

RPC – Remote Procedure Call

Stand-alone program

```
#include <stdio.h>
long bin_date(void);
char *str_date(long bintime);

main(int argc, char **argv) {
    long lresult; /* return from bin_date */
    char *sresult; /* return from str_date */
    if (argc != 1) {
        fprintf(stderr, "usage: %s\n", argv[0]);
        exit(1);
    }
    /* call the procedure bin_date */
    lresult = bin_date();
    printf("time is %ld\n", lresult);
    /* convert the result to a date string */
    sresult = str_date(lresult);
    printf("date is %s", sresult);
    exit(0);
}
```

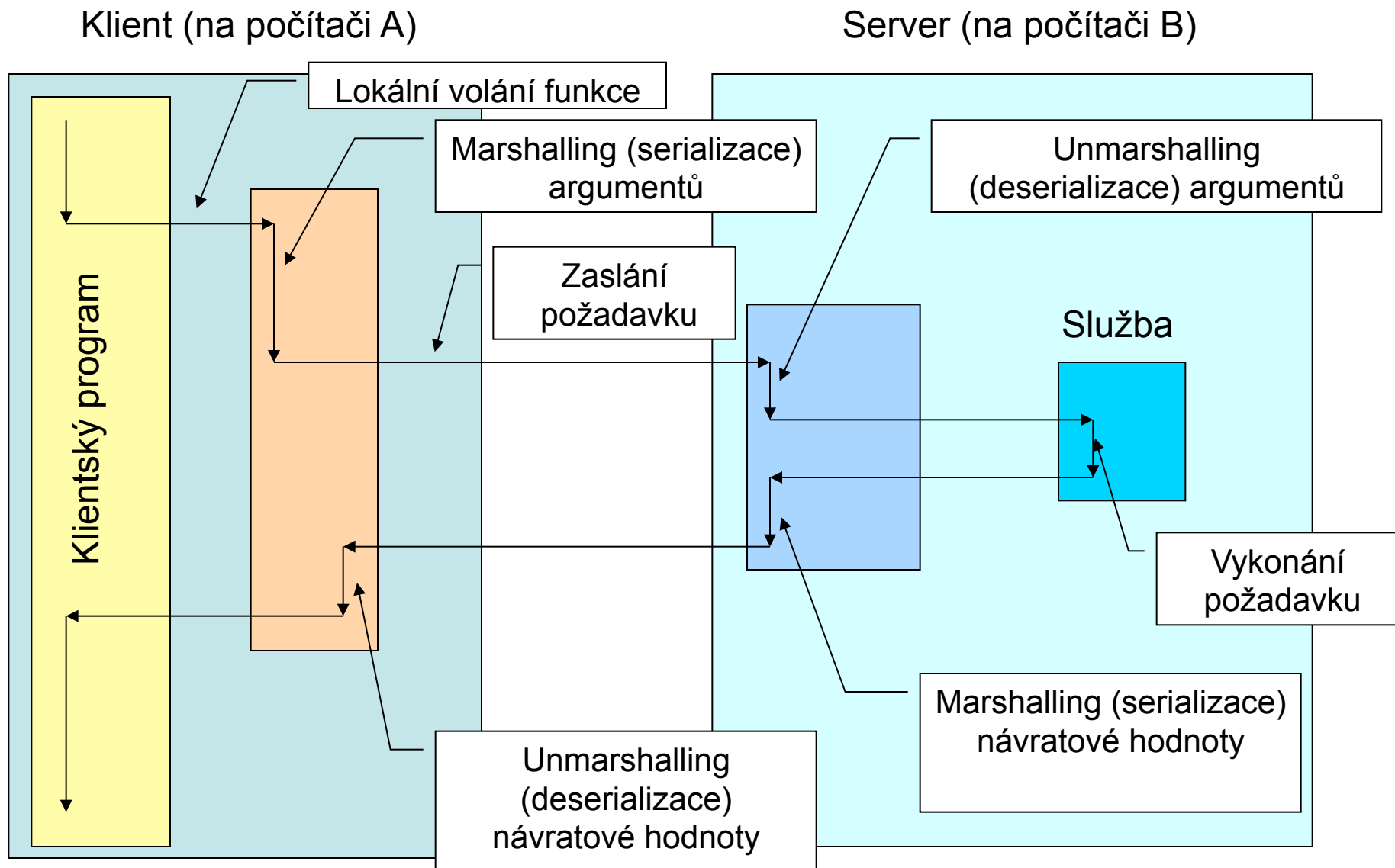
RPC – Remote Procedure Call

Stand-alone program: functions

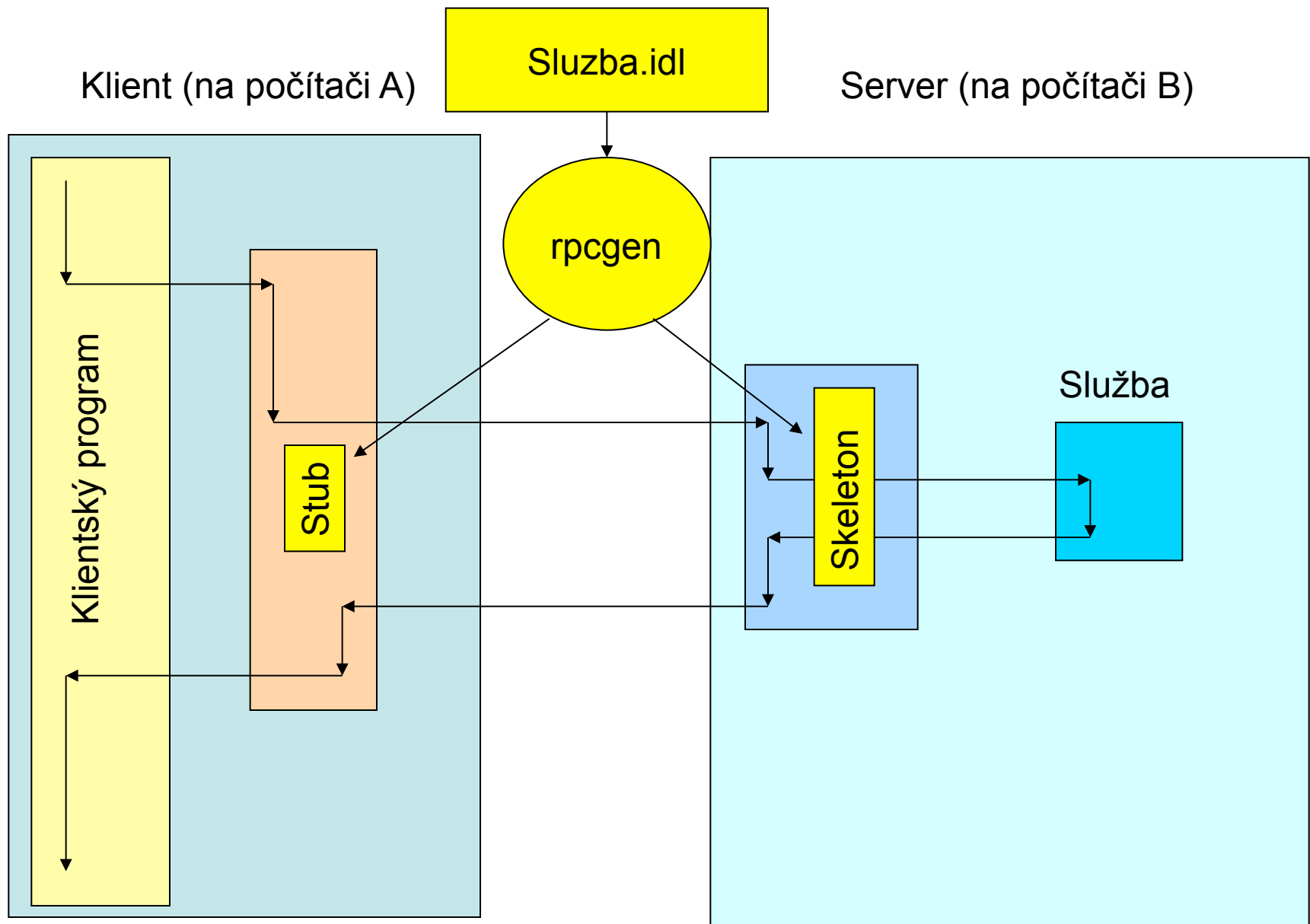
```
long bin_date(void) {
    long timeval;
    long time(); /* Unix time function */
    timeval = time((long *)0);
    return timeval;
}

char *str_date(long bintime) {
    char *ptr;
    char *ctime(); /* Unix library function
*/
    ptr = ctime(&bintime);
    return ptr;
}
```

