CS4514 Project 2 Help Session (B06)

Mingzhe Li

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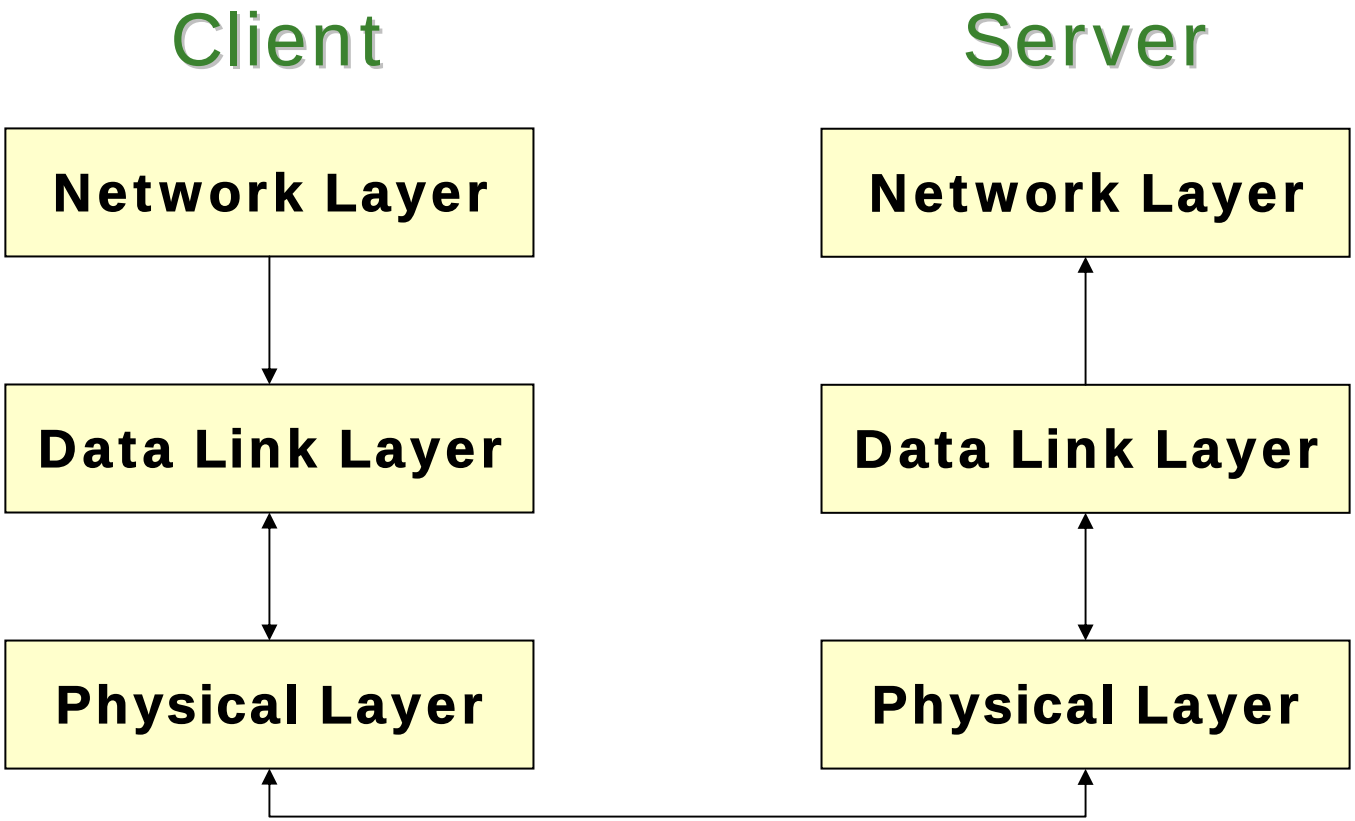
Description

