Redes de Computadores

Computer Networks

labs

Message oriented network programming with UDP sockets

Lab class #1

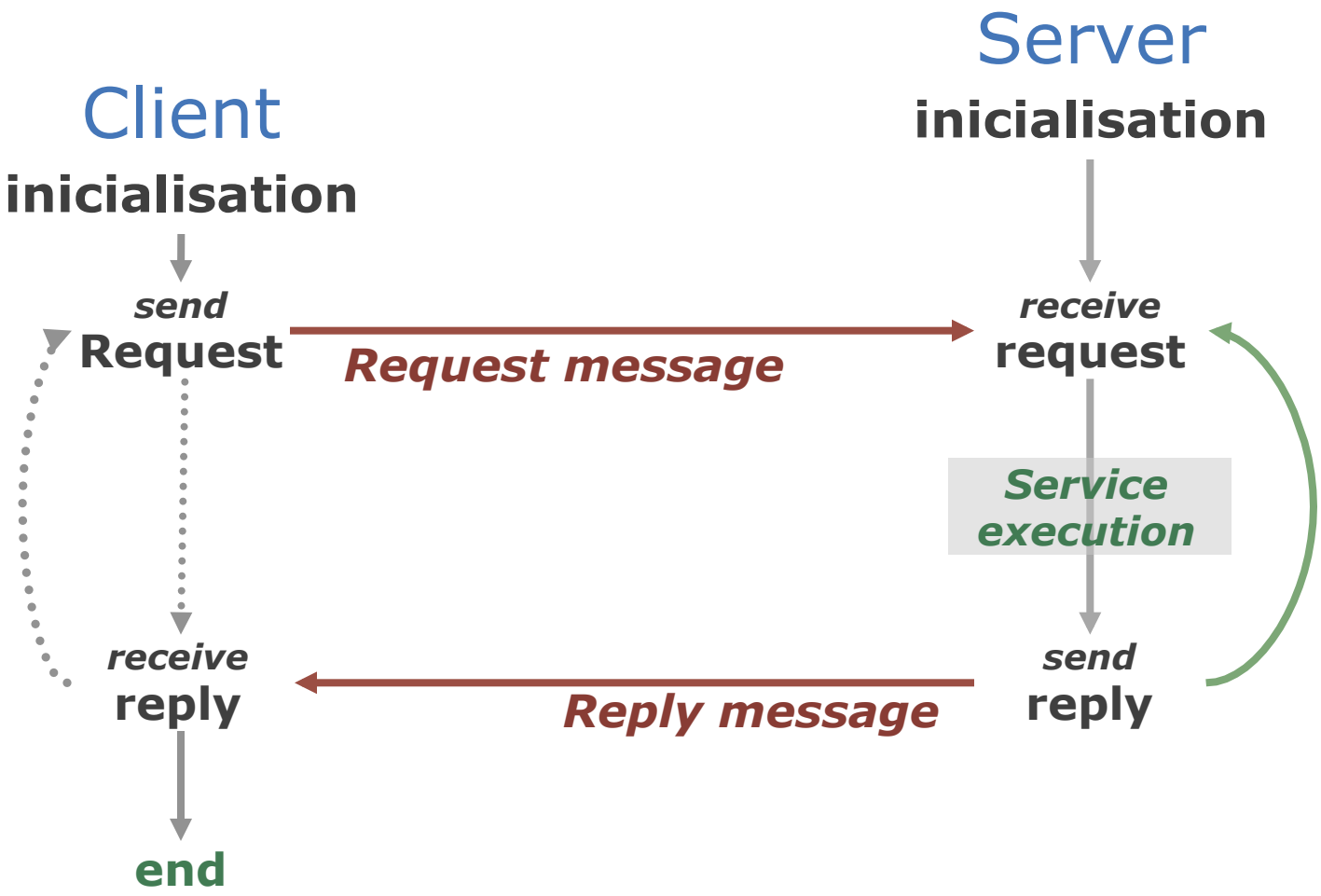
Summary

- Client/Server model
- Java Example
- Exercise: File transfer