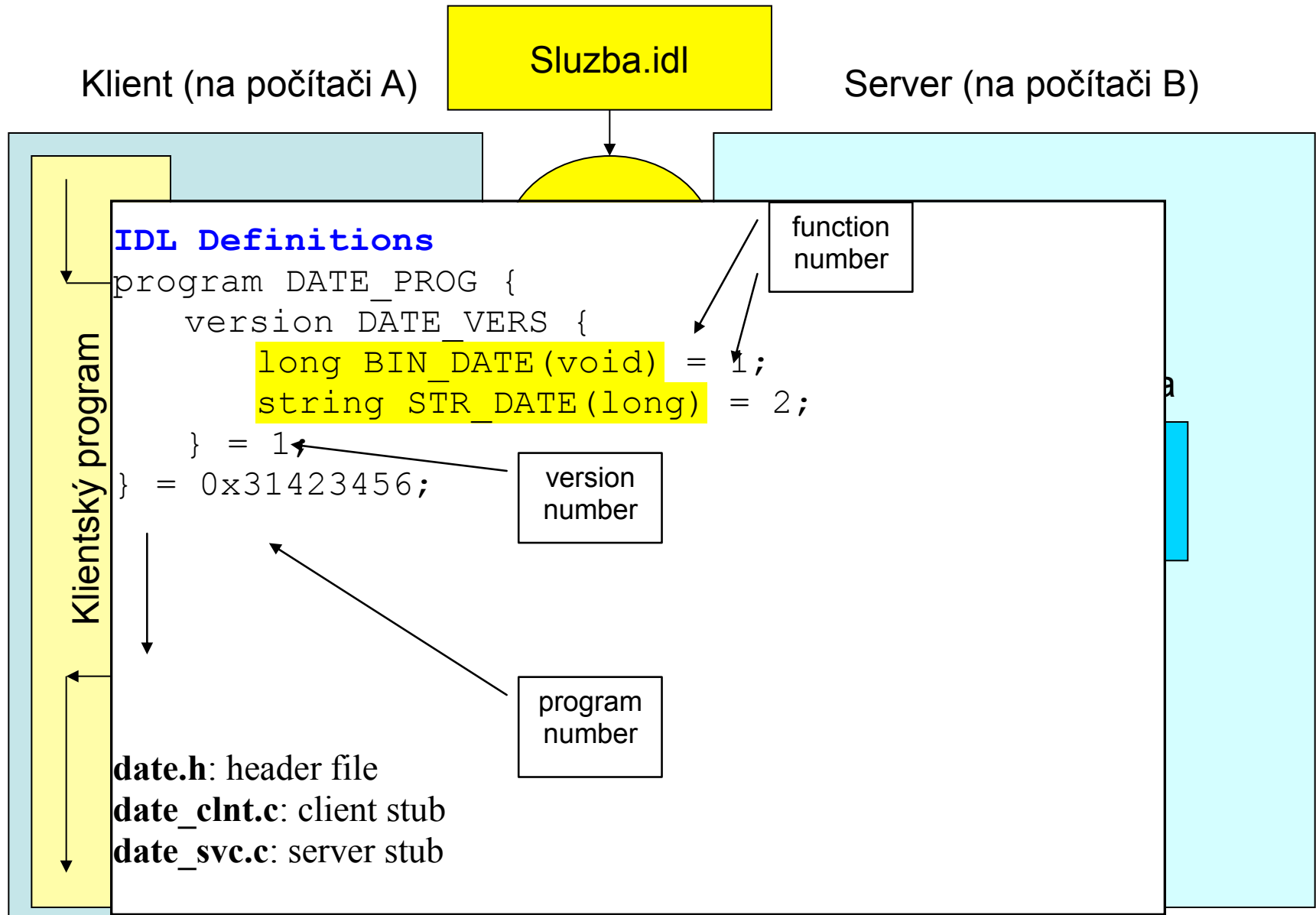
RPC – Remote Procedure Call



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Vygenerovaný skeleton:

```
#include "date.h"
long *
bin_date_1_svc(void *argp,
                struct svc_req *rqstp)
{
    static long result;
    /* insert server code here */
    return &result;
}

char **
str_date_1_svc(long *argp,
                struct svc_req *rqstp)
{
    static char *result;
    /* insert server code here */
    return &result;
}
```