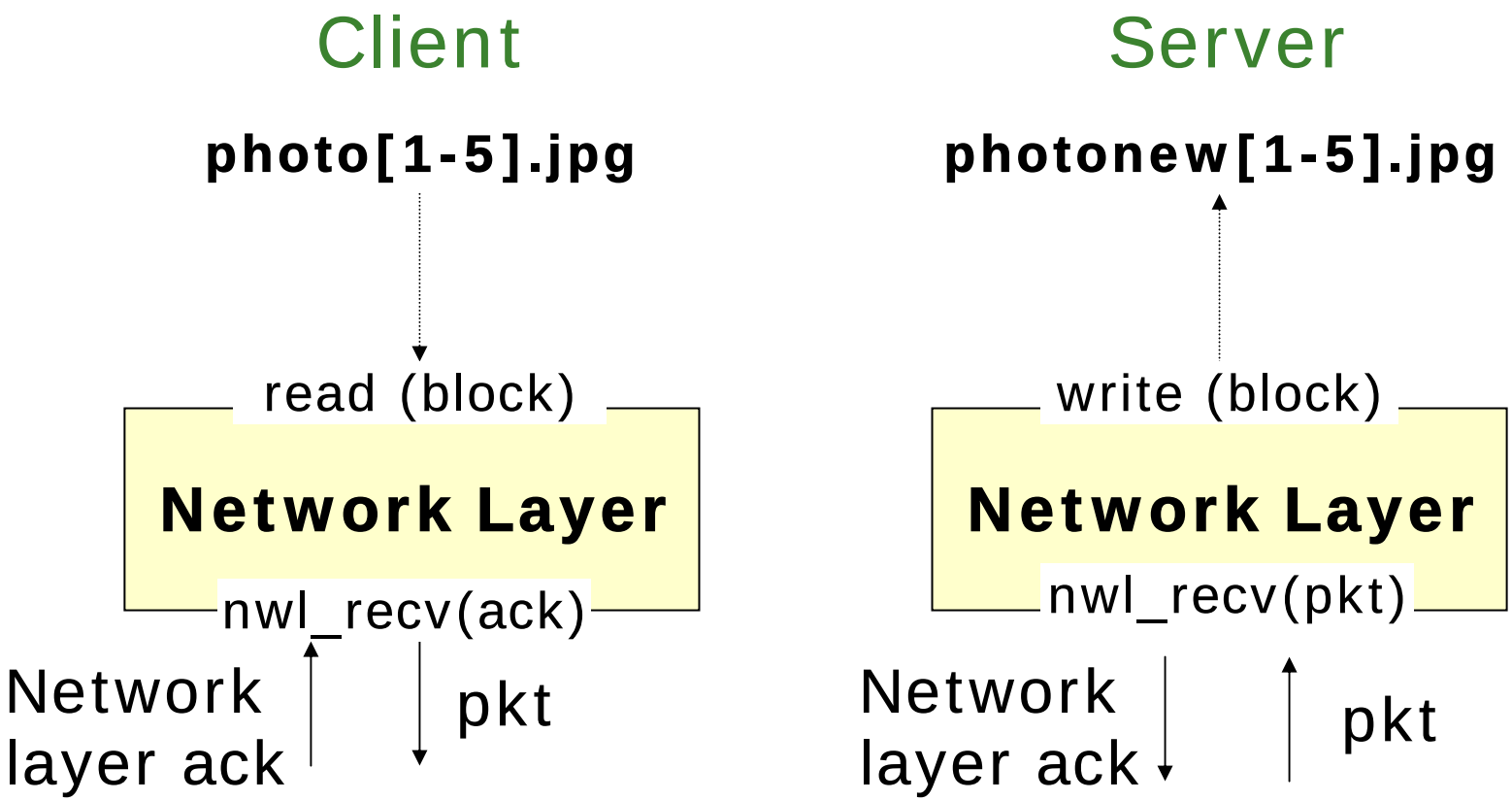
- The goal is to implement a Positive Acknowledgement with Retransmission (PAR) protocol on top of an emulated physical layer.
  - The receiver acknowledges only the correctly received segments and the sender uses timeout to detect and send the lost segment.
  - Physical layer is emulated by a TCP connection plus an error module.
  - Your programs should compile and work on "ccc[1-10].wpi.edu"

