2:Addition>
    </S:Body>
</S:Envelope>
```

SOAP Response



int	20

Method returned

int : "**30**"

SOAP Request

```
    <?xml version="1.0" encoding="UTF-8"?><S:Envelope xmlns:S="http://schemas.xmlsoap.org/soap/envelope/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/en
        <SOAP-ENV:Header/>
        <S:Body>
            <ns2:Addition xmlns:ns2="http://src/">
                <Input1>10</Input1>
                <Input2>20</Input2>
            </ns2:Addition>
        </S:Body>
    </S:Envelope>
```

SOAP Response

```
    <?xml version="1.0" encoding="UTF-8"?><S:Envelope xmlns:S="http://schemas.xmlsoap.org/soap/envelope/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/en
        <SOAP-ENV:Header/>
        <S:Body>
            <ns2:AdditionResponse xmlns:ns2="http://src/">
                <return>30</return>
            </ns2:AdditionResponse>
        </S:Body>
    </S:Envelope>
```

STTPScientificWSDL.wsdl

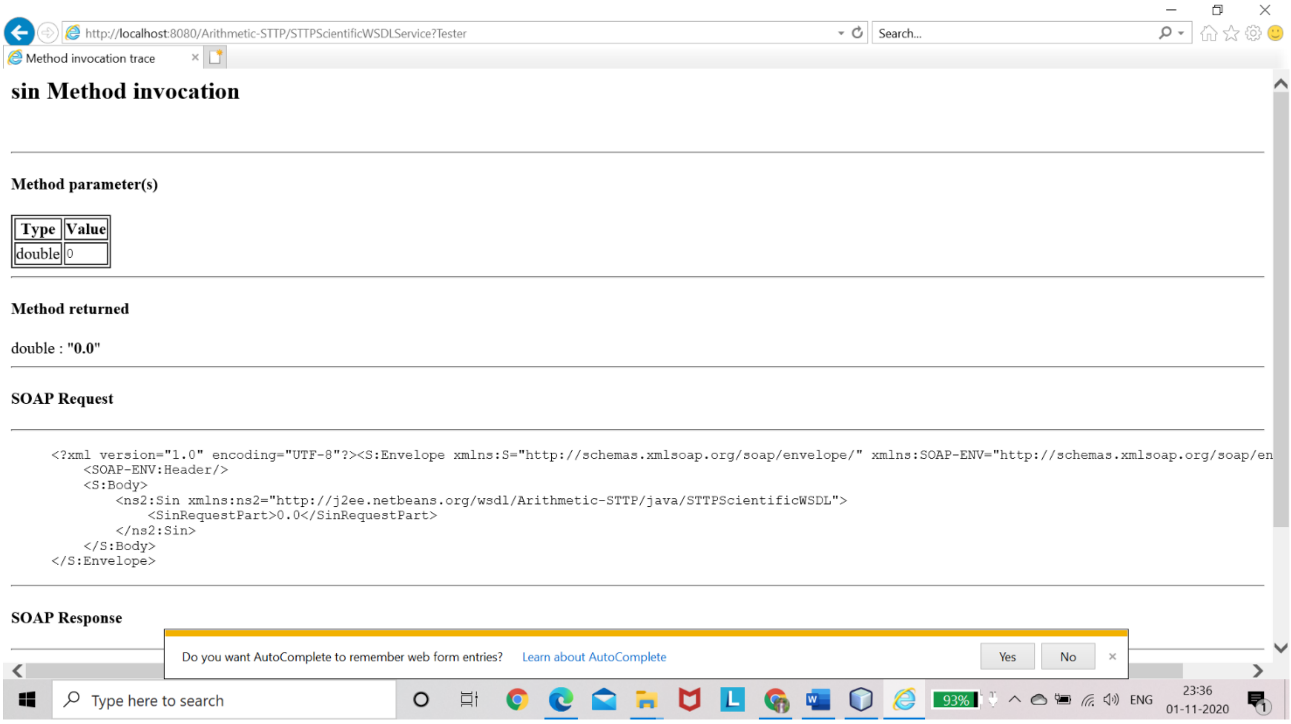
```
<?xml version="1.0" encoding="UTF-8"?>
<definitions name="STTPScientificWSDL"
targetNamespace="http://j2ee.netbeans.org/wsdl/Arithmetic-STTP/java/STTPScientificWSDL"
    xmlns="http://schemas.xmlsoap.org/wsdl/"
    xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:tns="http://j2ee.netbeans.org/wsdl/Arithmetic-STTP/java/STTPScientificWSDL"
xmlns:plnk="http://docs.oasis-open.org/wsbpel/2.0/plnktype"
xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/">
    <types/>
    <message name="SinRequest">
        <part name="SinRequestPart" type="xsd:double"/>
    </message>
    <message name="SinResponse">
        <part name="SinReponsePart" type="xsd:double"/>
    </message>
    <message name="CosRequest">
        <part name="CosRequestPart" type="xsd:double"/>
    </message>
    <message name="CosResponse">
        <part name="CosResponsePart" type="xsd:double"/>
    </message>
    <portType name="STTPScientificWSDLPortType">
        <operation name="Sin">
```

```
            <input name="input1" message="tns:SinRequest"/>
            <output name="output1" message="tns:SinResponse"/>
        </operation>
        <operation name="Cos">
            <input name="input2" message="tns:CosRequest"/>
            <output name="output2" message="tns:CosResponse"/>
        </operation>
    </portType>
    <binding name="STTPScientificWSDLBinding" type="tns:STTPScientificWSDLPortType">
        <soap:binding style="rpc" transport="http://schemas.xmlsoap.org/soap/http"/>
        <operation name="Sin">
            <soap:operation/>
            <input name="input1">
                <soap:body use="literal" namespace="http://j2ee.netbeans.org/wsdl/Arithmetic-
STTP/java/STTPScientificWSDL"/>
            </input>
            <output name="output1">
                <soap:body use="literal" namespace="http://j2ee.netbeans.org/wsdl/Arithmetic-
STTP/java/STTPScientificWSDL"/>
            </output>
        </operation>
        <operation name="Cos">
            <soap:operation/>
            <input name="input2">
                <soap:body use="literal" namespace="http://j2ee.netbeans.org/wsdl/Arithmetic-
STTP/java/STTPScientificWSDL"/>
            </input>
            <output name="output2">
                <soap:body use="literal" namespace="http://j2ee.netbeans.org/wsdl/Arithmetic-
STTP/java/STTPScientificWSDL"/>
            </output>
        </operation>
    </binding>
    <service name="STTPScientificWSDLService">
        <port name="STTPScientificWSDLPort" binding="tns:STTPScientificWSDLBinding">
            <soap:address
location="http://localhost:${HttpDefaultPort}/STTPScientificWSDLService/STTPScientificWSDL
Port"/>
        </port>
    </service>
    <plnk:partnerLinkType name="STTPScientificWSDL">
        <!-- A partner link type is automatically generated when a new port type is added. Partner link
types are used by BPEL processes.
In a BPEL process, a partner link represents the interaction between the BPEL process and a partner
service. Each partner link is associated with a partner link type.
A partner link type characterizes the conversational relationship between two services. The partner
link type can have one or two roles.-->
```

```
        <plnk:role name="STTPScientificWSDLPortTypeRole"
portType="tns:STTPScientificWSDLPortType"/>
    </plnk:partnerLinkType>
</definitions>
```

STTPScientific.java :

```
package websvc;
import javax.jws.WebService;

/**
 *
 * @author CHINTAN
 */
@WebService(serviceName = "STTPScientificWSDLService", portName =
"STTPScientificWSDLPort", endpointInterface =
"org.netbeans.j2ee.wsdl.arithmetic_sttp.java.sttpscientificwsdl.STTPScientificWSDLPortType",
targetNamespace = "http://j2ee.netbeans.org/wsdl/Arithmetic-STTP/java/STTPScientificWSDL",
wsdlLocation = "WEB-INF/wsdl/STTPScientific/STTPScientificWSDL.wsdl")
public class STTPScientific {

    public double sin(double sinRequestPart) {
        double SinRequestPart = 0;
        //TODO implement this method
        //throw new UnsupportedOperationException("Not implemented yet.");
            return Math.sin(SinRequestPart*Math.PI/180);
    }

    public double cos(double cosRequestPart) {
        double CosRequestPart = 0;
        //TODO implement this method
       // throw new UnsupportedOperationException("Not implemented yet.");
        return Math.cos(CosRequestPart*Math.PI/180);
    }