RPC – Remote Procedure Call

Modifikace klienta

```
#include <rpc/rpc.h>
#include "date.h"
CLIENT *cl; /* rpc handle */
cl = clnt_create(server,
                DATE_PROG,
                DATE_VERS,
                "netpath");

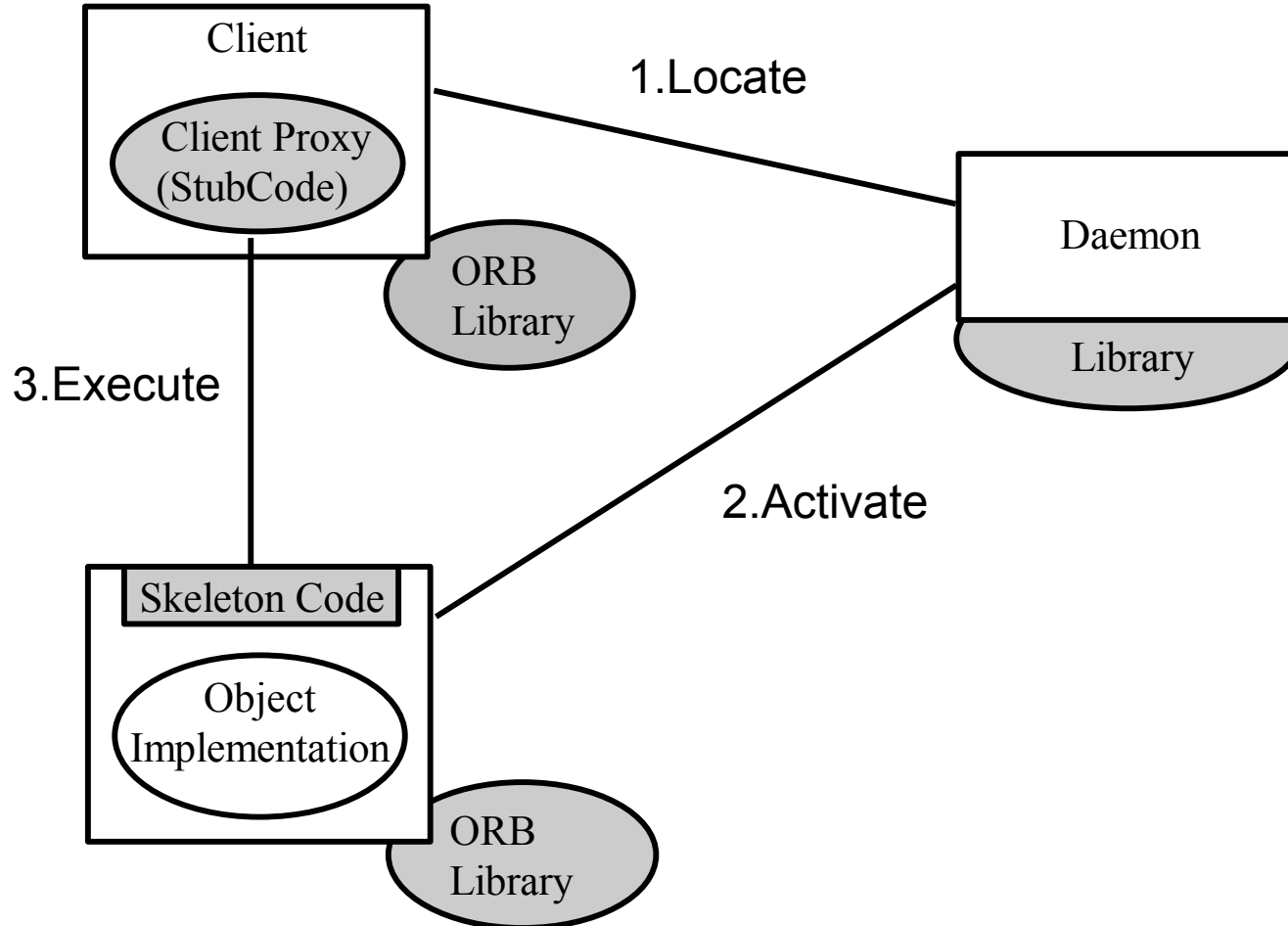
long *lresult; /* return from bin_date_1 */
char **sresult; /* return from str_date_1 */

if ((lresult=bin_date_1(NULL, cl)) == NULL) {
    clnt_perror(cl, server);
    exit(1);
}
printf("time on %s is %ld\n",
       server,
       *lresult);
if ((sresult=str_date_1(lresult, cl)) == NULL) {
    clnt_perror(cl, server);
    exit(1);
}
printf("date is %s", *sresult);
```

CORBA – Common Object Request Broaker Architecture

The Object ManagementGroup (OMG)

