CS3516 Project 3 Help Session (B14)

Dongqing Xiao

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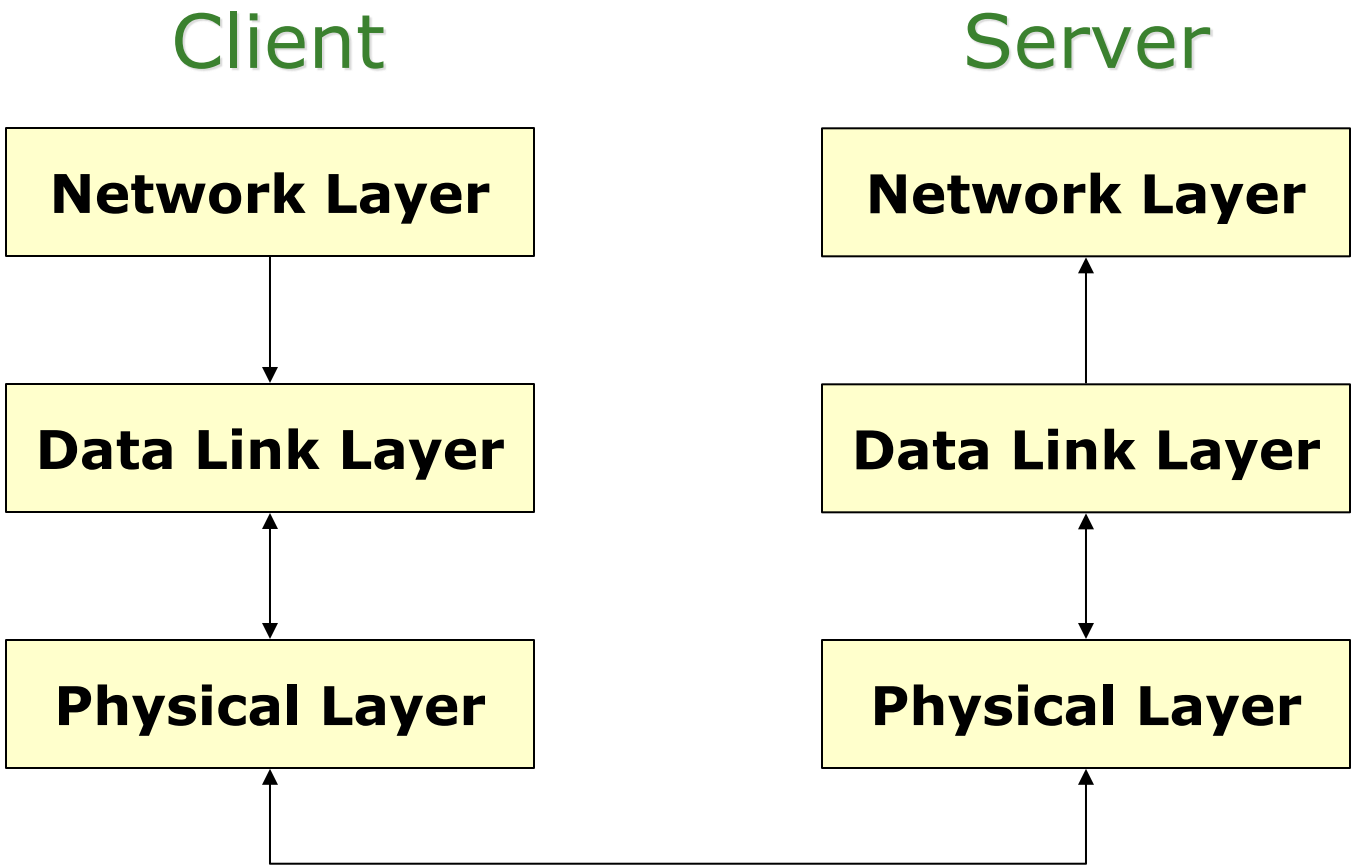
Description