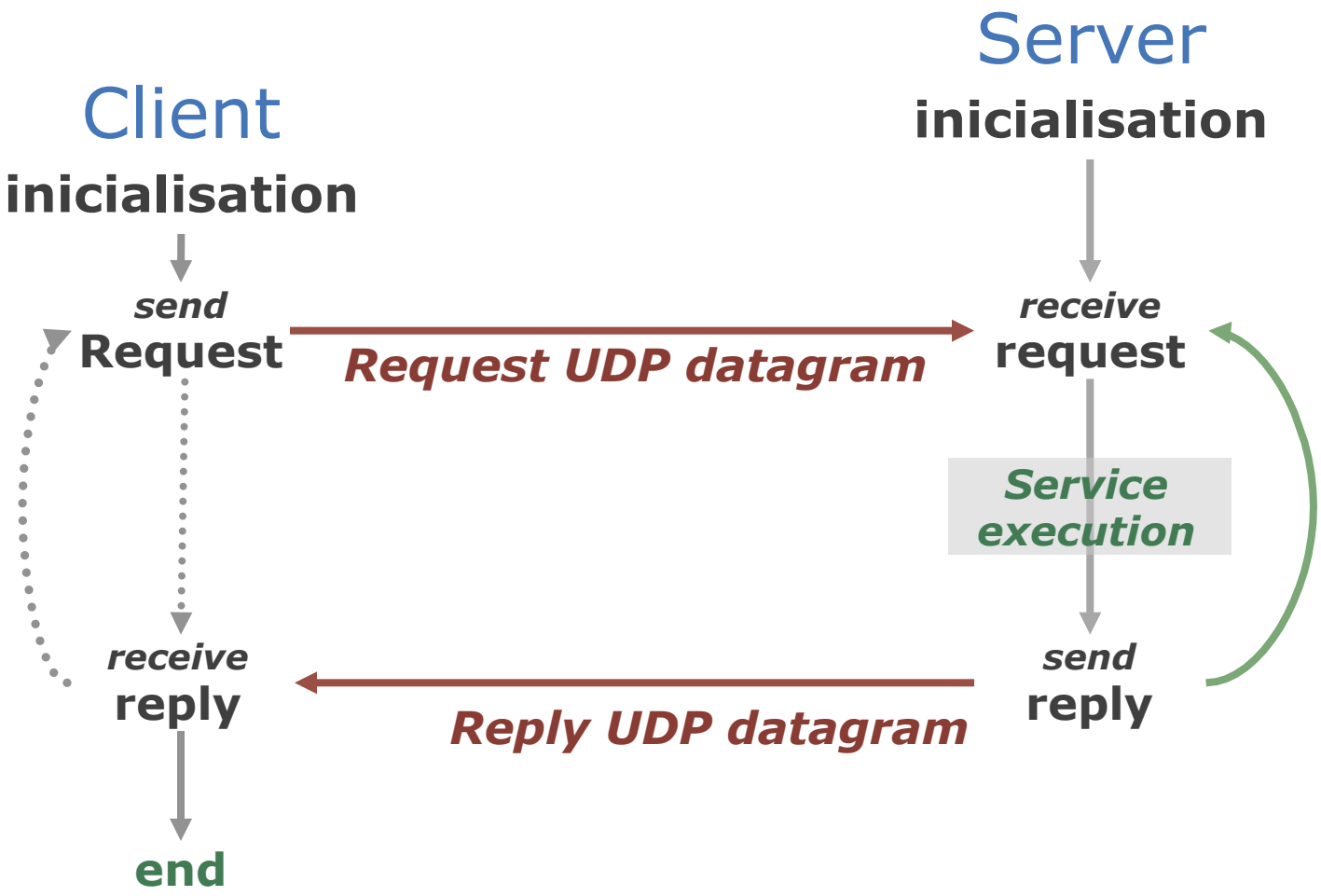
Client/Server Model

- Two autonomous components:
  - **Server**, first to run and usually always running.
  - **Client**, usually started by user to request a service…