Framework



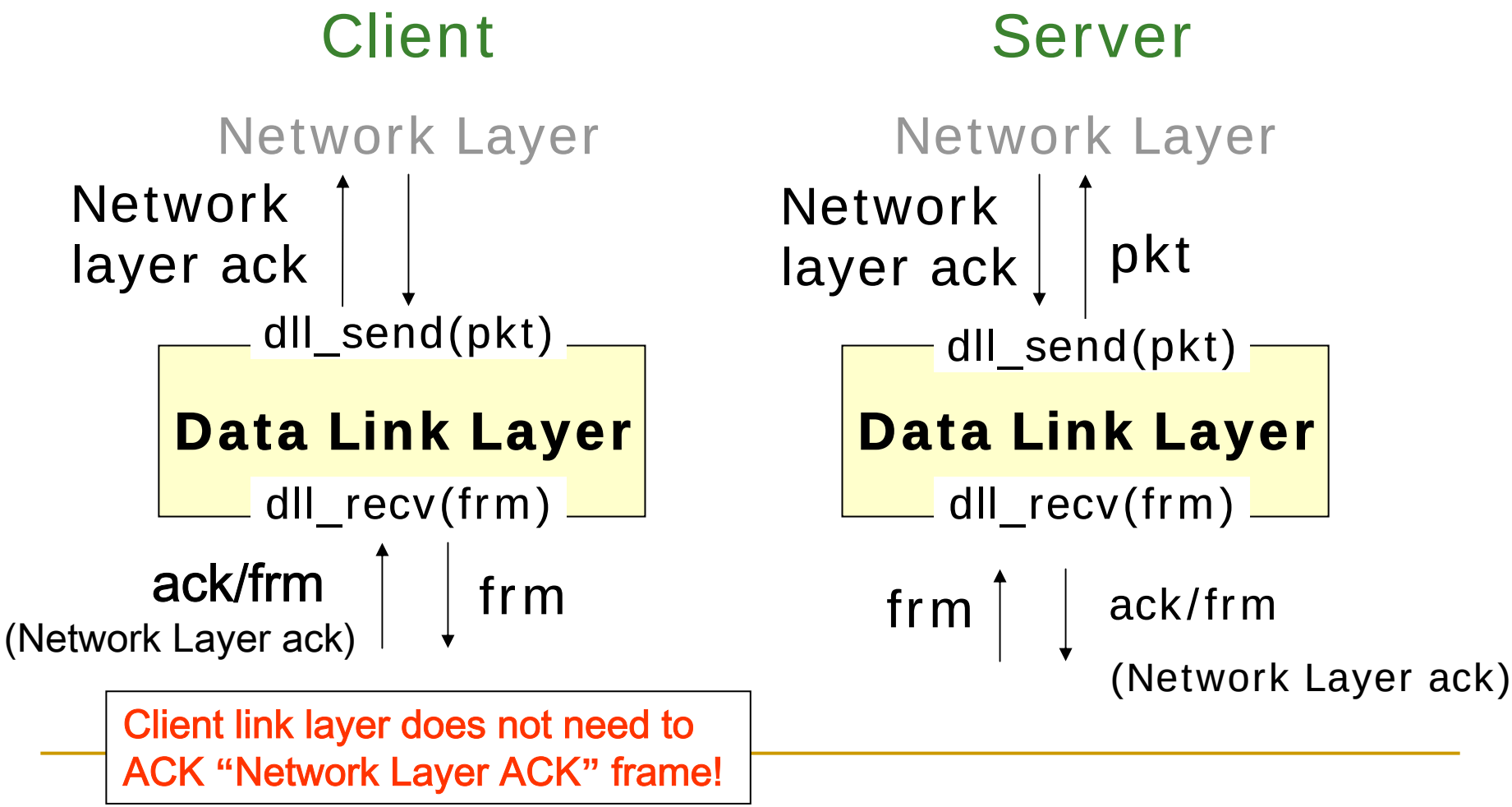
Do NOT attempt to put everything in one big main()