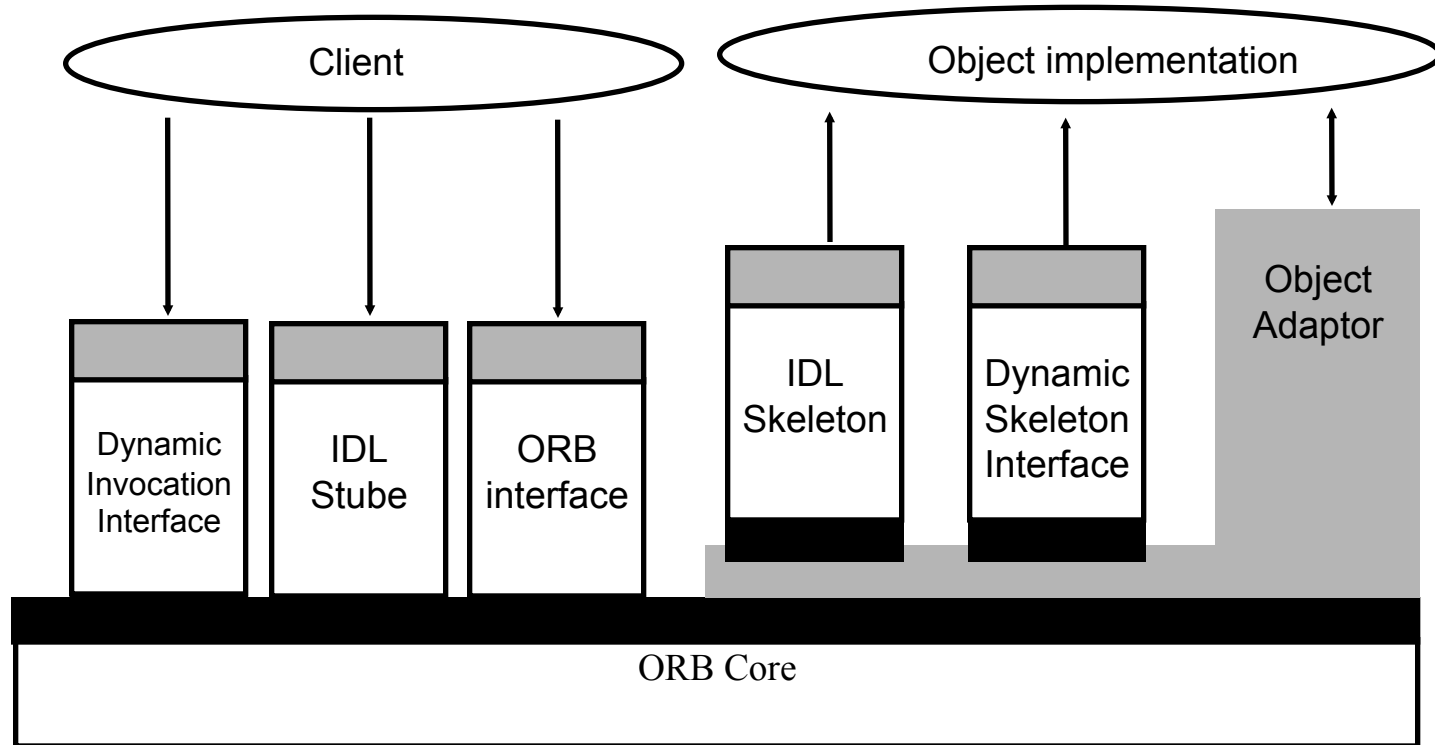
<http://www.omg.org/>



CORBA – Common Object Request Broaker Architecture

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Příklad CORBA IDL:

```
#include "MISDefinitions.idl"

module MISData {

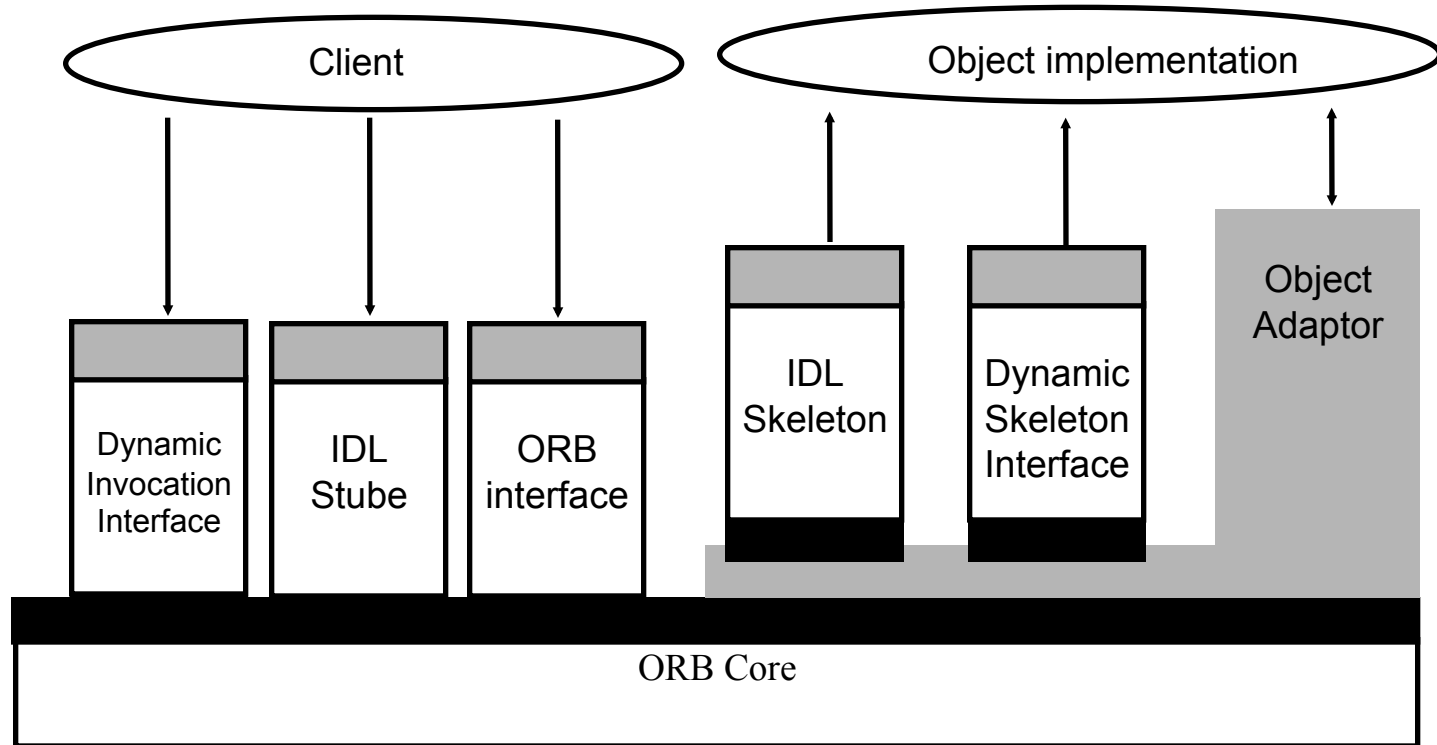
    struct TstData {
        unsigned short opId;
        unsigned short roleId;
    };

    interface TstDataIF {
        TstDef::TstResult GetTstData (
            in unsigned short opId,
            out MISData::TstData data
        );
    }
}
```

CORBA – Common Object Request Broaker Architecture

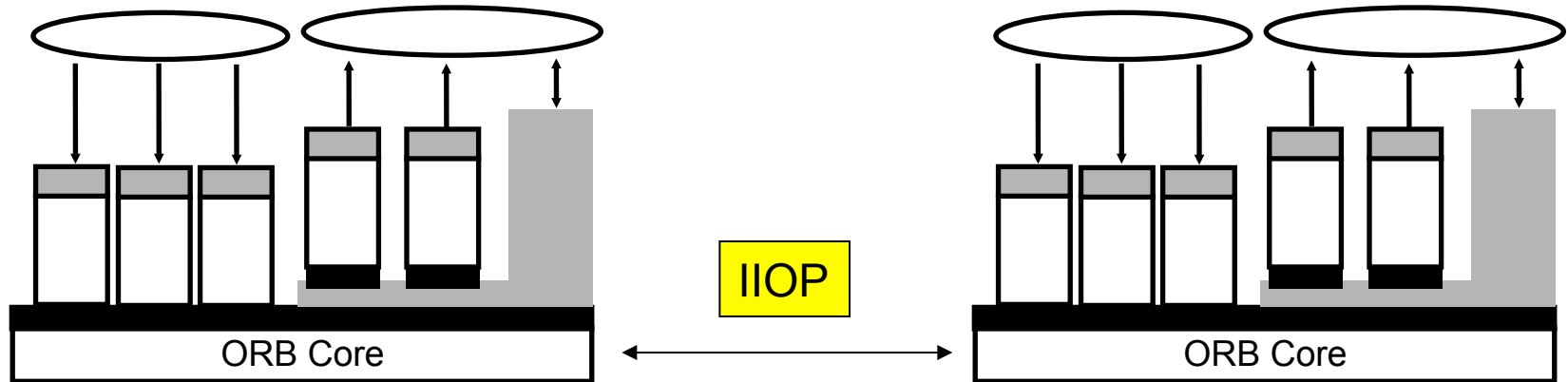
The Object ManagementGroup (OMG)