}
```


http://localhost:8080/Arithmetic-STTP/STTPScientificWSDLService?Tester
Search...
Method invocation trace
Do you want AutoComplete to remember web form entries?
Learn about AutoComplete
Yes
No
Type here to search
93%
ENG
23:36
01-11-2020

sin Method invocation

Method parameter(s)

Type	Value
double	0

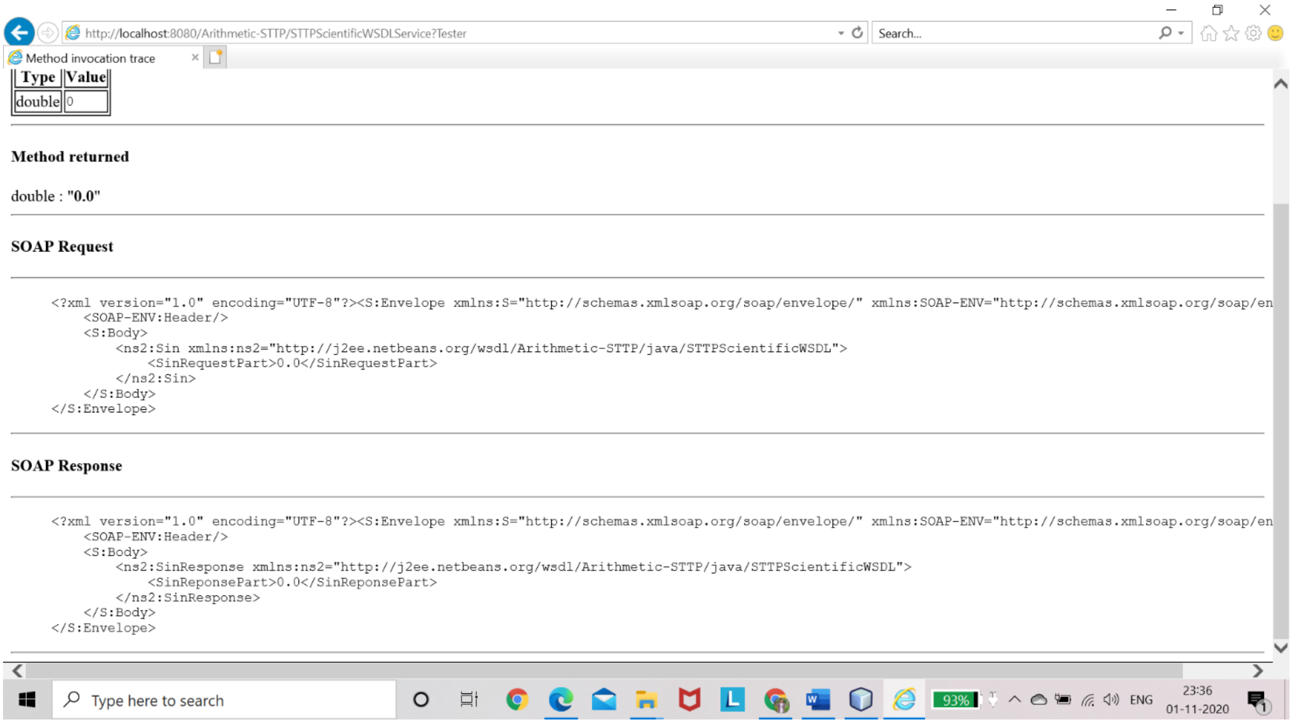
Method returned

double : "**0.0**"

SOAP Request

```
<?xml version="1.0" encoding="UTF-8"?><S:Envelope xmlns:S="http://schemas.xmlsoap.org/soap/envelope/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/en
    <SOAP-ENV:Header/>
    <S:Body>
        <ns2:Sin xmlns:ns2="http://j2ee.netbeans.org/wsdl/Arithmetic-STTP/java/STTPScientificWSDL">
            <SinRequestPart>0.0</SinRequestPart>
        </ns2:Sin>
    </S:Body>
</S:Envelope>
```

SOAP Response



Type	Value
double	0

Method returned

double : "**0.0**"

SOAP Request

```
<?xml version="1.0" encoding="UTF-8"?><S:Envelope xmlns:S="http://schemas.xmlsoap.org/soap/envelope/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/en
    <SOAP-ENV:Header/>
    <S:Body>
        <ns2:Sin xmlns:ns2="http://j2ee.netbeans.org/wsdl/Arithmetic-STTP/java/STTPScientificWSDL">
            <SinRequestPart>0.0</SinRequestPart>
        </ns2:Sin>
    </S:Body>
</S:Envelope>
```

SOAP Response

```
<?xml version="1.0" encoding="UTF-8"?><S:Envelope xmlns:S="http://schemas.xmlsoap.org/soap/envelope/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/en
    <SOAP-ENV:Header/>
    <S:Body>
        <ns2:SinResponse xmlns:ns2="http://j2ee.netbeans.org/wsdl/Arithmetic-STTP/java/STTPScientificWSDL">
            <SinReponsePart>0.0</SinReponsePart>
        </ns2:SinResponse>
    </S:Body>
</S:Envelope>
```

EXPERIMENT-5

Aim: Design and test BPEL module that composes ArithmeticService and TrignometricService.
Tools/ Apparatus: Web service, BPEL Runtime Environment: GlassFish Server, GUI-IDE Tool: NetBeans 6.0

Arithmetic Service WSDL

```
<?xml version="1.0" encoding="UTF-8"?><!-- Published by JAX-WS RI at http://jax-
ws.dev.java.net. RI's version is JAX-WS RI 2.1.3.1-hudson-417-SNAPSHOT. --><!-- Generated by
JAX-WS RI at http://jax-ws.dev.java.net. RI's version is JAX-WS RI 2.1.3.1-hudson-
417SNAPSHOT. --><definitions xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-
200401wss-wssecurity-utility-1.0.xsd" xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
xmlns:tns="http://src/" xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns="http://schemas.xmlsoap.org/wsdl/" targetNamespace="http://src/"
name="ArithmeticServiceService">
<types>
<xsd:schema>
<xsd:import namespace="http://src/"
schemaLocation="ArithmeticServiceService_xsd_1.xsd"></xsd:import>
</xsd:schema>
</types>
<message name="addition">
<part name="parameters" element="tns:addition"></part>
</message>
<message name="additionResponse">
<part name="parameters" element="tns:additionResponse"></part>
</message>
<portType name="ArithmeticService">
<operation name="addition">
<input message="tns:addition"></input>
<output message="tns:additionResponse"></output>
</operation>
</portType>
<binding name="ArithmeticServicePortBinding" type="tns:ArithmeticService">
<soap:binding transport="http://schemas.xmlsoap.org/soap/http"
style="document"></soap:binding>
<operation name="addition">
<soap:operation soapAction=""></soap:operation>
<input>
<soap:body use="literal"></soap:body>
</input>
<output>
<soap:body use="literal"></soap:body>
</output>
```

```
</operation>
</binding>
<service name="ArithmeticServiceService">
<port name="ArithmeticServicePort" binding="tns:ArithmeticServicePortBinding">
<soap:address
location="http://localhost:8080/MyArithmeticService/ArithmeticServiceService"></soap:address>
</port>
</service>
</definitions>
```

Arithmetic Service Wrapper WSDL

```
<definitions
   xmlns="http://schemas.xmlsoap.org/wsdl/"
xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/"
   xmlns:xsd="http://www.w3.org/2001/XMLSchema" name="ArithmeticServiceServiceWrapper"
targetNamespace="http://enterprise.netbeans.org/bpel/ArithmeticServiceServiceWrapper"
xmlns:tns="http://enterprise.netbeans.org/bpel/ArithmeticServiceServiceWrapper"
xmlns:plnk="http://docs.oasis-open.org/wsbpel/2.0/plnktype" xmlns:ns="http://src/">
   <import location="ArithmeticServiceService.wsdl" namespace="http://src/"/>
   <plnk:partnerLinkType name="ArithmeticService4">
      <plnk:role name="ArithmeticServiceRole" portType="ns:ArithmeticService"/>
   </plnk:partnerLinkType>
   <plnk:partnerLinkType name="ArithmeticServiceLinkType">
      <plnk:role name="ArithmeticServiceRole" portType="ns:ArithmeticService"/>
</plnk:partnerLinkType>
</definitions>
```

Arithmetic Service XSD

```
<?xml version="1.0" encoding="UTF-8"?><!-- Published by JAX-WS RI at
http://jaxws.dev.java.net. RI's version is JAX-WS RI 2.1.3.1-hudson-417-SNAPSHOT. --
><xs:schema xmlns:tns="http://src/" xmlns:xs="http://www.w3.org/2001/XMLSchema"
version="1.0" targetNamespace="http://src/">

<xs:element name="addition" type="tns:addition"></xs:element>

<xs:element name="additionResponse" type="tns:additionResponse"></xs:element>

<xs:complexType name="addition">
<xs:sequence>
<xs:element name="input1" type="xs:double"></xs:element>
<xs:element name="input2" type="xs:double"></xs:element>
</xs:sequence>
</xs:complexType>
```

```
<xs:complexType name="additionResponse">
<xs:sequence>
<xs:element name="return" type="xs:double"></xs:element>
</xs:sequence>
</xs:complexType>
</xs:schema>
```

Scientific Services WSDL

