ISA 563: Fundamentals of Systems Programming

Remote Procedure Calls (RPCs)

April 3, 2012

Types of Procedure Calls

- Local procedure call

    - Regular functions call within a program

- Remote procedure call within a host

    - Process calls a procedure inside another process running on the same host

        - Example: Doors

- Remote procedure call between remote hosts

    - Today's focus

Level of Distribution

- Options:

  - build one huge monolithic program

  - distribute functionalities among multiple processes that communicate with each other
    - assume that all processes run in the same host
    - assume that some of the processes run on other hosts

What is RPC?

- A technique for implementing client/server based application

  - Avdoid the details of interfacing with the network

  - Isolates application from the elements of data communication mechanisms

  - Makes client/server computing easier to program

  - Combined with RPCGEN clients can transparently make remote calls through local procedure interface

RPC Advantages

- Versus remote shell execution:

    - the command could be slow to execute

    - have to have a login account on the server

- Versus explicit client/server architecture:

    - RPC Transparently handles network communication

RPC Application Development

- Specify the protocol for client server communication

- Develop the client program
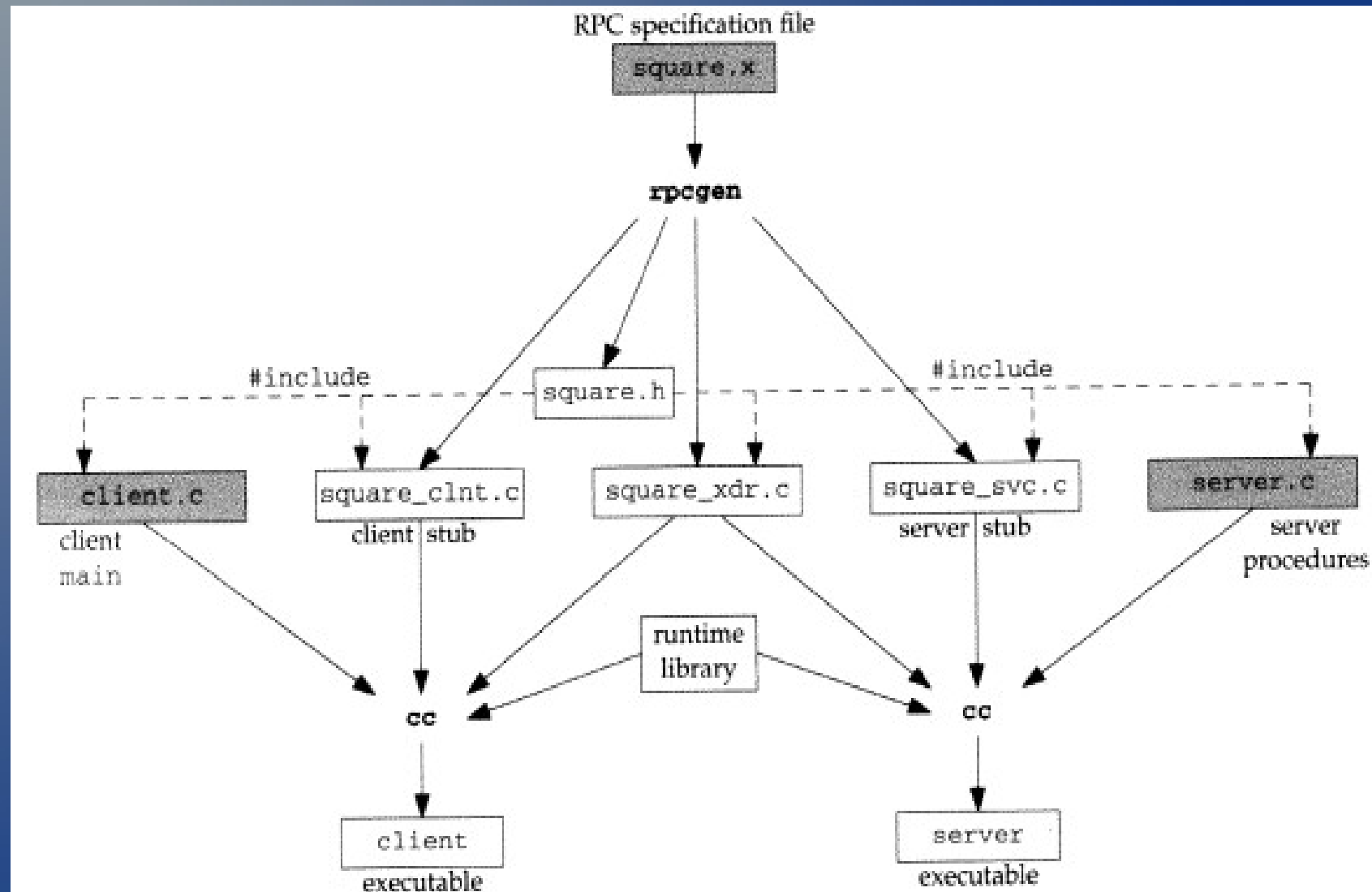
- Develop the server program