C/S execution diagram



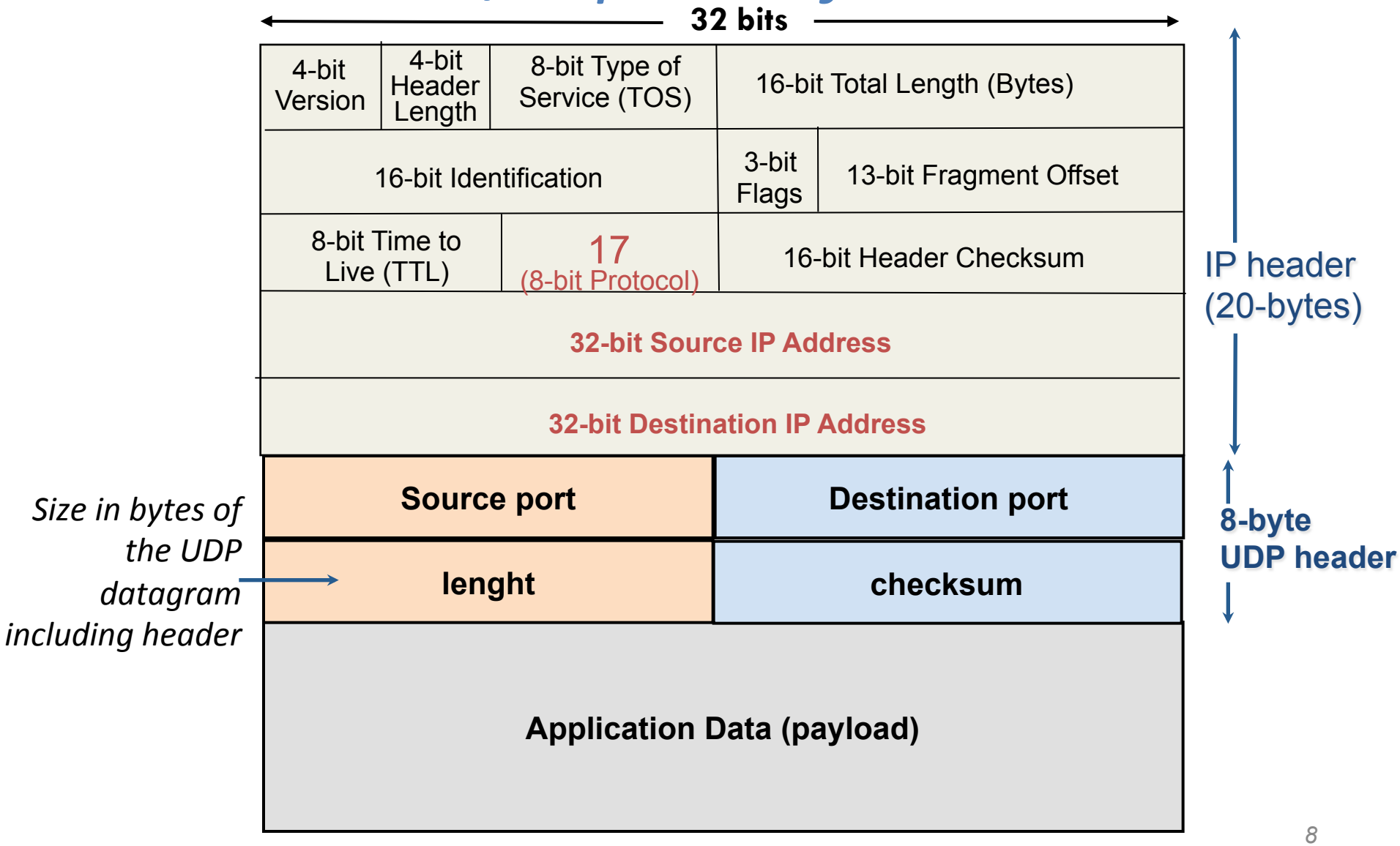
C/S with UDP datagrams



What's a UDP Datagram?

- Raw byte sequence (at most 64K long)
- **Addressed** to a computer and a process (port)
- **From** a computer and a port (port)
- Called an **UDP datagram**

UDP/IP packet format



Datagrams communication

- Communication is based on **sockets**
  - End point abstraction with all the operations…
- Addresses identify sender and receiver.
  - **Computer** (IP Address)
    - 10.1.233.67, 127.0.0.1, 192.168.1.1, etc.
  - **Port** (16 bits)
    - 8000

Example: ECHO

- The client sends a string message to server (IP + port).

- The server sends back a copy of that string to client.