```
<?xml version="1.0" encoding="UTF-8"?><!-- Published by JAX-WS RI at http://jax-
ws.dev.java.net. RI's version is JAX-WS RI 2.1.3.1-hudson-417-SNAPSHOT. --><!-- Generated by
JAX-WS RI at http://jax-ws.dev.java.net. RI's version is JAX-WS RI 2.1.3.1-hudson-
417SNAPSHOT. --><definitions xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-
200401wss-wssecurity-utility-1.0.xsd" xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
xmlns:tns="http://src/" xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns="http://schemas.xmlsoap.org/wsdl/" targetNamespace="http://src/"
name="DualScientifcServiceService">
<types>
<xsd:schema>
<xsd:import namespace="http://src/"
schemaLocation="DualScientifcServiceService_xsd_1.xsd"></xsd:import>
</xsd:schema>
</types>
<message name="sin">
<part name="parameters" element="tns:sin"></part>
</message>
<message name="sinResponse">
<part name="parameters" element="tns:sinResponse"></part>
</message>
<message name="cos">
<part name="parameters" element="tns:cos"></part>
</message>
<message name="cosResponse">
<part name="parameters" element="tns:cosResponse"></part>
</message>
<portType name="DualScientifcService">
<operation name="sin">
<input message="tns:sin"></input>
<output message="tns:sinResponse"></output>
</operation>
<operation name="cos">
<input message="tns:cos"></input>
<output message="tns:cosResponse"></output>
</operation>
```

```
</portType>
<binding name="DualScientifcServicePortBinding" type="tns:DualScientifcService">
<soap:binding transport="http://schemas.xmlsoap.org/soap/http"
style="document"></soap:binding>
<operation name="sin">
<soap:operation soapAction=""></soap:operation>
<input>
<soap:body use="literal"></soap:body>
</input>
<output>
<soap:body use="literal"></soap:body>
</output>
</operation>
<operation name="cos">
<soap:operation soapAction=""></soap:operation>
<input>
<soap:body use="literal"></soap:body>
</input>
<output>
<soap:body use="literal"></soap:body>
</output>
</operation>
</binding>
<service name="DualScientifcServiceService">
<port name="DualScientifcServicePort" binding="tns:DualScientifcServicePortBinding">
<soap:address
location="http://localhost:8080/MyDualScientificService/DualScientifcServiceService"></soap:a
dd ress> </port>
</service>
</definitions>
```

<u>Scientific Service Wrapper WSDL</u>

```
<?xml version="1.0" encoding="UTF-8"?>

<definitions
    xmlns="http://schemas.xmlsoap.org/wsdl/"
xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
name="DualScientifcServiceServiceWrapper"
targetNamespace="http://enterprise.netbeans.org/bpel/DualScientifcServiceServiceWrapper"
xmlns:tns="http://enterprise.netbeans.org/bpel/DualScientifcServiceServiceWrapper"
xmlns:plnk="http://docs.oasis-open.org/wsbpel/2.0/plnktype" xmlns:ns="http://src/">
    <import location="DualScientifcServiceService.wsdl" namespace="http://src/"/>
    <plnk:partnerLinkType name="DualScientifcService1">
```

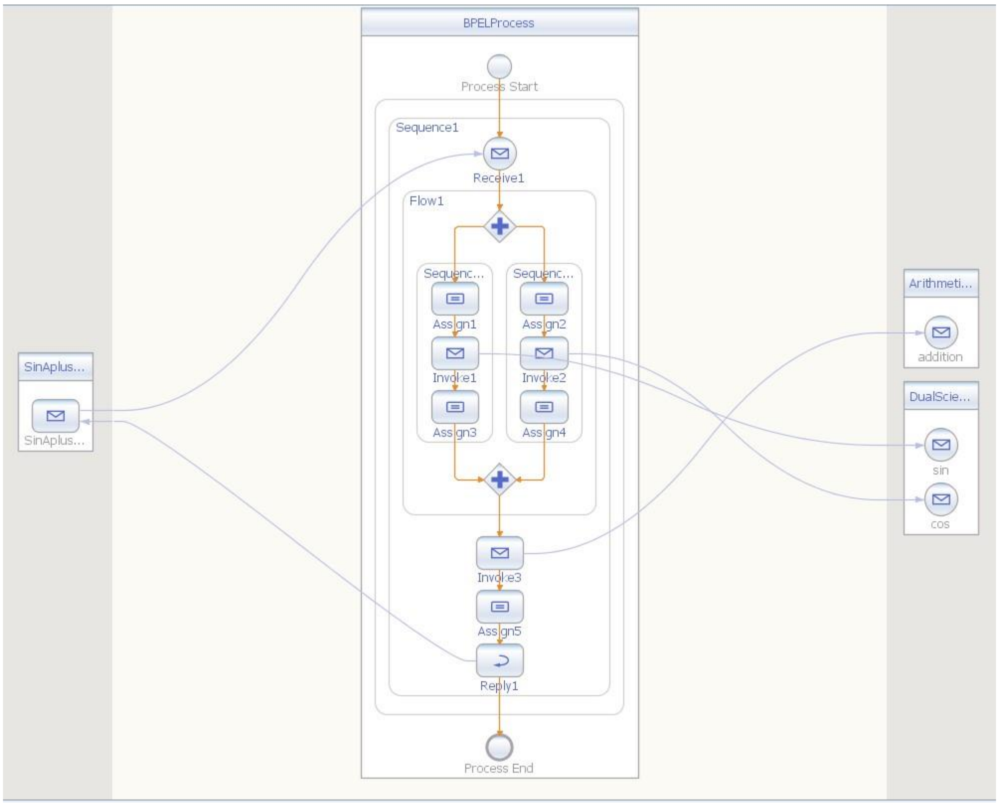
```
        <plnk:role name="DualScientifcServiceRole" portType="ns:DualScientifcService"/>
</plnk:partnerLinkType>
    <plnk:partnerLinkType name="DualScientifcServiceLinkType">
        <plnk:role name="DualScientifcServiceRole" portType="ns:DualScientifcService"/>
</plnk:partnerLinkType>
</definitions>
```

Scientific Services XSD

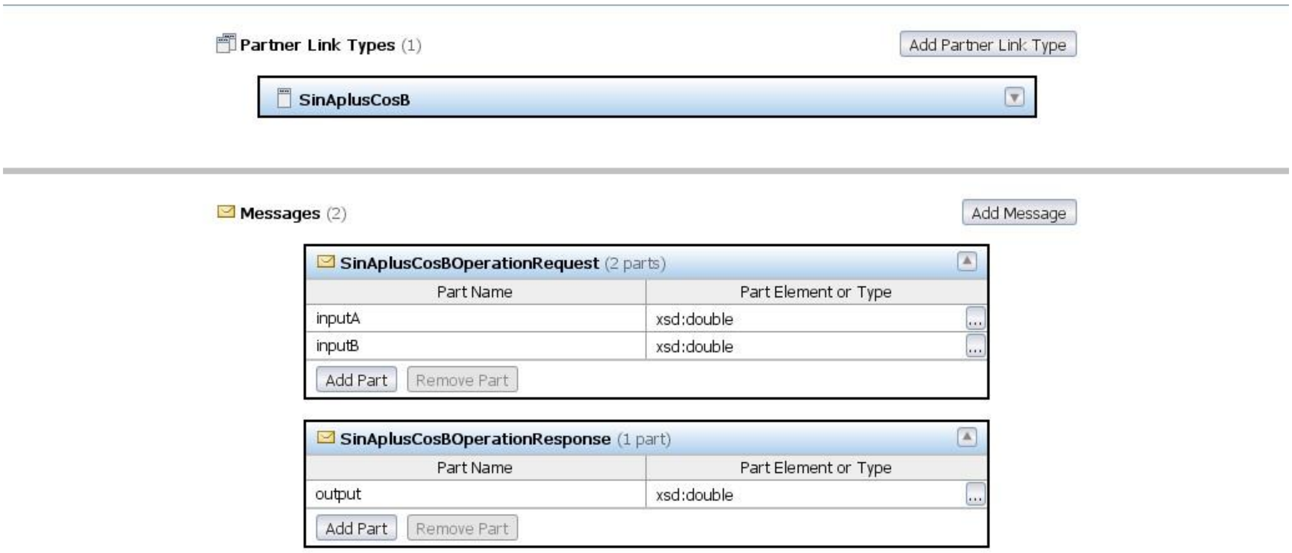
```
<?xml version="1.0" encoding="UTF-8"?><!-- Published by JAX-WS RI at
http://jaxws.dev.java.net. RI's version is JAX-WS RI 2.1.3.1-hudson-417-SNAPSHOT. --
><xs:schema xmlns:tns="http://src/" xmlns:xs="http://www.w3.org/2001/XMLSchema"
version="1.0" targetNamespace="http://src/">

<xs:element name="cos" type="tns:cos"></xs:element>

<xs:element name="cosResponse" type="tns:cosResponse"></xs:element>

<xs:element name="sin" type="tns:sin"></xs:element>

<xs:element name="sinResponse" type="tns:sinResponse"></xs:element>

<xs:complexType name="sin">
<xs:sequence>
<xs:element name="inputSin" type="xs:double"></xs:element>
</xs:sequence>
</xs:complexType>