Network Layer



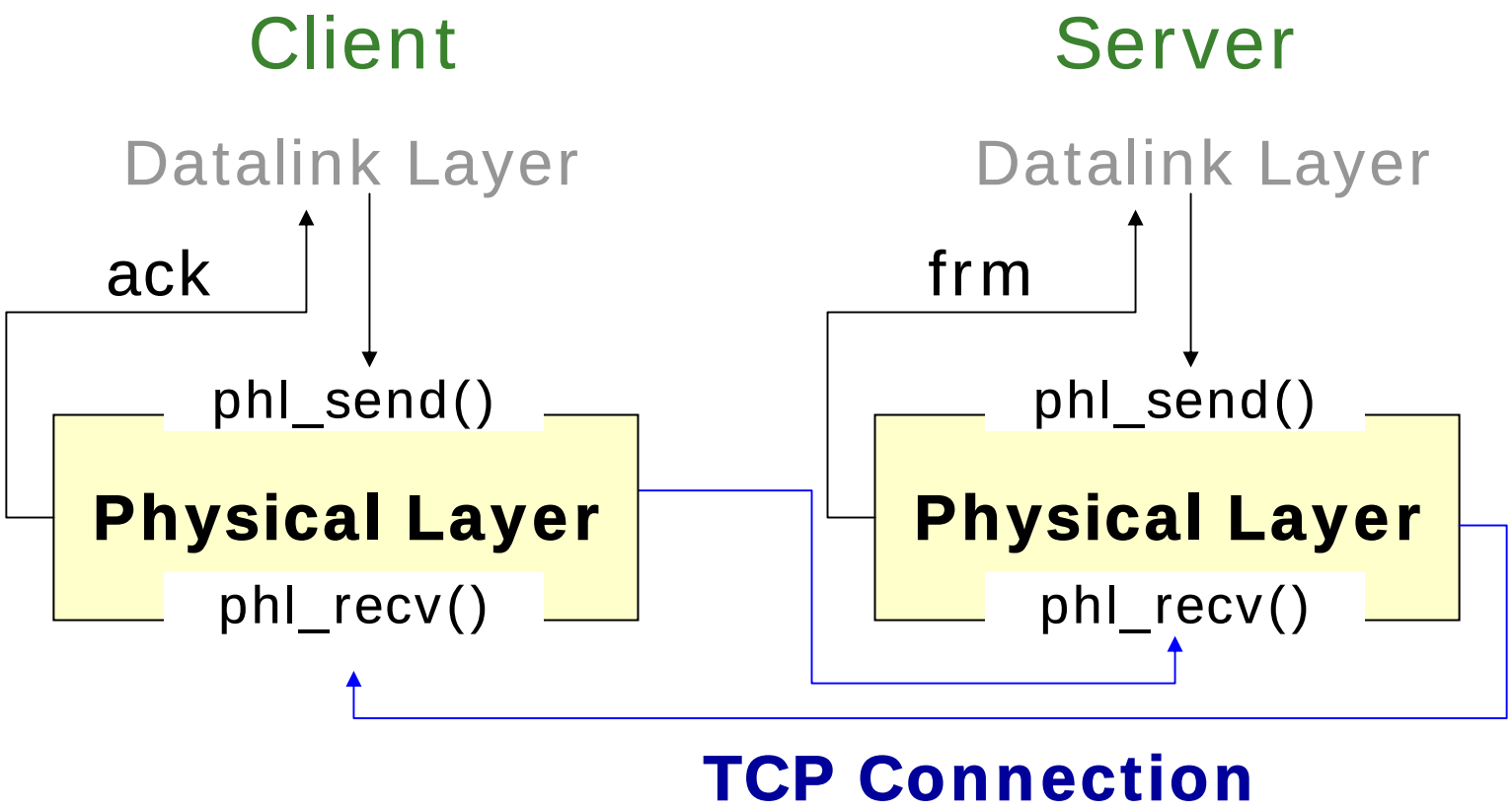
Packet size: 200 bytes

Data Link Layer

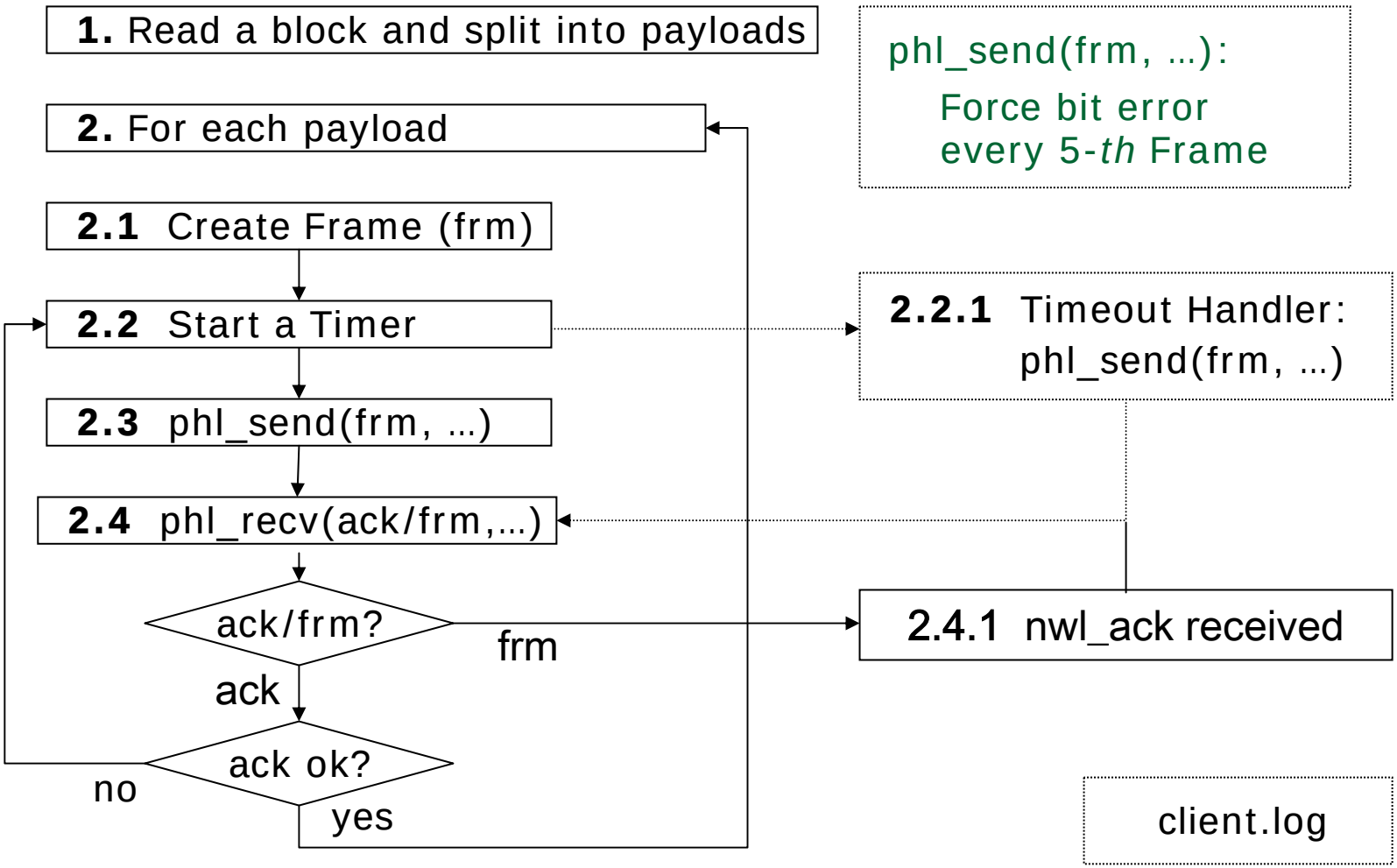