Protocol Definition

- Parts need to be speficied inside protocol declaration file:
    - name of service procedures
    - data types of parameters
    - data types of return arguments
- Protocol compiler reads the protocol definition and automatically generates client a server stubs
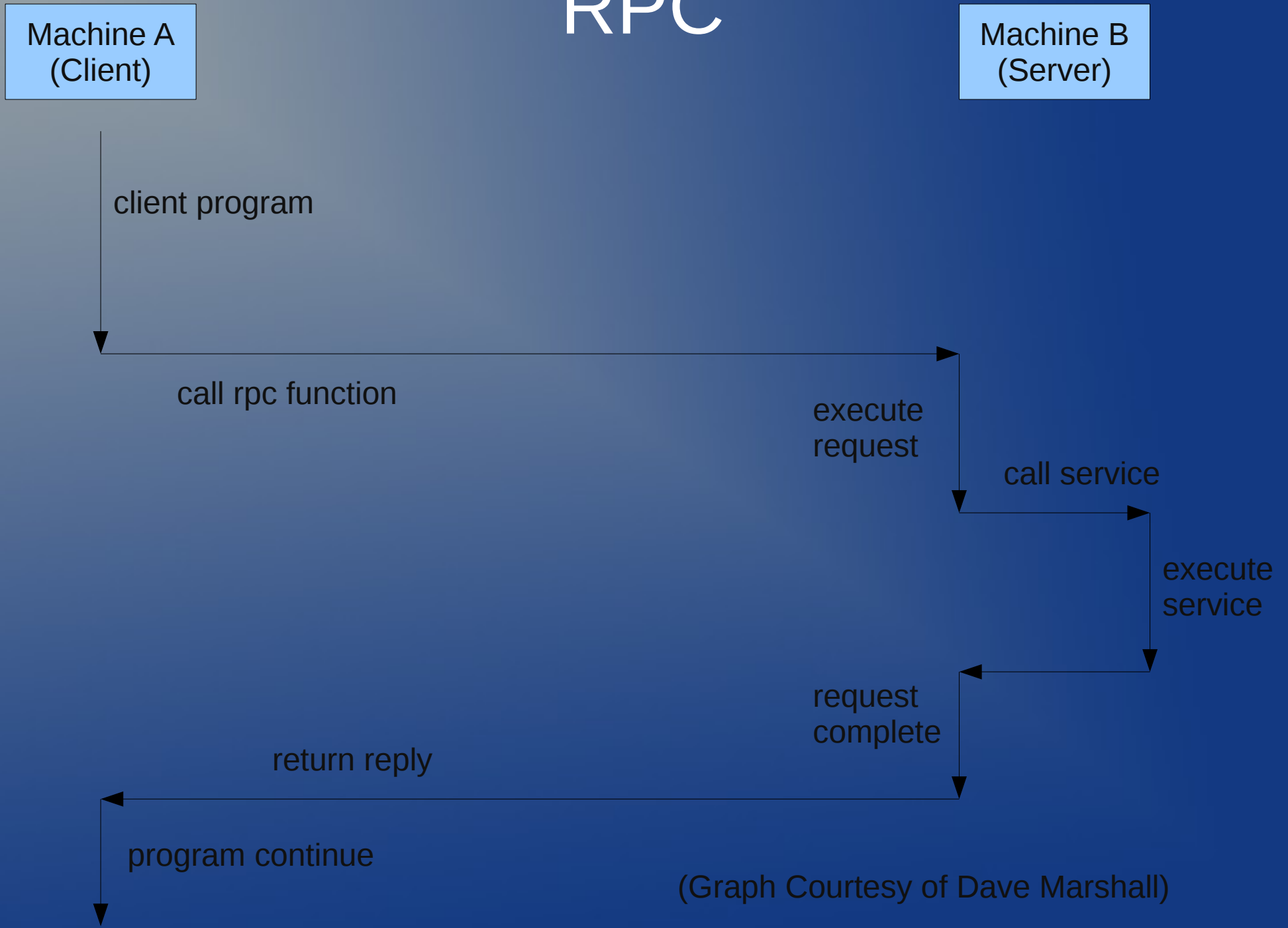
RPCGEN

- rpc exists as a standalone compiler

  - reads special files denoted by .x suffix.

- example:

  - rpcgen rpcprog.x

- The above command will generate the following files:

  - rpcprog_clnt.c – the client stub

  - rpcprog_svc.c – the server stub

  - rpcprog_xdr.c – the external data rep. file

  - rpcprog.h – common header to be included

RPCGEN (cont'd)

(Image Courtesy of Unix Network Programming V2)

RPC

Machine A (Client)

Machine B (Server)

client program

call rpc function

execute request

call service

execute service

request complete

return reply

program continue

(Graph Courtesy of Dave Marshall)

Demo

square.x
client.c
server.c