<xs:complexType name="sinResponse">
<xs:sequence>
<xs:element name="return" type="xs:double" minOccurs="0"></xs:element>
</xs:sequence>
</xs:complexType>

<xs:complexType name="cos">
<xs:sequence>
<xs:element name="inputCos" type="xs:double"></xs:element>
</xs:sequence>
</xs:complexType>

<xs:complexType name="cosResponse">
<xs:sequence>
<xs:element name="return" type="xs:double" minOccurs="0"></xs:element>
</xs:sequence>
</xs:complexType>
```

</xs:schema>

BPEL Process



sinA plus cosB



Partner Link Types (1)

SinAplusCosB

Messages (2)

SinAplusCosBOperationRequest (2 parts)

Part Name	Part Element or Type
inputA	xsd:double
inputB	xsd:double

SinAplusCosBOperationResponse (1 part)

Part Name	Part Element or Type
output	xsd:double

EXPERIMENT-6

Aim: Deployment of a HADOOP cluster and monitoring status of its components.
Tools/ Apparatus: GUI-IDE Tool NetBeans 6.0, Hadoop Common, Hadoop Distributed File System, Hadoop YARN, Hadoop MapReduce, Ambari

Procedure:

- Install the appropriate version of java for your Hadoop.
- ssh must be installed and sshd must be running to use the Hadoop scripts that manage remote Hadoop daemons.
- Download the appropriate hadoop file system from link given below.
  http://www.apache.org/dyn/closer.cgi/hadoop/common/

- Unpack the downloaded Hadoop distribution. In the distribution, edit the file etc/hadoop/hadoop-env.sh to define some parameters as follows: “ #export JAVA_HOME=/usr/java/latest“.
- The following example copies the unpacked conf directory to use as input and then finds and displays every match of the given regular expression. Output is written to the given output directory.

```
$ mkdir input
$ cp etc/hadoop/*.xml input
$ bin/hadoop jar share/hadoop/mapreduce/hadoop-mapreduce-examples- 2.9.2.jar
grep input output 'dfs[a-z.]+'
$ cat output/*
```

- Now check that you can ssh to the localhost without a passphrase:

```
$ ssh localhost
```

- If you cannot ssh to localhost without a passphrase, execute the following commands:

```
$ ssh-keygen -t rsa -P '' -f ~/.ssh/id_rsa
$ cat ~/.ssh/id_rsa.pub >> ~/.ssh/authorized_keys
$ chmod 0600 ~/.ssh/authorized_keys
```

Execution

- The following instructions are to run a MapReduce job locally.

1. Format the filesystem:

```
$ bin/hdfs namenode -format
```

2. Start NameNode daemon and DataNode daemon:

```
$ sbin/start-dfs.sh
```

- The hadoop daemon log output is written to the $HADOOP_LOG_DIR directory (defaults to $HADOOP_HOME/logs).

- Browse the web interface for the NameNode; by default it is available at: NameNode http://localhost:50070/
- Make the HDFS directories required to execute MapReduce jobs:

```
$ bin/hdfs dfs -mkdir /user
$ bin/hdfs dfs -mkdir /user/<username>
```

- Copy the input files into the distributed filesystem:

```
$ bin/hdfs dfs -put etc/hadoop input
```

- Run some of the examples provided:

```
$ bin/hadoop jar share/hadoop/mapreduce/hadoop-mapreduce-examples-2.9.2.jar grep input
output 'dfs[a-z.]+'
```

- Examine the output files: Copy the output files from the distributed file-system to the local filesystem and examine them:

```
$ bin/hdfs dfs -get output output
$ cat output/*
```

OR

- View the output files on the distributed filesystem: $ bin/hdfs dfs -cat output/*
- When you’re done, stop the daemons with:

```
$ sbin/stop-dfs.sh
```

EXPERIMENT-7

Aim: Perform data intensive computing using map-reduce based programming on a HADOOP cluster.
Tools/ Apparatus: GUI-IDE Tool NetBeans 6.0, Hadoop Common, Hadoop Distributed File System, Hadoop YARN, Hadoop MapReduce, Ubuntu

Procedure:

Prerequisites

1. Installation and Configuration of Single node Hadoop :

2. Prepare your computer network (Decide no of nodes to set up cluster) :

3. Basic installation and configuration :

   3.1 configure etc/hosts for master and slaves nodes

   ```
   $ sudo gedit /etc/hosts
   # Add following hostname and their ip in host table
   192.168.2.14 HadoopMaster
   192.168.2.15 HadoopSlave1
   192.168.2.16 HadoopSlave2
   ```

   3.2 Create hadoop as group and hduser as user in all Machines (if not created !!).

   ```
   DDU@HadoopMaster:~$ sudo addgroup hadoop
   DDU@HadoopMaster:~$ sudo adduser --ingroup hadoop hduser
   sudo usermod -a -G sudo hduser
   ```

OR

Add following line in /etc/sudoers/

```
hduser ALL=(ALL:ALL) ALL
```

   3.3 Install rsync for sharing hadoop source with rest all Machines, and reboot all the machine.

   ```
   $ sudo apt-get install rsync
   ```

   3.4 To make above changes reflected, we need to reboot all of the Machines. $ sudo reboot

4. Applying Common Hadoop Configuration

   4.1 Update core-site.xml

   Update this file by changing hostname from localhost to HadoopMaster
   ## To edit file, fire the below given command
   hduser@HadoopMaster:/usr/local/hadoop/etc/hadoop$ sudo gedit core-site.xml ## Paste these lines into <configuration> tag OR Just update it by replacing localhost with master <property>
   <name>fs.default.name</name>

```
<value>hdfs://HadoopMaster:9000</value>
</property>
```

4.2 Update hdfs-site.xml

Update this file by updating repliction factor from 1 to 3.

```
## To edit file, fire the below given command
hduser@HadoopMaster:/usr/local/hadoop/etc/hadoop$ sudo gedit hdfs-site.xml
## Paste/Update these lines into <configuration> tag
<property>
<name>dfs.replication</name>
<value>3</value>
</property>
```

4.3 Update yarn-site.xml

Update this file by updating the following three properties by updating hostname from
localhost to HadoopMaster

```
## To edit file, fire the below given command
hduser@HadoopMaster:/usr/local/hadoop/etc/hadoop$ sudo gedit yarn-site.xml
## Paste/Update these lines into <configuration> tag
<property>
<name>yarn.resourcemanager.resource-tracker.address</name>
<value>HadoopMaster:8025</value>
</property>
<property>
<name>yarn.resourcemanager.scheduler.address</name>
<value>HadoopMaster:8035</value>
</property>
<property>
<name>yarn.resourcemanager.address</name>
<value>HadoopMaster:8050</value>
</property>
```

4.4 Update Mapred-site.xml

Update this file by updating and adding following properties,

```
## To edit file, fire the below given command
hduser@HadoopMaster:/usr/local/hadoop/etc/hadoop$ sudo gedit mapred-site.xml
## Paste/Update these lines into <configuration> tag

<property>
<name>mapreduce.job.tracker</name>
<value>HadoopMaster:5431</value>
</property>
<property>
<name>mapred.framework.name</name>
<value>yarn</value>
</property>
```

4.5 Update masters

Update the directory of master nodes of Hadoop cluster

```
## To edit file, fire the below given command
hduser@HadoopMaster:/usr/local/hadoop/etc/hadoop$ sudo gedit masters
## Add name of master nodes
HadoopMaster
```

4.6 Update slaves

Update the directory of slave nodes of Hadoop cluster

```
## To edit file, fire the below given command
hduser@HadoopMaster:/usr/local/hadoop/etc/hadoop$ sudo gedit slaves
## Add name of slave nodes
HadoopSlave1
HadoopSlave2
```

5. Copying/Sharing/Distributing Hadoop config files to rest all nodes – master/slaves

5.1 Use rsync for distributing configured Hadoop source among rest of nodes via network.

```
# In HadoopSlave1 machine
$ sudo rsync -avxP /usr/local/hadoop/ hduser@HadoopSlave1:/usr/local/hadoop/
# In HadoopSlave2 machine
$ sudo rsync -avxP /usr/local/hadoop/ hduser@HadoopSlave2:/usr/local/hadoop/
```

6 Applying Master node specific Hadoop configuration: (Only for master nodes)

6.1 Remove existing Hadoop_data folder (which was created while single node hadoop setup.)

```
$ sudo rm -rf /usr/local/hadoop_tmp/
```

6.2 : Make same (/usr/local/hadoop_tmp/hdfs) directory and create NameNode (/usr/local/hadoop_tmp/hdfs/namenode) directory

```
$ sudo mkdir -p /usr/local/hadoop_tmp/
$ sudo mkdir -p /usr/local/hadoop_tmp/hdfs/namenode
```

6.3 : Make hduser as owner of that directory.