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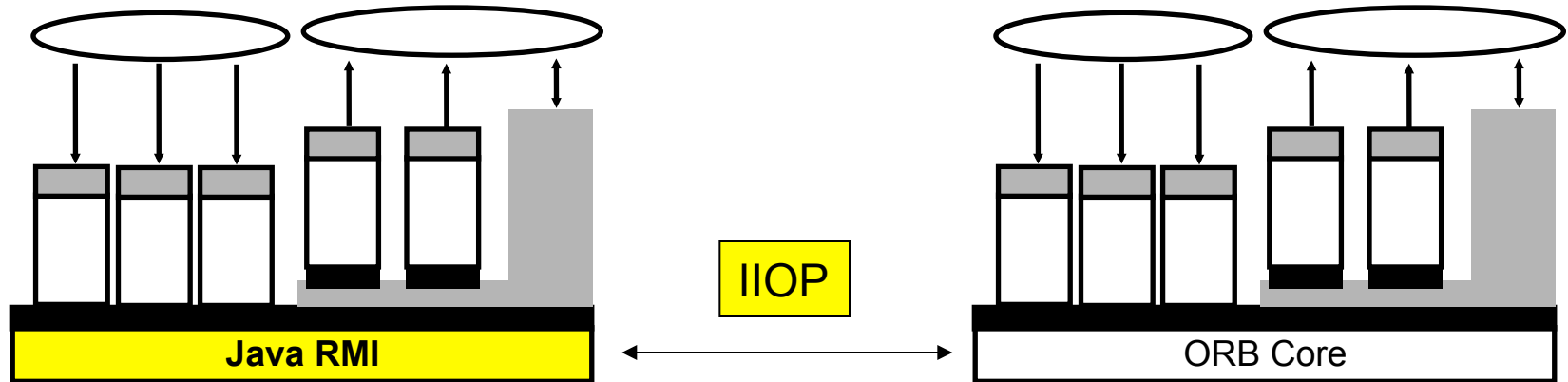
CORBA – Common Object Request Broaker Architecture

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Internet Inter-ORB Protocol

Java RMI – Remote Method Invocation



Java RMI – Remote Method Invocation

CLIENT

```
public class Client
{
    public static void main(String[] args)
    {
        try
        {
            Registry registry = LocateRegistry
                .getRegistry("localhost", 1099);
            ServerExecutable exec = (ServerExecutable)
                registry.lookup("scitacka");
            System.out.println("Client question: 15 + 3");
            System.out.println("Server answer: " + exec.add(15, 3));
        }
        catch (NotBoundException ex)
        {
            System.err.println(ex);
        }
        catch (RemoteException ex)
        {
            System.err.println(ex);
        }
    }
}
```

Java RMI – Remote Method Invocation

SPUŠTĚNÍ SERVERU

```
public class Server
{
    public static void main(String args[])
    {
        try
        {
            ServerExecutable stub =
                (ServerExecutable) UnicastRemoteObject.exportObject
                    (new ServerRemoteObject(), 0);

            Registry registry =
                LocateRegistry.createRegistry(1099);
            registry.rebind("rmi:///scitacka", stub);
            System.out.println("RMI Service is running.");
        }
        catch (Exception ex)
        {
            ex.printStackTrace();
            return;
        }
    }
}
```