Client link layer does not need to ACK "Network Layer ACK" frame!

Physical Layer



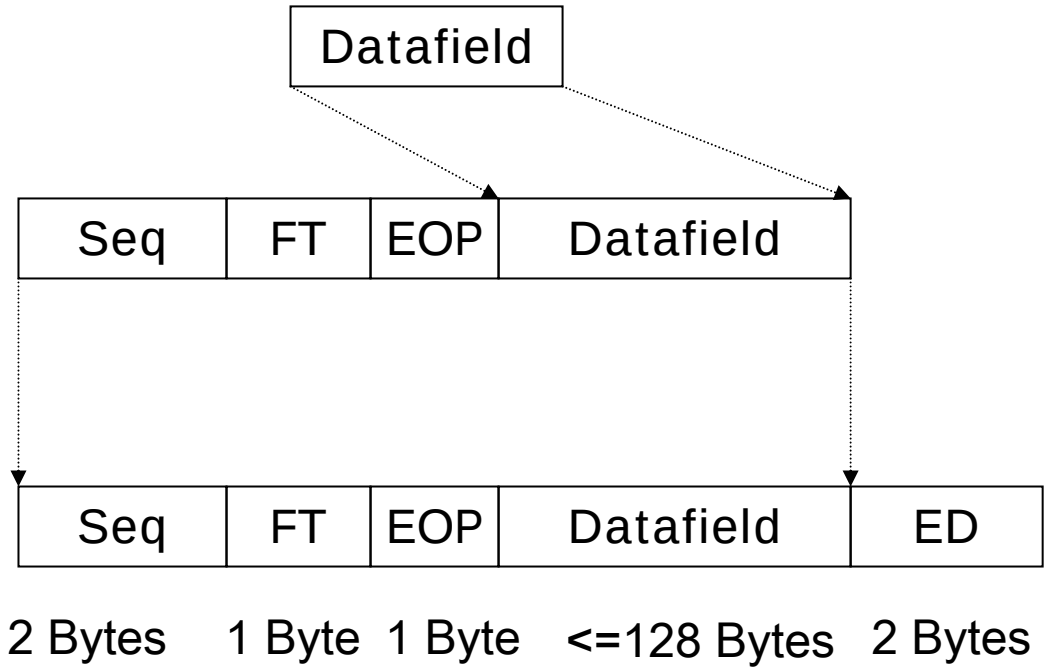
Client: dll_send(pkt, ...)