```
$ sudo chown hduser:hadoop -R /usr/local/hadoop_tmp/
```

7 Applying Slave node specific Hadoop configuration : (Only for slave nodes)

7.1 Remove existing Hadoop_data folder (which was created while single node hadoop setup)

```
$ sudo rm -rf /usr/local/hadoop_tmp/hdfs/
```

7.2 Creates same (/usr/local/hadoop_tmp/) directory/folder, an inside this folder again Create

DataNode (/usr/local/hadoop_tmp/hdfs/namenode) directory/folder

```
$ sudo mkdir -p /usr/local/hadoop_tmp/
$ sudo mkdir -p /usr/local/hadoop_tmp/hdfs/datanode
```

Step 7C : Make hduser as owner of that directory sudo
chown hduser:hadoop -R /usr/local/hadoop_tmp/

8 Copying ssh key for Setting up passwordless ssh access from Master to Slave node :

```
hduser@HadoopMaster: ~$ ssh-copy-id -i $HOME/.ssh/id_rsa.pub
hduser@HadoopSlave1
```

```
hduser@HadoopMaster: ~$ ssh-copy-id -i $HOME/.ssh/id_rsa.pub hduser@HadoopSlave2
```

9. Format Namenonde (Run on MasterNode) : # Run this command from Masternode

```
hduser@HadoopMaster: usr/local/hadoop/$ hdfs namenode -format
```

10. Starting up Hadoop cluster daemons : (Run on MasterNode) Start HDFS daemons:

```
hduser@HadoopMaster:/usr/local/hadoop$ start-dfs.sh
```

11. Start MapReduce daemons:

```
hduser@HadoopMaster:/usr/local/hadoop$ start-yarn.sh
```

12. Instead both of these above command you can also use start-all.sh, but its now deprecated so its not recommended to be used for better Hadoop operations.

13. Track/Monitor/Verify Hadoop cluster : (Run on any Node)

    Verify Hadoop daemons on Master and slaves(All slave):

```
hduser@HadoopMaster: jps
```

EXPERIMENT-8

Aim: Create Restful Webservice and test it using Postman.
Tools/ Apparatus: Web service, GlassFish Server, GUI-IDE Tool:NetBeans 6.0

UserService.java

```
import java.util.Iterator;
import java.util.List;
import javax.ws.rs.GET;
import javax.ws.rs.Path;
import javax.ws.rs.Produces;
import javax.ws.rs.core.MediaType;
import javax.ws.rs.*;

@Path("/UserService")
public class UserService {

   UserContext userDao = new UserContext();
   private static final String SUCCESS_RESULT = "<result>success</result>";
   private static final String FAILURE_RESULT = "<result>failure</result>";

   @GET
   @Path("/users")
   @Produces(MediaType.APPLICATION_JSON) // Because we want to return list of users in
JSON format
   public List<User> getUsers() {
      return userDao.getAllUsers();
   }

   @GET
   @Path("/users/{userid}")
   @Produces(MediaType.APPLICATION_JSON)
   public User getUser(@PathParam("userid") int userid) {
      System.out.println("The ID received in GET is" + userid);
      return userDao.getUser(userid);
   }

   @POST
   @Path("/insertuser")
   @Produces(MediaType.TEXT_PLAIN)
   public String InsertUsers() {
      List<User> NewList = userDao.getAllUsers();
      User newuser = new User(3, "ABC", "XYZ");
      NewList.add(newuser);
```

```
        userDao.saveUserList(NewList);

        return "Inserted";
    }

    @POST
    @Path("/adduser")
    @Produces(MediaType.APPLICATION_JSON)
    @Consumes(MediaType.APPLICATION_JSON)
    public User AddUser(User user) {
        System.out.println("Inside Add User Method");
        List<User> NewList = userDao.getAllUsers();
        NewList.add(user);
        userDao.saveUserList(NewList);
        return user;
    }

    @PUT
    @Path("/updateuser")
    @Produces(MediaType.APPLICATION_JSON)
    @Consumes(MediaType.APPLICATION_JSON)
    public User UpdateUser(User user) {
        System.out.println("The ID received in GET is" + user.getId());
        int result = userDao.updateUser(user);
        if (result == 1) {
            System.out.println("Success in Update");
        } else {
            System.out.println("Failure in Update");
        }

        return user;
    }

    @DELETE
    @Path("/deleteuser/{userid}")
    @Produces(MediaType.TEXT_PLAIN)
    @Consumes(MediaType.APPLICATION_JSON)
    public String deleteUser(@PathParam("userid") int userid) {
        System.out.println("The ID received in DELETE is" + userid);
        int result = userDao.deleteUser(userid);
        System.out.println("Value of Result is" + result);
        if (result == 1) {
            return "SUCCESS";
        }
        return "FAILURE";
    }
}
```

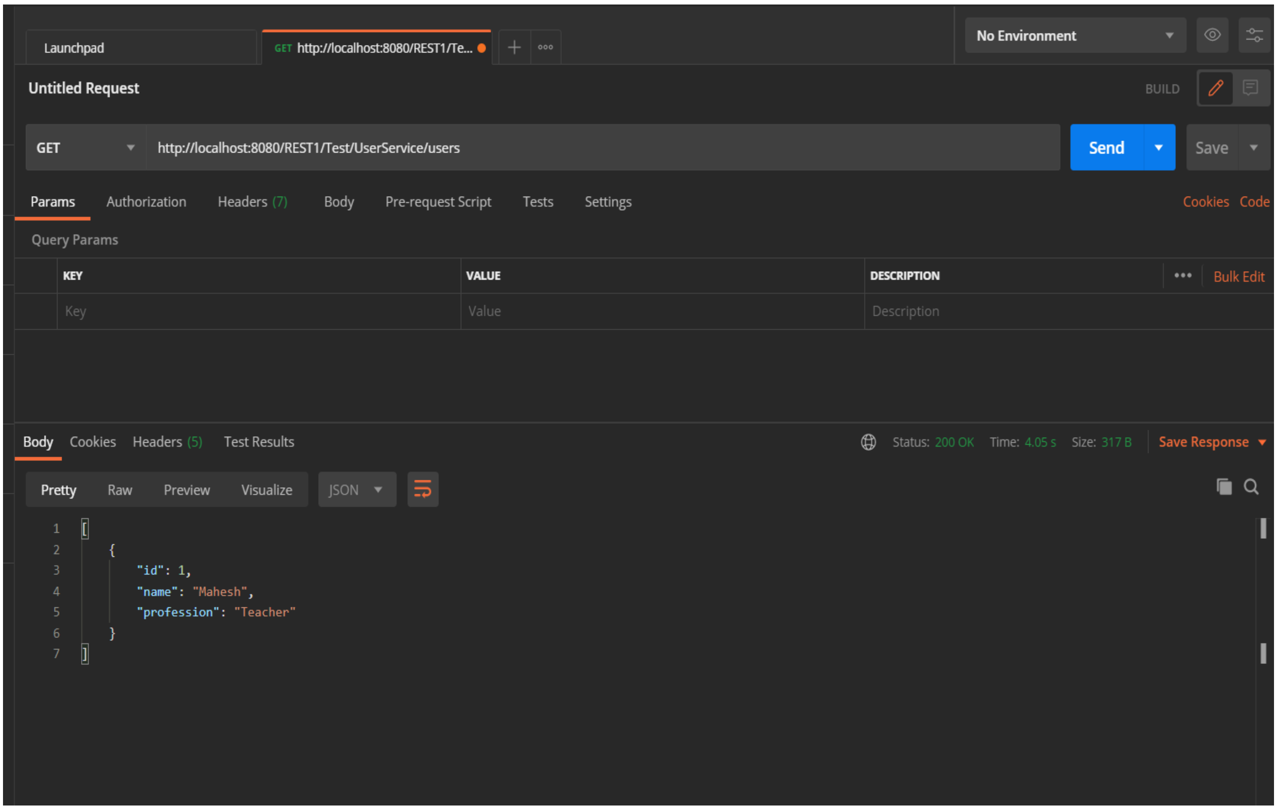
User.java

```
package Rest;
import java.io.Serializable;
import javax.xml.bind.annotation.XmlElement;
import javax.xml.bind.annotation.XmlRootElement;

//Add Java Class: User.java
@XmlRootElement(name = "user")
public class User implements Serializable {

   private static final long serialVersionUID = 1L;
   private int id;
   private String name;
   private String profession;

   public User() {
   }

   public User(int id, String name, String profession) {
      this.id = id;
      this.name = name;
      this.profession = profession;
   }
   public int getId() {
      return id;
   }
   public void setId(int id) {
      this.id = id;
   }

   public String getName() {
      return name;
   }

   public void setName(String name) {
      this.name = name;
   }

   public String getProfession() {
      return profession;
   }
   public void setProfession(String profession) {
      this.profession = profession;
   }
}
```

UserContext.java