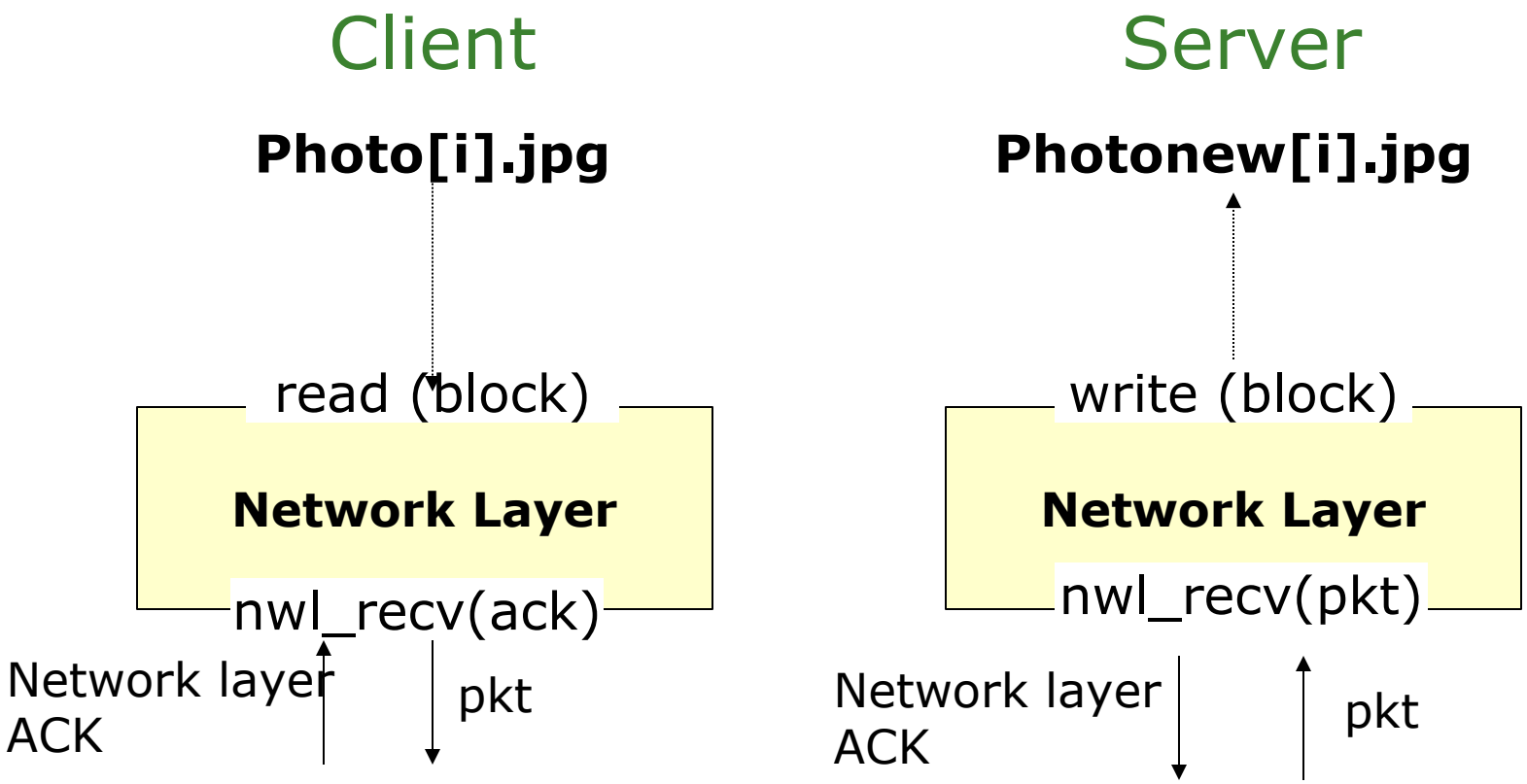
- The goal is to implement a Positive Acknowledgement with Retransmission (PAR) protocol on top of an emulated physical layer.
  - The receiver acknowledges only the correctly received segments
  - The sender uses timeout to detect and send the lost segment.
  - Physical layer is emulated by a TCP connection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