Create Frame

1. Compute Seq Number, Frame Type and End-Of-Packet (EOP) bytes

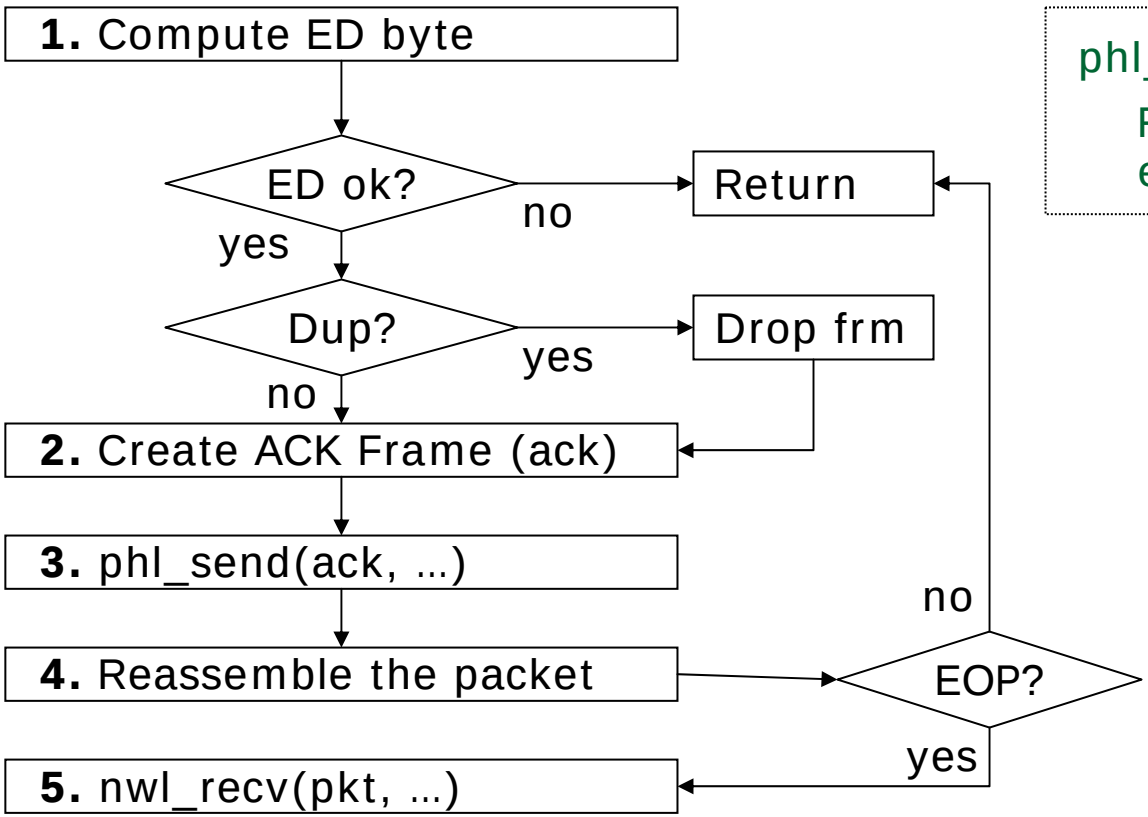
2. Error-Detection (ED) bytes (XOR on Seq + FT + EOP + Data)



EOP: End of Packet
FT: Frame Type

ED: Error Detection
Seq: Sequence Num

Server: dll_recv(frm, …)



phl_send(ack, …):