```
package Rest;
import java.io.File;
import java.io.FileInputStream;
import java.io.FileNotFoundException;
import java.io.FileOutputStream;
import java.io.IOException;
import java.io.ObjectInputStream;
import java.io.ObjectOutputStream;
import java.util.ArrayList;
import java.util.List;

public class UserContext {

    File file = new File("Users23.dat");

    public List<User> getAllUsers() {

        List<User> userList = null;
        try {
            if (!file.exists()) {
                User user = new User(1, "Mahesh", "Teacher");
                userList = new ArrayList<User>();
                userList.add(user);
                saveUserList(userList);
            } else {
                FileInputStream fis = new FileInputStream(file);
                ObjectInputStream ois = new ObjectInputStream(fis);
                userList = (List<User>) ois.readObject();
                ois.close();
            }
        } catch (IOException e) {
            e.printStackTrace();
        } catch (ClassNotFoundException e) {
        }
        return userList;
    }

    public void saveUserList(List<User> userList1) {
        try {
            FileOutputStream fos;
            fos = new FileOutputStream(file);
            ObjectOutputStream oos = new ObjectOutputStream(fos);
            oos.writeObject(userList1);
            oos.close();
        } catch (FileNotFoundException e) {
            e.printStackTrace();
        } catch (IOException e) {
            e.printStackTrace();

        }
    }

    public User getUser(int id) {
        List<User> users = getAllUsers();
        for (User user : users) {
            if (user.getId() == id) {
                System.out.println("getID is" + user.getId() + "AND ID is" + id);
                return user;
            }
        }
        return null;
    }

    public int deleteUser(int id) {
        System.out.println("Inside Delete User Method of User Context");
        List<User> userList = getAllUsers();
        for (User user : userList) {
            if (user.getId() == id) {
                System.out.println("Inside Delete User getID is" + user.getId() + "AND ID is" + id);
                int index = userList.indexOf(user);
                userList.remove(index);
                saveUserList(userList);
                return 1;
            }

        }
        return 0;
    }

    public int updateUser(User pUser) {
        List<User> userList = getAllUsers();
        for (User user : userList) {
            if (user.getId() == pUser.getId()) {
                int index = userList.indexOf(user);
                userList.set(index, pUser);
                saveUserList(userList);
                return 1;
            }
        }
        return 0;
    }
```

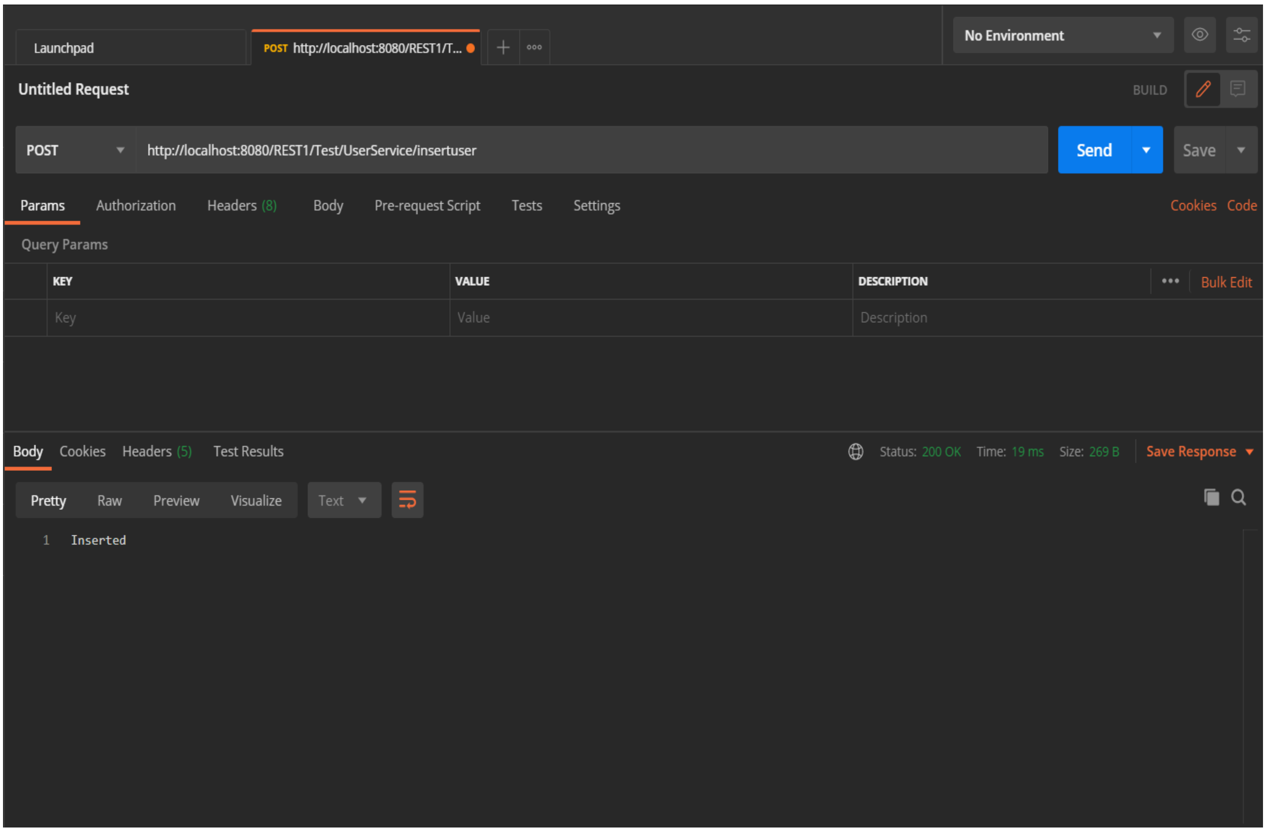
}



GET http://localhost:8080/REST1/Test/UserService/users

Status: 200 OK Time: 4.05 s Size: 317 B

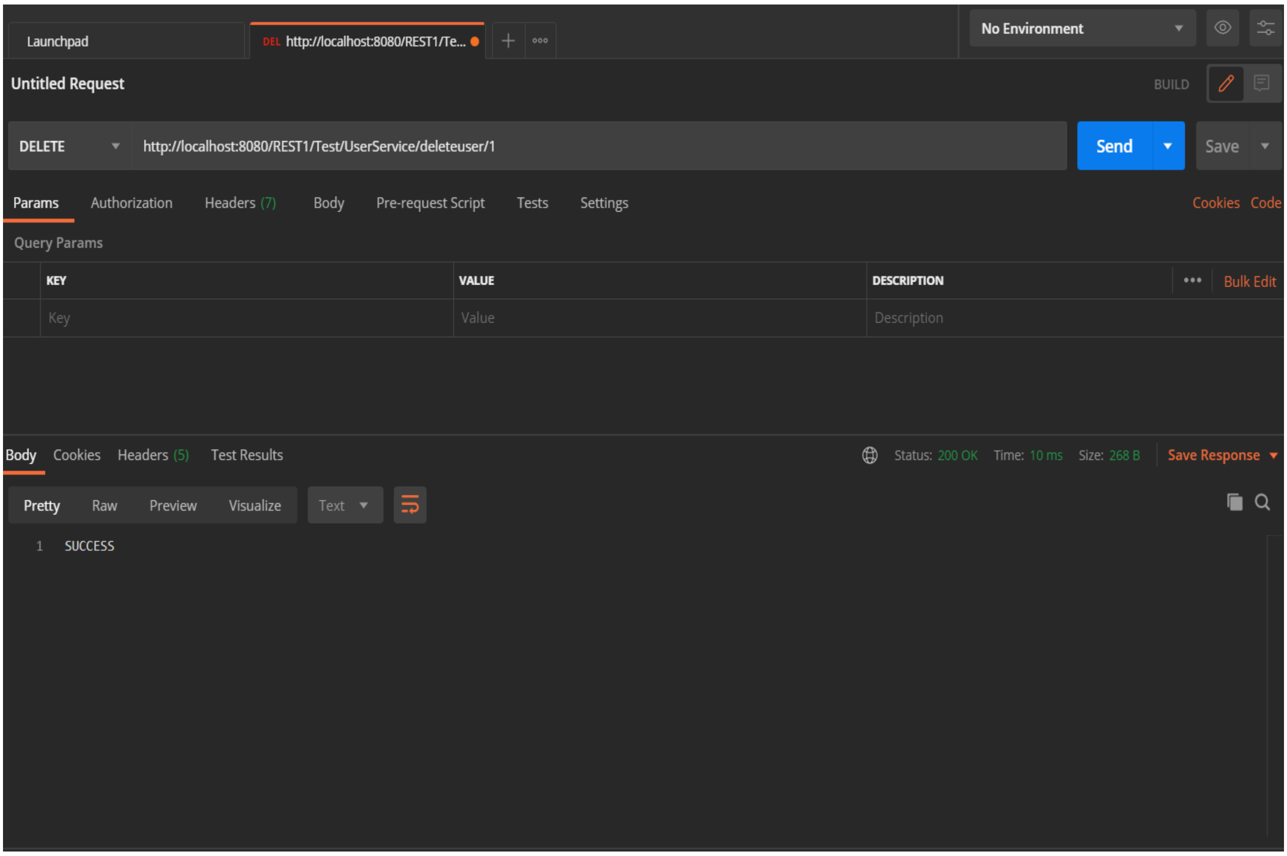
```
[
    {
        "id": 1,
        "name": "Mahesh",
        "profession": "Teacher"
    }
]
```



POST http://localhost:8080/REST1/Test/UserService/insertuser

Status: 200 OK Time: 19 ms Size: 269 B