Framework



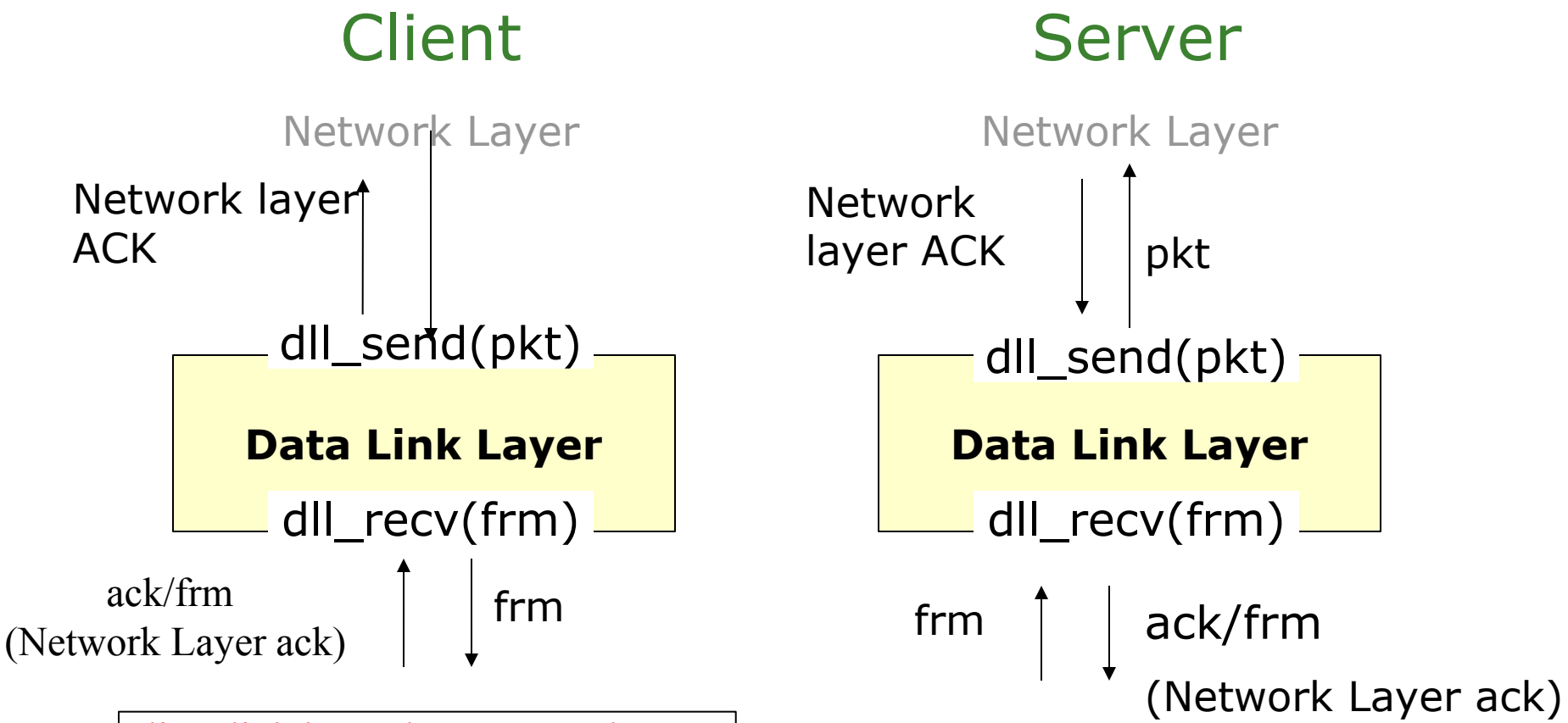
Do NOT attempt to put everything in one big main()

