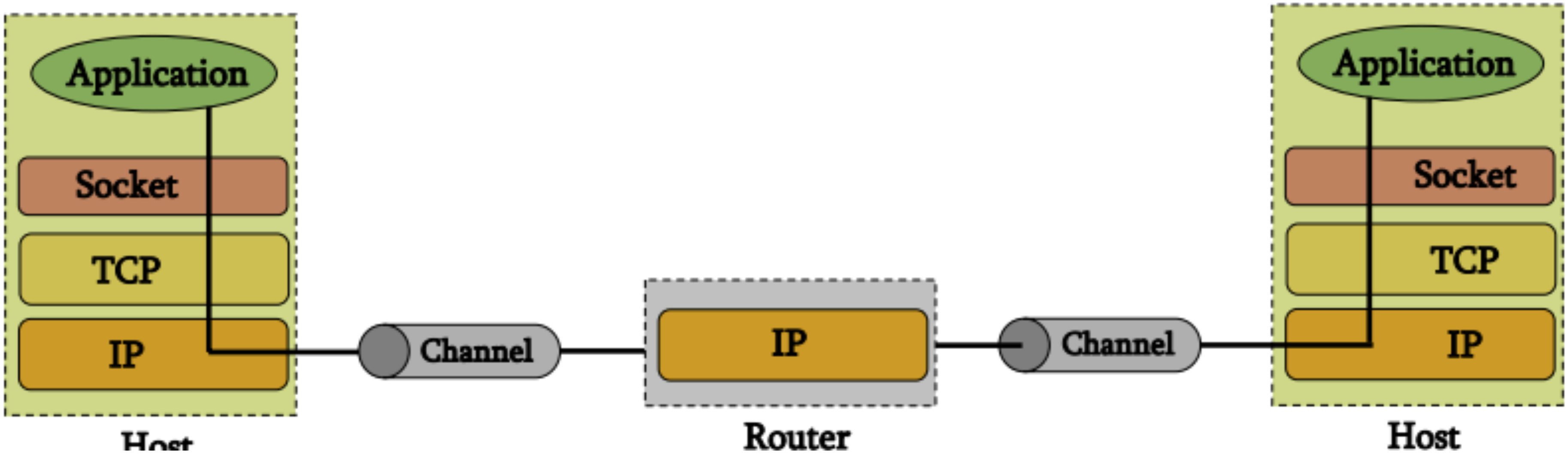
Lab 3 – Lecture: Client/Server with Minimum Security

Socket Programming

- A way of connecting two nodes (e.g., two computers) on a network
- A socket
  - An abstraction through which an application may send and receive data
  - Uniquely identified by
    - An internet address
    - An end-to-end protocol (e.g. TCP or UDP)
    - A port number