```
Inserted
```



DELETE http://localhost:8080/REST1/Test/UserService/deleteuser/1

Status: 200 OK Time: 10 ms Size: 268 B

```
SUCCESS
```

EXPERIMENT-9

Aim: Create Microservice based application using Spring Boot.
Tools/ Apparatus: Web service, BPEL Runtime Environment: GlassFish Server, GUI-IDE Tool: NetBeans 6.0

Movie Catelog Service

```
package io.javabrains.moviecatalogservice.resources;

import io.javabrains.moviecatalogservice.models.CatalogItem;
import io.javabrains.moviecatalogservice.models.Movie;
import io.javabrains.moviecatalogservice.models.Rating;
import org.springframework.web.bind.annotation.RequestMapping;
import org.springframework.web.bind.annotation.RestController;
import org.springframework.web.client.RestTemplate;

import javax.websocket.server.PathParam;
import java.util.Arrays;
import java.util.Collections;
import java.util.List;
import java.util.stream.Collectors;

@RestController
@RequestMapping("/catalog")
public class MovieCatalogResource {

    @RequestMapping("/{userId}")
    public List<CatalogItem> getCatalog(@PathParam("userId") String userId) {

        RestTemplate restTemplate = new RestTemplate();


        // Get all rated movieIds

        List<Rating> ratings = Arrays.asList(
                new Rating("1", 4),
                new Rating("2", 3)
        );

        // For each movie call the movie info service and get details

        return ratings.stream().map(rating -> {
            Movie movie = restTemplate.getForObject("http://localhost:8081/movies/" + rating.getMovieId(), Movie.class);
            return new CatalogItem(movie.getName(), "Murder/Mystery", rating.getRatings());
        }).collect(Collectors.toList());

        // Put them all together

   }
}
```

CatelogItems.java

```
package io.javabrains.moviecatalogservice.models;

public class CatalogItem {

    private String name;
    private String desc;
    private int ratings;

    public CatalogItem(String name, String desc, int ratings) {
        this.name = name;
        this.desc = desc;
        this.ratings = ratings;
    }

    public String getName() {
        return name;
    }

    public String getDesc() {
        return desc;
    }

    public int getRatings() {
        return ratings;
    }

    public void setName(String name) {
        this.name = name;
    }

    public void setDesc(String desc) {
        this.desc = desc;
    }

    public void setRatings(int ratings) {
        this.ratings = ratings;
    }
}
```

Movie.java

```
package io.javabrains.moviecatalogservice.models;

public class Movie {
    private int movieId;
    private String name;

    public Movie() {
    }

    public Movie(int movieId, String name) {
        this.movieId = movieId;
        this.name = name;
    }

    public int getMovieId() {
        return movieId;
    }

    public void setMovieId(int movieId) {
        this.movieId = movieId;
    }

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }
}
```

Rantings.java

```
package io.javabrains.moviecatalogservice.models;

public class Rating {
    private String movieId;
    private int ratings;

    public Rating(String movieId, int ratings) {
        this.movieId = movieId;
        this.ratings = ratings;
    }
    public String getMovieId() {
        return movieId;
    }

    public void setMovieId(String movieId) {
        this.movieId = movieId;
    }

    public int getRatings() {
        return ratings;
    }

    public void setRatings(int ratings) {
        this.ratings = ratings;
    }
}
```

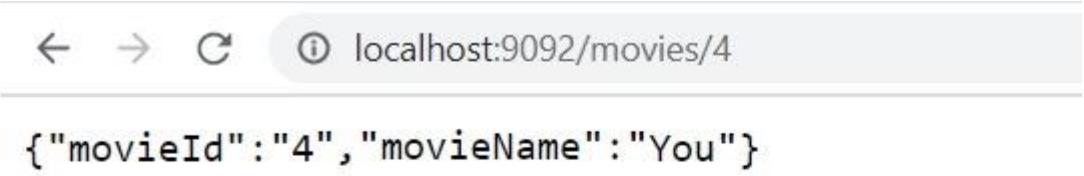
Movie Info Service

```
package io.javabrains.movieinfoserice.movieinfoservice.resources;

import io.javabrains.movieinfoserice.movieinfoservice.models.Movie;
import org.springframework.web.bind.annotation.RequestMapping;
import org.springframework.web.bind.annotation.RestController;

import javax.websocket.server.PathParam;

@RestController
@RequestMapping("/movies")
public class MovieResource {

    @RequestMapping("/{movieId}")
    public Movie getMovieInfo(@PathParam("movieId") String movieId) {
        return new Movie(
                1, "500 Days Of Summer"
        );
    }
}
```

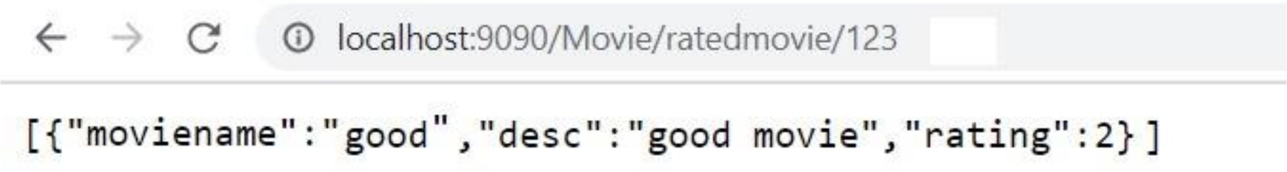
Rating Service

```
package io.javabrains.ratingdataservice.ratingdataservie.resources;

import io.javabrains.ratingdataservice.ratingdataservie.models.Rating;
import org.springframework.web.bind.annotation.RequestMapping;
import org.springframework.web.bind.annotation.RestController;

import javax.websocket.server.PathParam;

@RestController
@RequestMapping("/ratings")
public class RatingResource {
    @RequestMapping("/{movieId}")
    public Rating getRating(@PathParam("movieId") String movieId) {
        return new Rating(
                1, 4
        );
    }
}
```

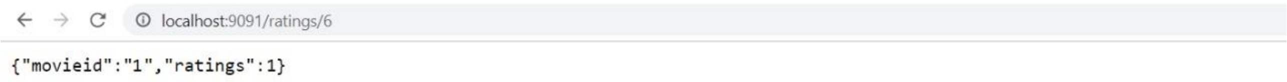
Output



```
{"movieId":"4","movieName":"You"}
```



```
[{"moviename":"good","desc":"good movie","rating":2}]
```



```
{"movieid":"1","ratings":1}
```

EXPERIMENT-10

Aim: Implementation JMS based application using Publish-Subscribe paradigm.
Tools/ Apparatus: Web service, BPEL Runtime Environment: GlassFish Server, GUI-IDE Tool: NetBeans 6.0, JMS, ESB: WSO2

MyListerner.java

```
package Demo;
import javax.jms.JMSException;
import javax.jms.Message;
import javax.jms.MessageListener;
import javax.jms.TextMessage;


public class MyListener implements MessageListener {

    @Override
    public void onMessage(Message message) {
        try{
        TextMessage msg=(TextMessage)message;
        System.out.println("following message is received:"+msg.getText());
        }
        catch(JMSException e)
        {System.out.println(e);}
    }
}
```

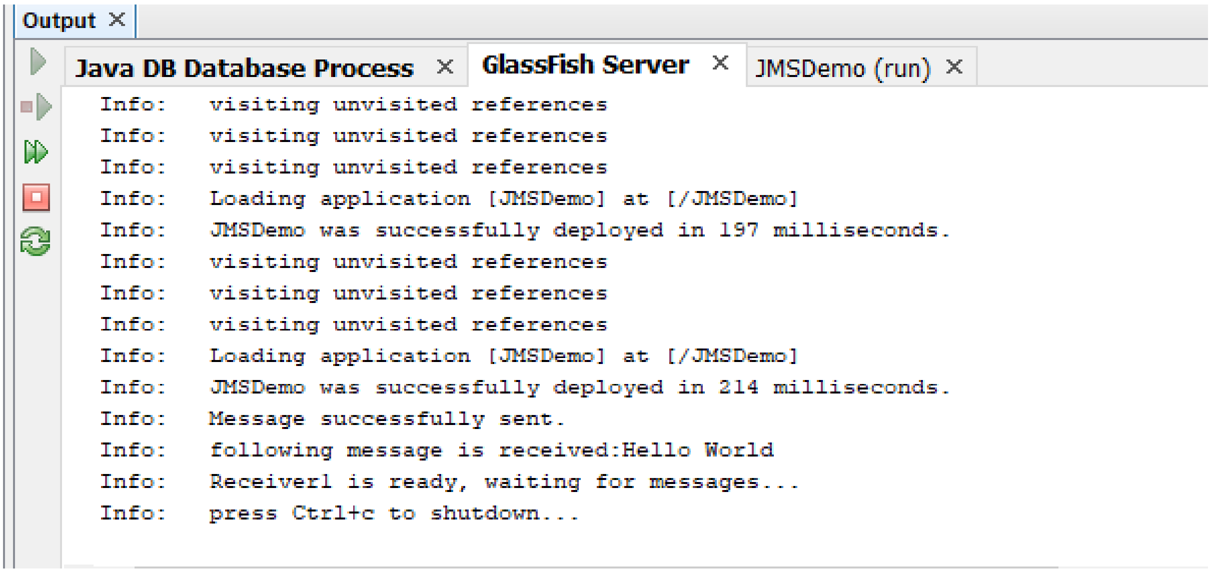
Reviewer.java