Network Layer



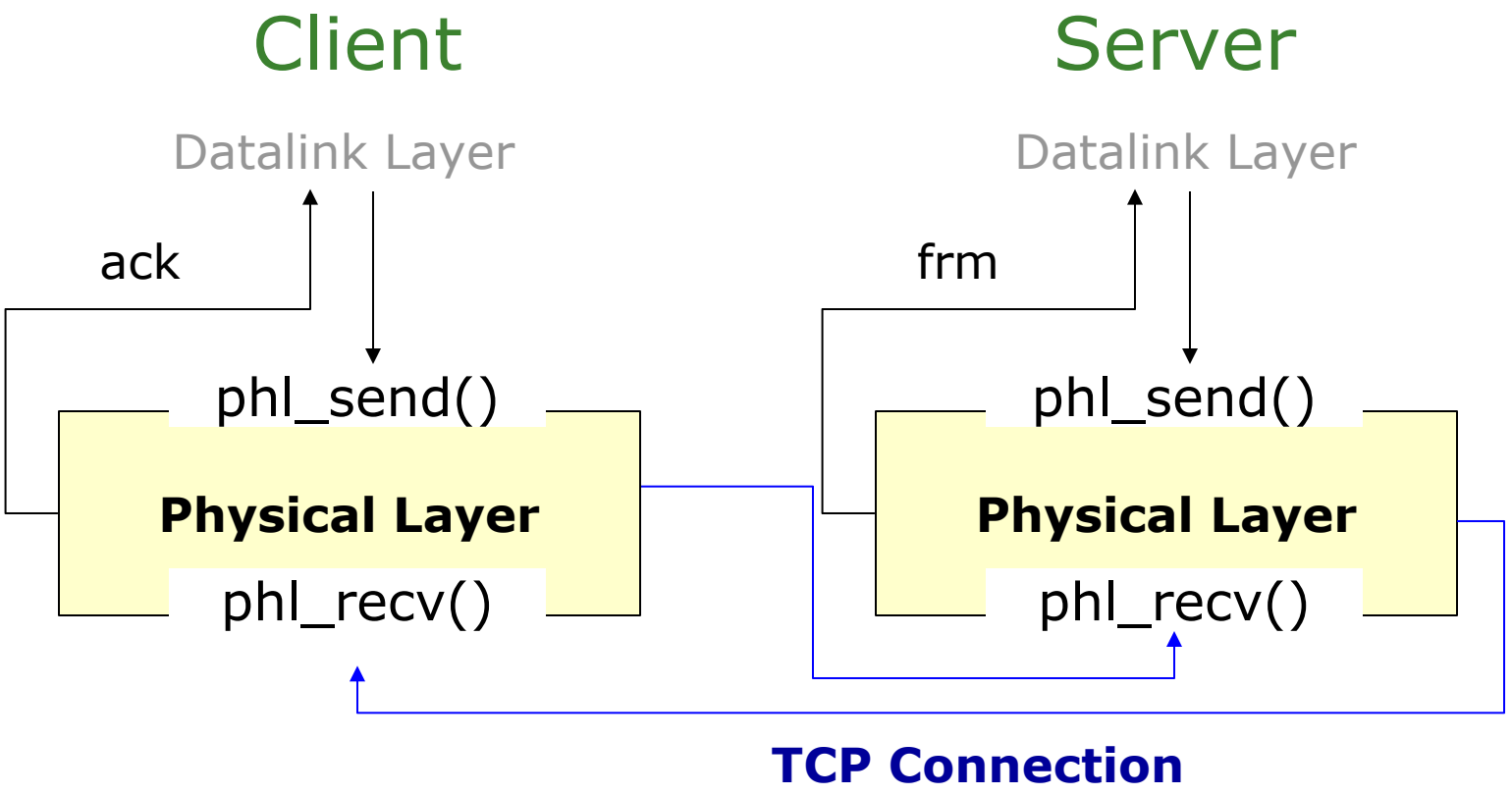
Packet payload: 200 bytes

Data Link Layer

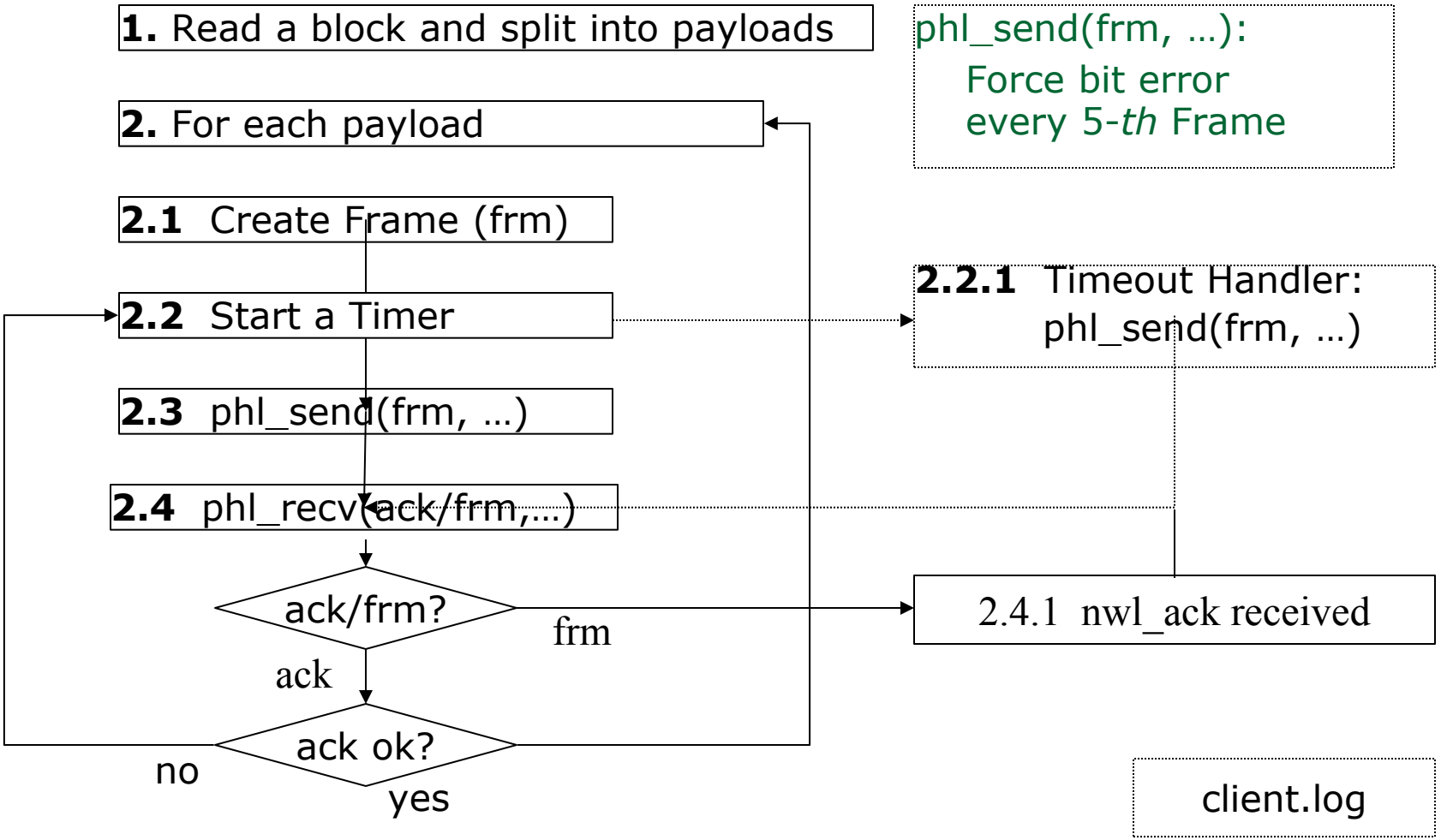


Client link layer does not need to ACK "Network Layer ACK" frame!