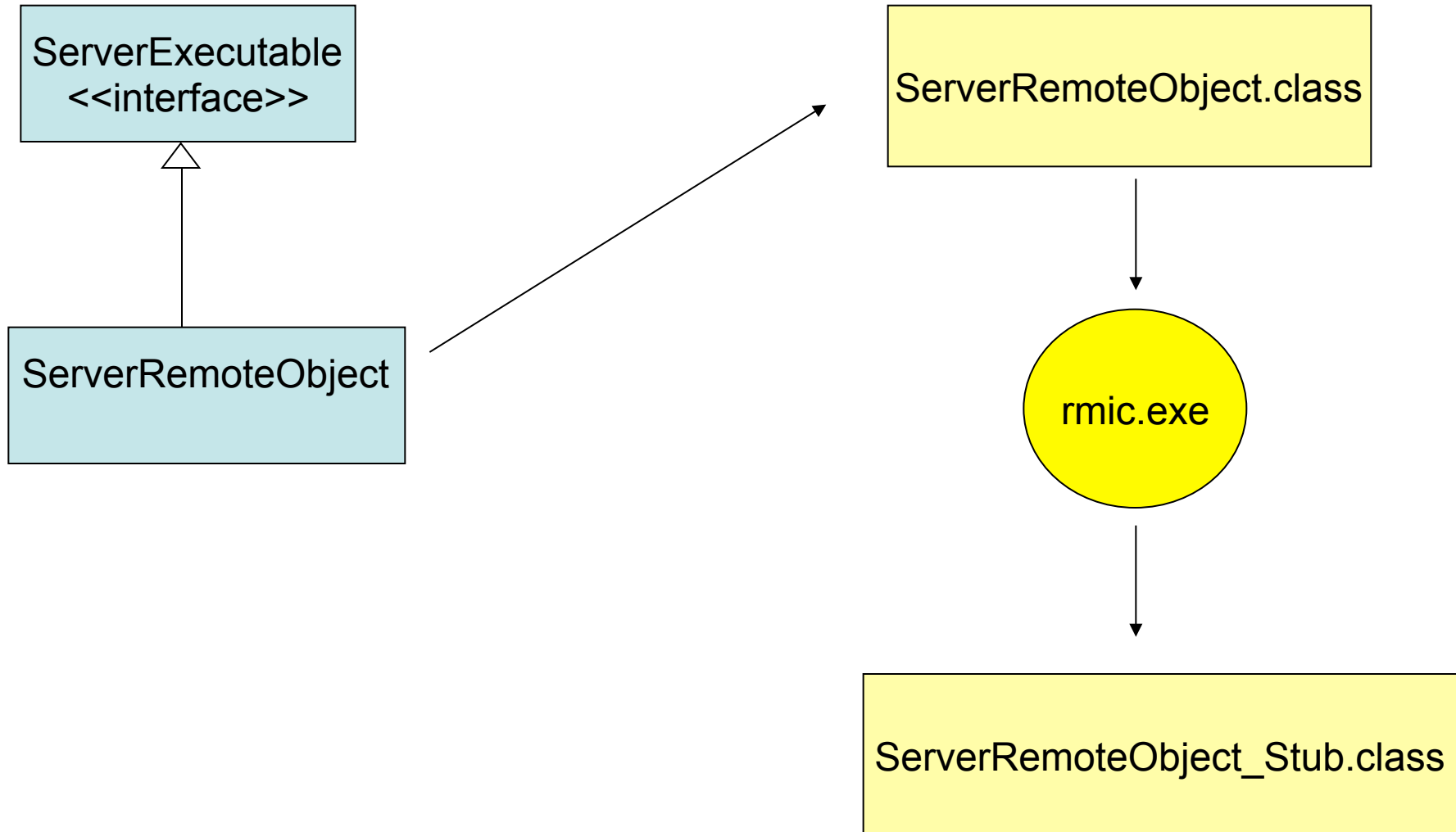
Java RMI – Remote Method Invocation

SERVER

```
public class ServerRemoteObject
    extends UnicastRemoteObject
    implements ServerExecutable
{
    public int add(int a, int b) throws RemoteException
    {
        return a + b;
    }

    private static final long serialVersionUID = 1L;
}
```


Java RMI – Remote Method Invocation



Java RMI – Remote Method Invocation

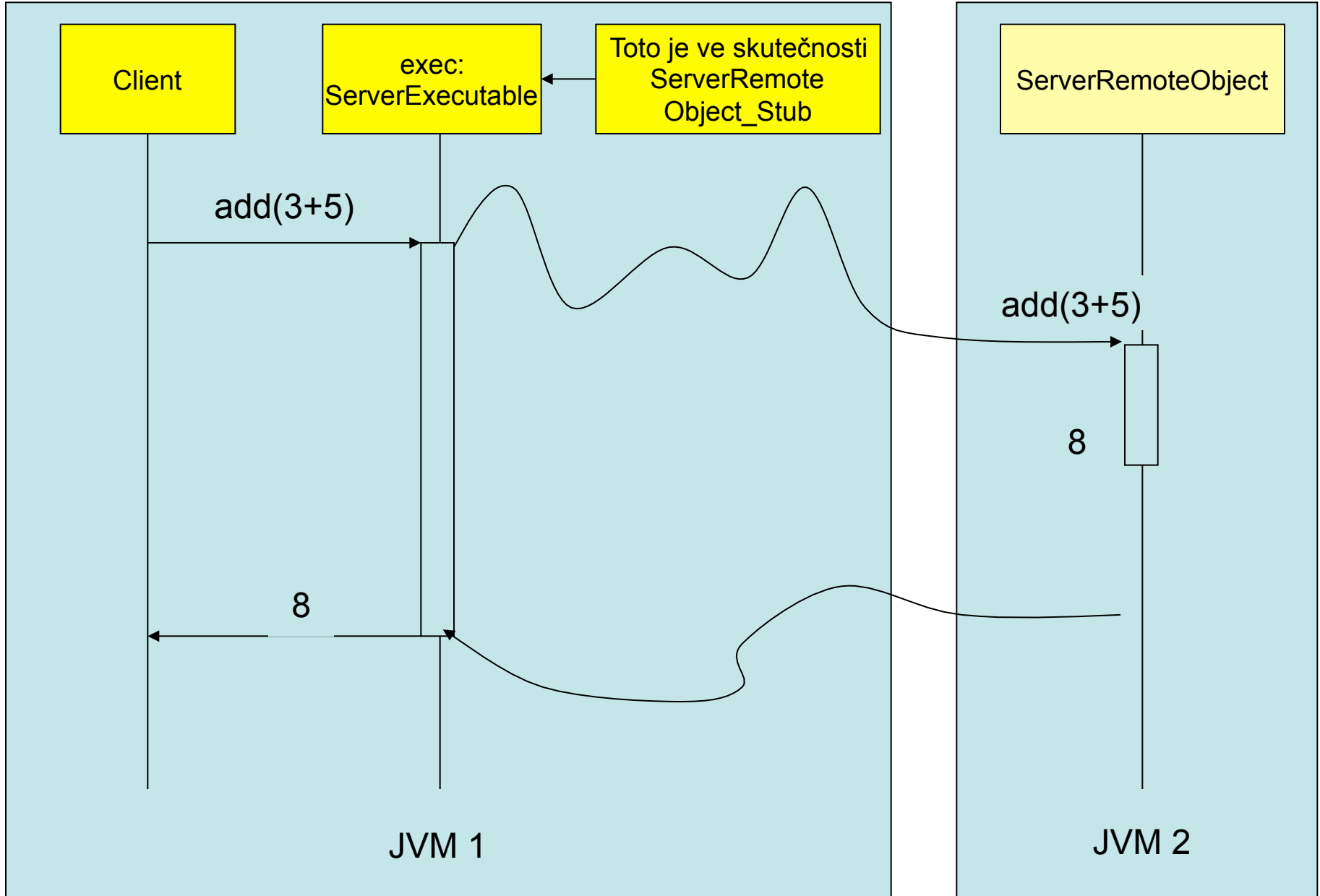
ServerRemoteObject.class

```
graph TD; A[ServerRemoteObject.class] --> B((rmic.exe)); B --> C[ServerRemoteObject_Stub.class];
```