```
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;
import javax.jms.*;
import javax.naming.InitialContext;

public class Receiver extends HttpServlet {

    protected void processRequest(HttpServletRequest request, HttpServletResponse response)
sssssss             throws ServletException, IOException {
        response.setContentType("text/html;charset=UTF-8");
        try{
//1) Create and start connection
            InitialContext ctx=new InitialContext();
            QueueConnectionFactory
            f=(QueueConnectionFactory)ctx.lookup("myQueueConnectionFactory");
            QueueConnection con=f.createQueueConnection();
            con.start();
            //2) create Queue session
            QueueSession ses=con.createQueueSession(false,
            Session.AUTO_ACKNOWLEDGE);
            //3) get the Queue object
            Queue t=(Queue)ctx.lookup("myQueue");
            //4)create QueueReceiver
            QueueReceiver receiver=ses.createReceiver(t);
            //5) create listener object
            MyListener listener=new MyListener();
            //6) register the listener object with receiver
            receiver.setMessageListener(listener);
            System.out.println("Receiver1 is ready, waiting for messages...");
            System.out.println("press Ctrl+c to shutdown...");
        }
        catch(Exception e){System.out.println(e);}

    }

    // <editor-fold defaultstate="collapsed" desc="HttpServlet methods. Click on the + sign on the
left to edit the code.">
    /**
     * Handles the HTTP <code>GET</code> method.
     *
     * @param request servlet request
     * @param response servlet response
     * @throws ServletException if a servlet-specific error occurs
     * @throws IOException if an I/O error occurs
     */
    @Override
    protected void doGet(HttpServletRequest request, HttpServletResponse response)
            throws ServletException, IOException {
        processRequest(request, response);
    }

    /**
     * Handles the HTTP <code>POST</code> method.
     *
     * @param request servlet request
     * @param response servlet response
     * @throws ServletException if a servlet-specific error occurs
     * @throws IOException if an I/O error occurs
     */
    @Override
    protected void doPost(HttpServletRequest request, HttpServletResponse response)
            throws ServletException, IOException {
        processRequest(request, response);
    }

    /**
     * Returns a short description of the servlet.
     *
     * @return a String containing servlet description
     */
    @Override
    public String getServletInfo() {
        return "Short description";
    }
}
```

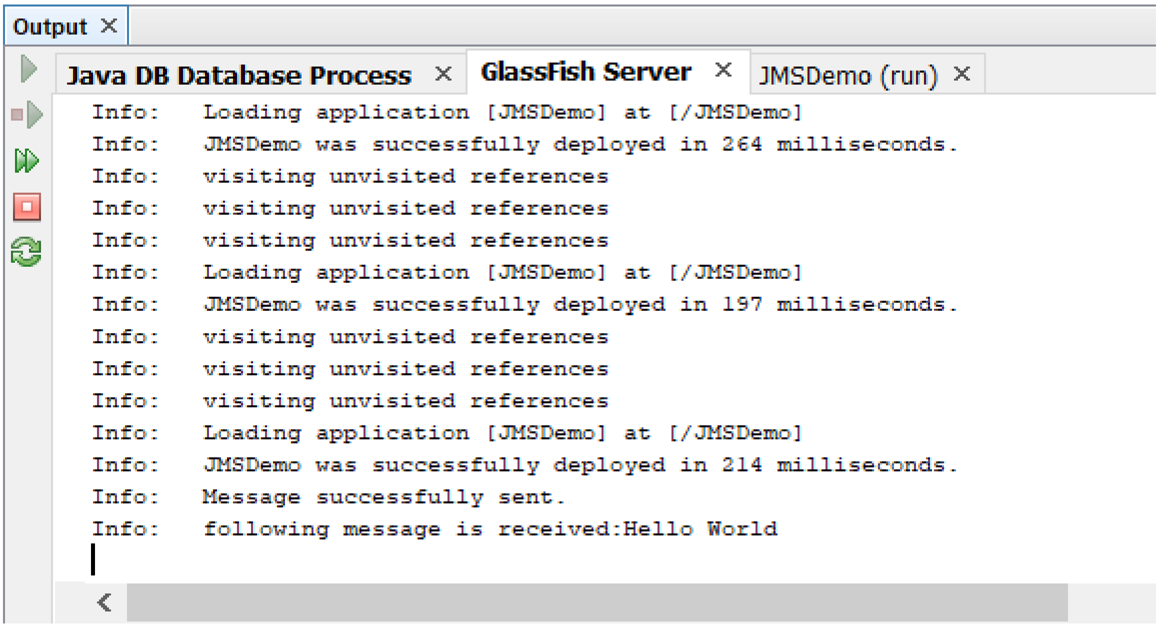
Sender.java

```
package Demo;

import java.io.IOException;
import javax.servlet.ServletException;
import javax.servlet.http.HttpServlet;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;
import javax.naming.*;
import javax.jms.*;

public class Sender extends HttpServlet {

    protected void processRequest(HttpServletRequest request, HttpServletResponse response)
            throws ServletException, IOException {
        response.setContentType("text/html;charset=UTF-8");

        try
      s  { //Create and start connection
            InitialContext ctx=new InitialContext();
            QueueConnectionFactory
            f=(QueueConnectionFactory)ctx.lookup("myQueueConnectionFactory");
            QueueConnection con=f.createQueueConnection();
            con.start();
            //2) create queue session
            QueueSession ses=con.createQueueSession(false,
            Session.AUTO_ACKNOWLEDGE);
            //3) get the Queue object
            Queue t=(Queue)ctx.lookup("myQueue");
            //4)create QueueSender object
            QueueSender sender=ses.createSender(t);
            //5) create TextMessage object
            TextMessage msg=ses.createTextMessage();
            //6) write message
```

```
          msg.setText("Hello World");
          sender.send(msg);

          System.out.println("Message successfully sent.");
       //8) connection close
          con.close();
       }
       catch(Exception e)
       {System.out.println(e);}
          }

    /**
     * Handles the HTTP <code>GET</code> method.
     *
     * @param request servlet request
     * @param response servlet response
     * @throws ServletException if a servlet-specific error occurs
     * @throws IOException if an I/O error occurs
     */
    @Override
    protected void doGet(HttpServletRequest request, HttpServletResponse response)
          throws ServletException, IOException {
       processRequest(request, response);
    }

    /**
     * Handles the HTTP <code>POST</code> method.
     *
     * @param request servlet request
     * @param response servlet response
     * @throws ServletException if a servlet-specific error occurs
     * @throws IOException if an I/O error occurs
     */
    @Override
    protected void doPost(HttpServletRequest request, HttpServletResponse response)
          throws ServletException, IOException {
       processRequest(request, response);
    }
    @Override
    public String getServletInfo() {
       return "Short description";
    }// </editor-fold>
}
```



```
Info:   visiting unvisited references
Info:   visiting unvisited references
Info:   visiting unvisited references
Info:   Loading application [JMSDemo] at [/JMSDemo]
Info:   JMSDemo was successfully deployed in 197 milliseconds.
Info:   visiting unvisited references
Info:   visiting unvisited references
Info:   visiting unvisited references
Info:   Loading application [JMSDemo] at [/JMSDemo]
Info:   JMSDemo was successfully deployed in 214 milliseconds.
Info:   Message successfully sent.
Info:   following message is received:Hello World
Info:   Receiver1 is ready, waiting for messages...
Info:   press Ctrl+c to shutdown...
```



```
Info:   Loading application [JMSDemo] at [/JMSDemo]
Info:   JMSDemo was successfully deployed in 264 milliseconds.
Info:   visiting unvisited references
Info:   visiting unvisited references
Info:   visiting unvisited references
Info:   Loading application [JMSDemo] at [/JMSDemo]
Info:   JMSDemo was successfully deployed in 197 milliseconds.
Info:   visiting unvisited references
Info:   visiting unvisited references
Info:   visiting unvisited references
Info:   Loading application [JMSDemo] at [/JMSDemo]
Info:   JMSDemo was successfully deployed in 214 milliseconds.
Info:   Message successfully sent.
Info:   following message is received:Hello World
```