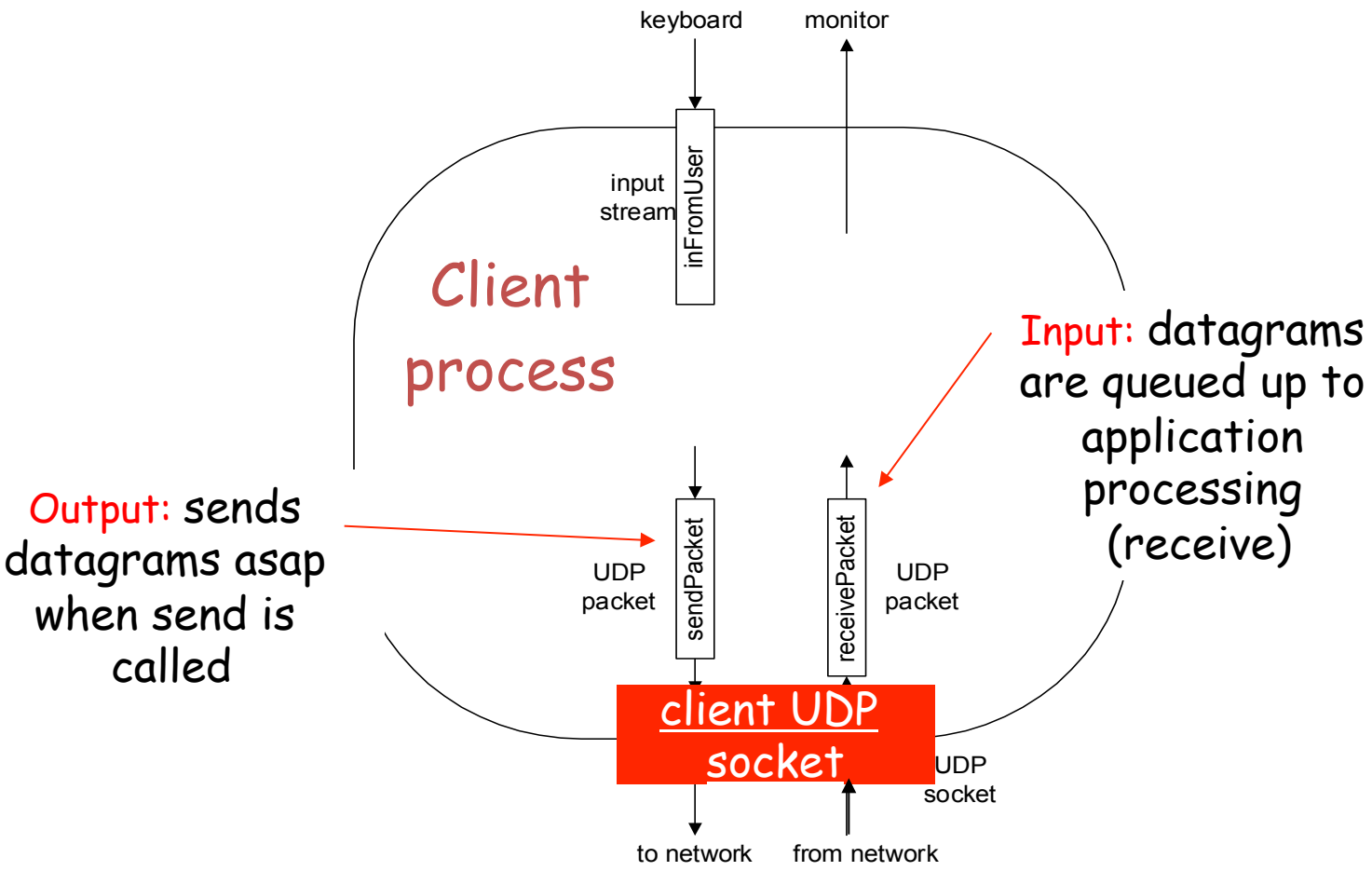
Java Programming with UDP Datagrams

- Java package:
  - java.net
- Java classes:
  - DatagramSocket
  - DatagramPacket
  - InetAddress

Java code (ECHO)

- Server ECHO (EchoServer.java)
- Client ECHO (EchoClient.java)