rmic.exe

ServerRemoteObject_Stub.class

Java RMI – Remote Method Invocation



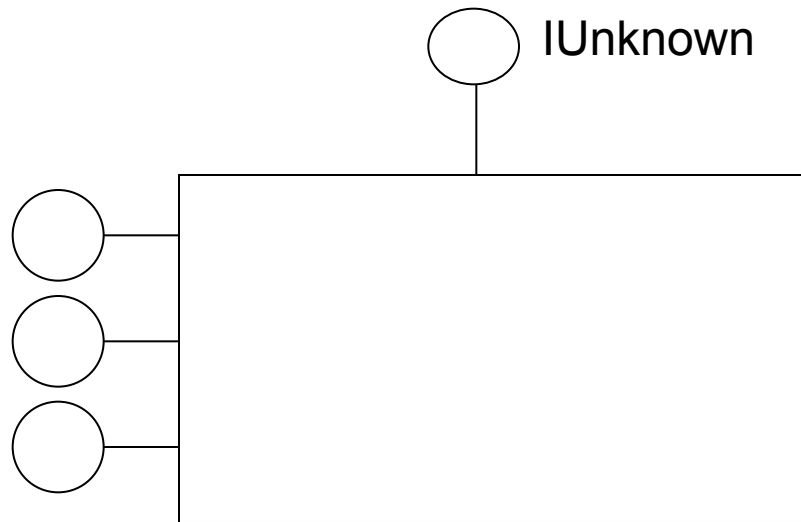
COM

Component Object Model

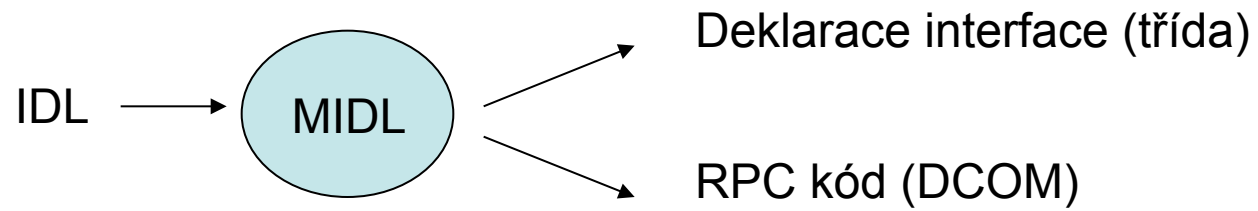
Interface Identifier – např. {A46C12C0-4E88-11CE-A6F1-00AA0037DEFB}

GUID – Global Unique Identifier

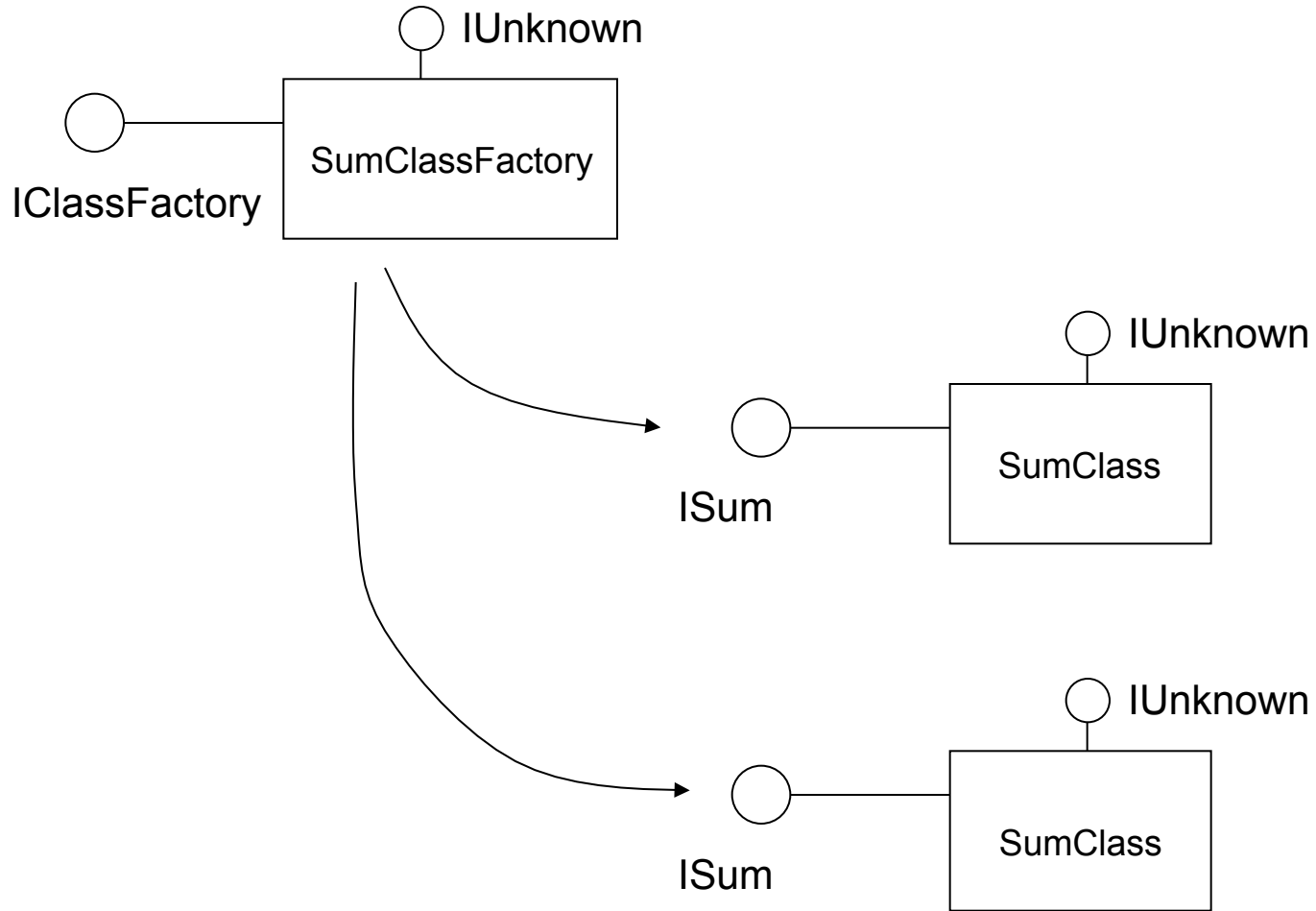
GUIDGEN – nástroj generující GUID



COM



COM



COM

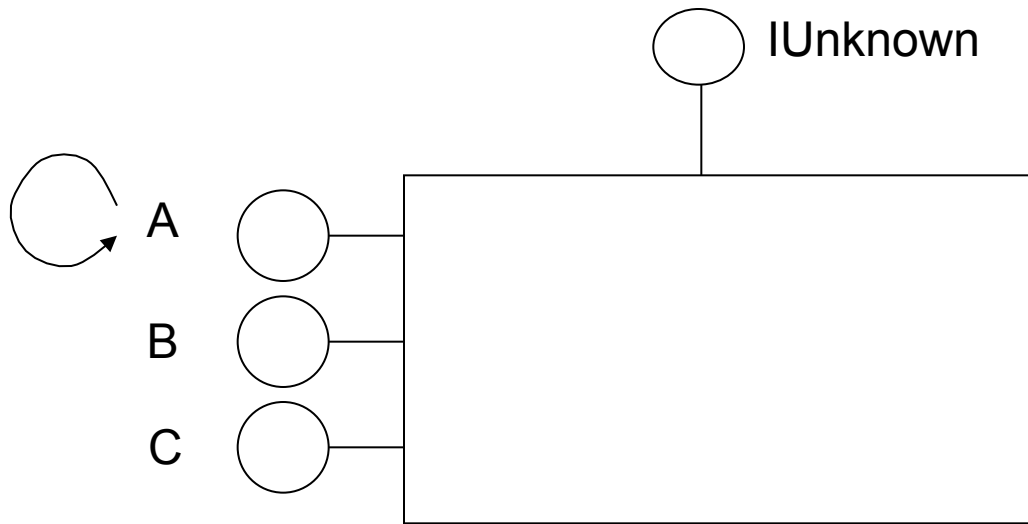
```
Class CFactory: public IClassFactory
{
    public:
        // IUnknown
        ... AddRef();
        ... Release();
        ... QueryInterface(REFIID, void**);

        // IClassFactory
        ... CreateInstance(IUnknown *, REFIID, void **);
        ... LockServer(BOOL);
        ... CFactory(): m_cRef(1) {g_cLocks++};
        ... ~CFactory() {g_cLocks--};

    private:
        ULONG m_cRef;
}
```