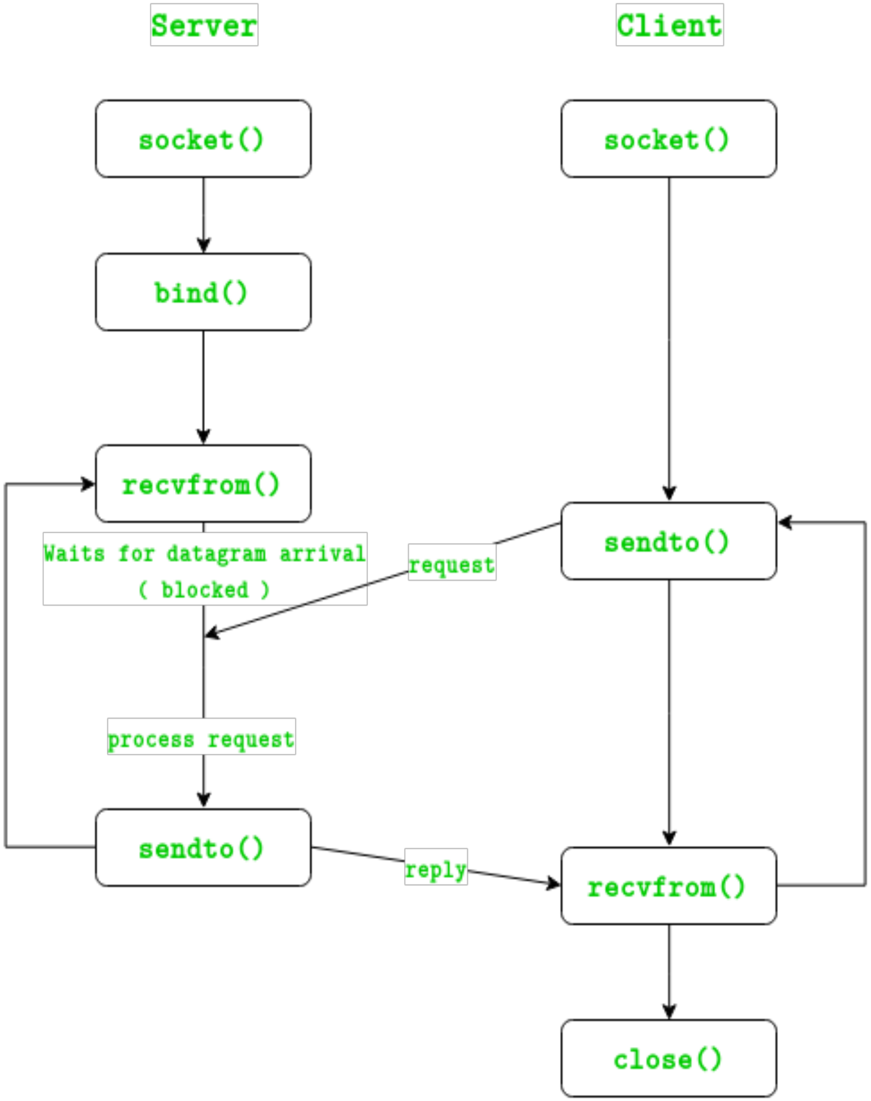


Two types of socket

- Stream sockets (uses TCP)
  - Provide reliable byte-stream service
- Datagram sockets (uses UDP)
  - Provide best-effort datagram service (e.g. data can be lost)
- **Our assignments focus on Datagram sockets!**

Datagram Sockets

- Server
  - Create a datagram (UDP) socket
  - Bind the socket to server address
  - Wait until datagram packet arrives from client
  - Process the datagram packet and send a reply to client
- Client
  - Create UDP socket
  - Send message to server
  - Wait until response from server is received
  - Close socket descriptor and exit



Basic functions in C

- int socket(int domain, int type, int protocol): Creates an unbound socket in the specified domain. Returns socket file descriptor.
  - domain: Specifies the communication domain (AF_INET for IPv4/ AF_INET6 for IPv6)
  - type: Type of socket to be created (SOCK_STREAM for TCP / SOCK_DGRAM for UDP)
  - protocol: Protocol to be used by socket. 0 means use default protocol for the address family.

Basic functions in C (cont.)

- int bind(int sockfd, const struct sockaddr *addr, socklen_t addrlen) : Assigns address to the unbound socket.
  - sockfd: File descriptor of socket to be binded
  - addr: Structure in which address to be binded to is specified
  - addrlen: Size of *addr* structure
- ssize_t sendto(int sockfd, const void *buf, size_t len, int flags, const struct sockaddr *dest_addr, socklen_t addrlen): Send a message on the socket
  - buf: Application buffer containing the data to be sent
  - len: Size of *buf* application buffer
  - flags: Bitwise OR of flags to modify socket behavior
  - dest_addr: Structure containing address of destination
  - addrlen: Size of *dest_addr* structure

Basic function in C (cont.)

- ssize_t recvfrom(int sockfd, void *buf, size_t len, int flags, struct sockaddr *src_addr, socklen_t *addrlen): Receive a message from the socket
  - buf: Application buffer in which to receive data
  - len: Size of *buf* application buffer
  - flags: Bitwise OR of flags to modify socket behavior
  - src_addr: Structure containing source address is returned
  - addrlen: Variable in which size of *src_addr* structure is returned
- int close(int sockfd): Close a file descriptor

More detail…

- A detailed tutorial on socket programming can be found here at Beej’s Guide to Network Programming Using Internet Sockets
- Sample codes for UDP client and server are from page 31-34. You can use these codes for your implementation.

Report Preparation - Format

- Both parts must be compressed (zip) and submitted together
  - Name the zipped file as <Year.Month.Date>.<Student_ID>.<LabXX>.zip
  - For example: 2019.08.1.s1222222.Lab1.zip
- Requirements for typed report
  - Must be prepared using a Word processor (e.g. MS Word or Latex)
  - Must be converted into PDF for submission
  - Submitted individually, even work in team (Lab 3)
  - Also name the file as <YearMonthDate><Student_ID><LabXX-report>.PDF
    - Example 2019.08.1.s122222.Lab1-report.pdf
- Requirements for source code
  - Also name the file as <YearMonthDate><Student_ID><file_name>
  - For <file_name>, refer to the lab description file.

Report Submission

- Lab report submission
  - By email (send the zip file to **d8202101, m5222108,** cc **pham).** The subject of your email should be **[CN02]Lab3**
  - Due date: **Aug. 1st**
    - Late submission is subject to penalty