UDP sockets have two queues

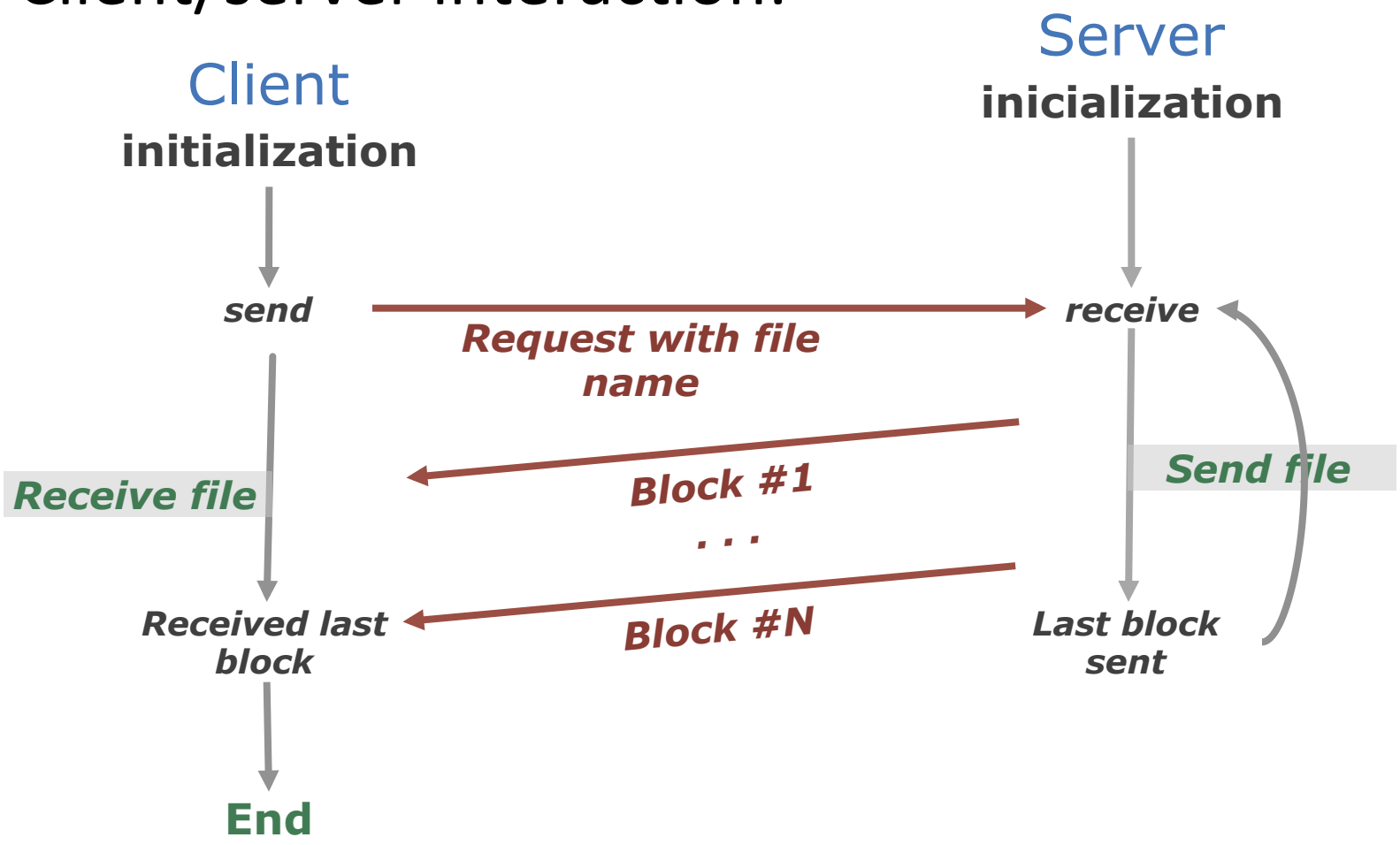


Exercise: File Transfer

- Implement a system capable of transferring files between two computers
  - A client program (receiver) requests a file to a server (sender). If it exists in the server computer, it sends its content to the client, using 1024 bytes blocks.
  - Design the communication protocol so that:
    - The request includes the file name
    - The client knows when the transfer/file ends

Exercise: File Transfer

- Client/server interaction:



Exercise: File Transfer

- Check that the receiver can lose some blocks
  - Use a big file (>=10MBytes)
- Try to solve the problem and evaluate:
  - Use Thread.sleep() so that the sender waits a little before sending each block
  - Verify the time you must use when: in the same computer; between different computers; if possible, computers in different networks.
  - Calculate the transfer rate (KB/s) achieved in each case