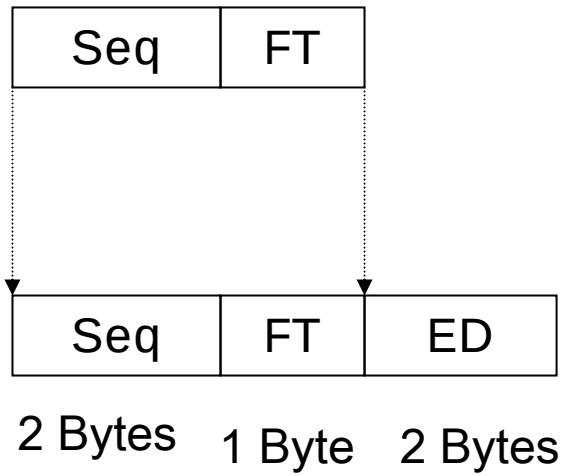
Force bit error every 7-*th* Frame

server.log

Create ACK Frame

1. Compute Seq Number and Frame Type

2. Error-Detection (ED) bytes (ED = Seq)



EOP: End of Packet
FT: Frame Type

ED: Error Detection
Seq: Sequence Num

Timers

- The client uses a timer to detect a frame loss.
  - The client sets a timer when it transmits a frame.
  - When the timer expires, the client retransmits the frame.
- Two kinds of timer
  - Select : easier to use
  - Signal and Timer : nicer implementation

Select: Monitor Given FDs (SDs)

```
# include <sys/select.h>
# include <sys/time.h>

int select (int maxfdp1, fd_set *readset, fd_set *writeset,
            fd_set *exceptset, const struct timeval *timeout);

struct timeval {
            long tv_sec;            /* seconds */
            long tv_usec;           /* microseconds */
}
```

Example: Select

```
fd_set bvfdRead;
int readyNo;
struct timeval timeout;
int sockfd;

while (1) {
    timeout.tv_sec = 0;
    timeout.tv_usec = 500;
    FD_ZERO(&bvfdRead);
    FD_SET(sockfd, &bvfdRead);
    readyNo = select(sockfd+1,
    &bvfdRead, 0, 0, &timeout);

    if(readyNo < 0)
        error_handler();
    else if(readyNo == 0)
        timeout_handler();
    else {
        FD_ZERO(&bvfdRead);
        receive_handler();
    }
}
```

Signal and Timer: Soft Interrupt

- Head files

  ```
  #include <signal.h>
  #include <time.h>
  ```

- Register a function to TIMEOUT signal

  ```
  signal (SIGALRM, timeout);
  ```

- Create a timer and begin to run

  ```
  timer_create();
  timer_settime();
  ```

- Compile with option “-lrt” (link runtime library)

Example: Signal and Timer

```
timer_t timer_id;

void timeout(int signal_number){
    printf("\n SIGNUM: %d\n",
                signal_number);
    exit(0);
}

void start_timer(){
    struct itimerspec time_val;
    signal (SIGALRM, timeout);
    timer_create(
          CLOCK_REALTIME,
          NULL, &timer_id);
```

```
/* set timeout to 1 second */
time_val.it_value.tv_sec     = 1;
time_val.it_value.tv_nsec    = 0;
time_val.it_interval.tv_sec  = 0;
time_val.it_interval.tv_nsec = 0;
timer_settime(timer_id, 0,
                    &time_val, NULL);
}

main(){
    start_timer();
    while(1);
}
```

Open a File

- Open a file for read:

```
int rfile;
if ((rfile = open(“filename1”, O_RDONLY)) < 0)
    {
      perror("Input File Open Error");
      exit(1);
    }
```

- Open a file for write (create if not exist):

```
int ofile;
if ((ofile = open(“filename2”, O_WRONLY|O_CREAT|O_TRUNC, S_IRUSR|S_IW
     USR|S_IRGRP|S_IWGRP)) < 0)
    {
      perror("Output File Open Error");
      exit(1);
    }
```

File Read

- Read from file

```
while ((rd_size = read(rfile, buf, 256)) > 0)
     {
     do something with “buf” here
     }
if (rd_size < 0)
     {
      perror("File Read Error");
      exit(1);
    }
else
    {
      printf ("Reach the end of the file\n");
    }
```

File Write/Close

- Write to File

```
if ((wr_size = write(ofile, buf, rd_size)) < 0)
    {
      perror("Write Error:");
      exit(1);
    }
```

- Close files

```
close(rfile);
close(ofile);
```

Display Image in Linux

- Make sure you have “X forwarding” with your ssh client
- And you need have an Xserver (X-Win32 or etc.) running on you win dows computer.
- The image display is not required for the Project.
- These code tested on ccc[1-10].wpi.edu

```
if (fork() == 0)
    {
      execl("/usr/local/bin/xv", "xv", “image.jpg”, NULL);
    }
  else
    {
      wait(NULL);
      printf("Done display! \n");
    }
```

Thanks!
and
Questions?