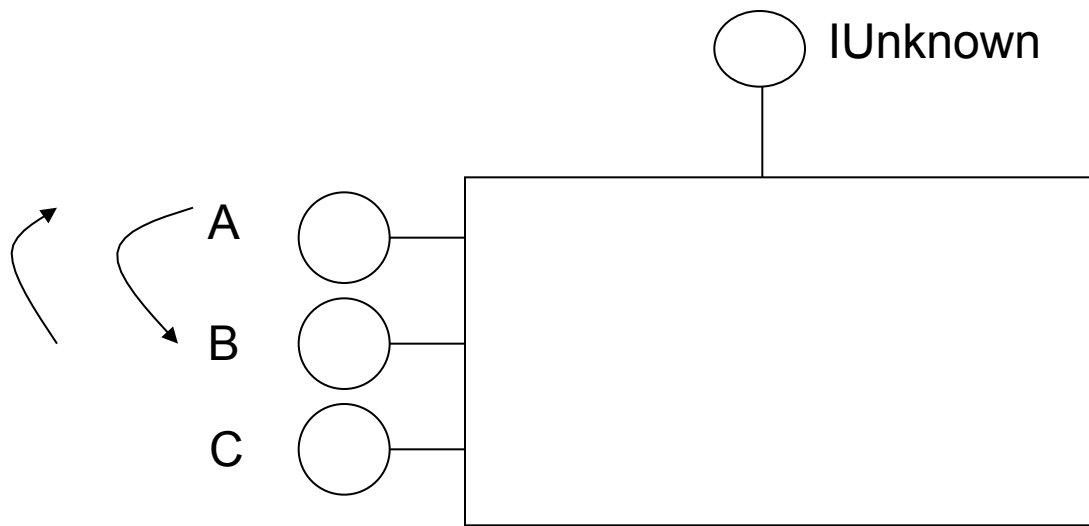
COM

QueryInterface - reflexivnost



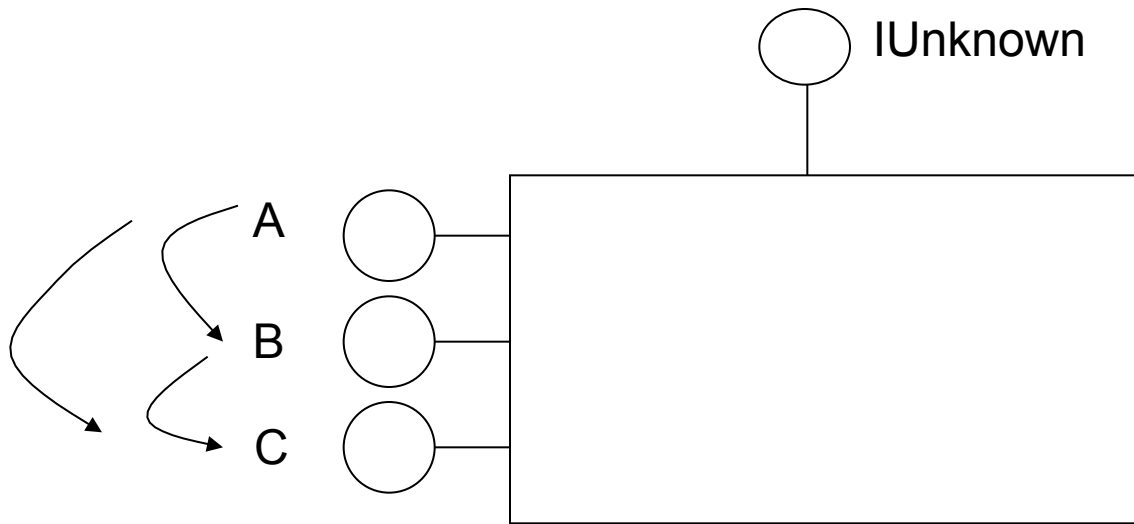
COM

QueryInterface - symetrie



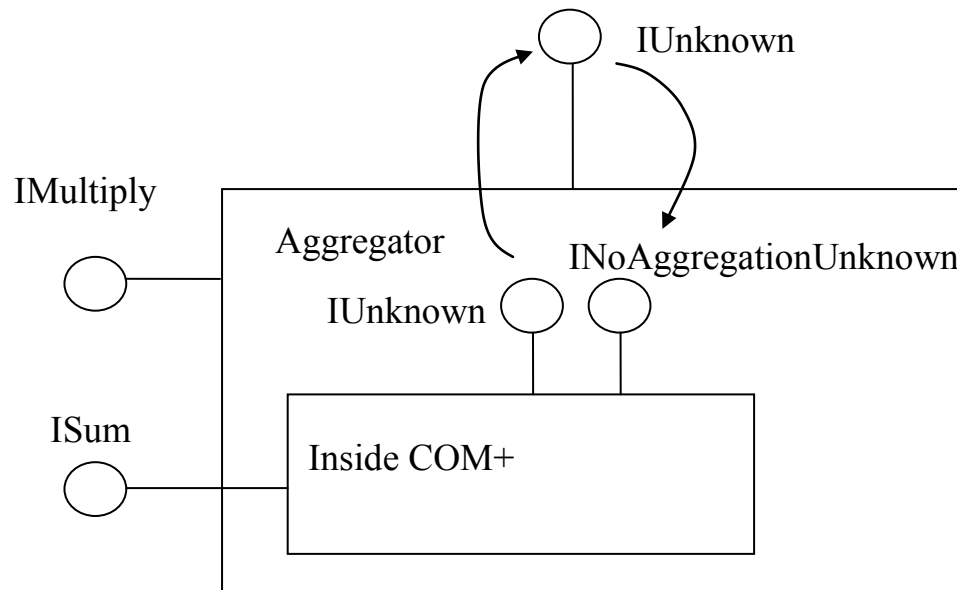
COM

QueryInterface - transitivita



COM – dědění na binární úrovni

COM+ Agregace komponent:



COM – dědění na binární úrovni

COM+ delegace komponent (containment):