Physical Layer



Client: dll_send(pkt, …)

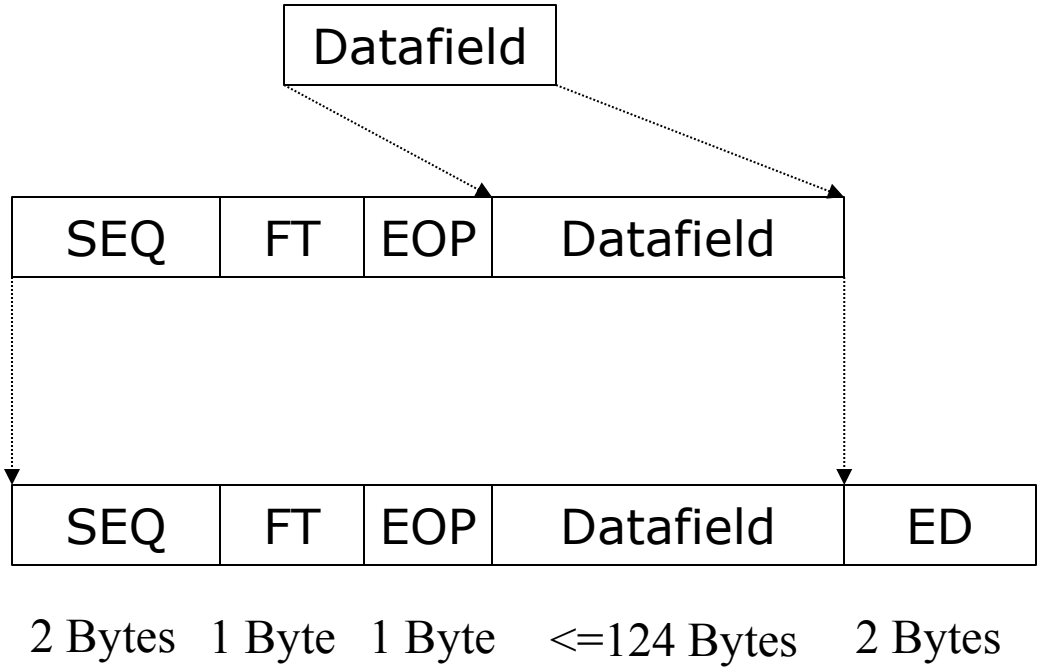


3. Waiting for Network Layer ack:
if (!nwl_ack) phl_recv(frm,…)

Create Frame

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

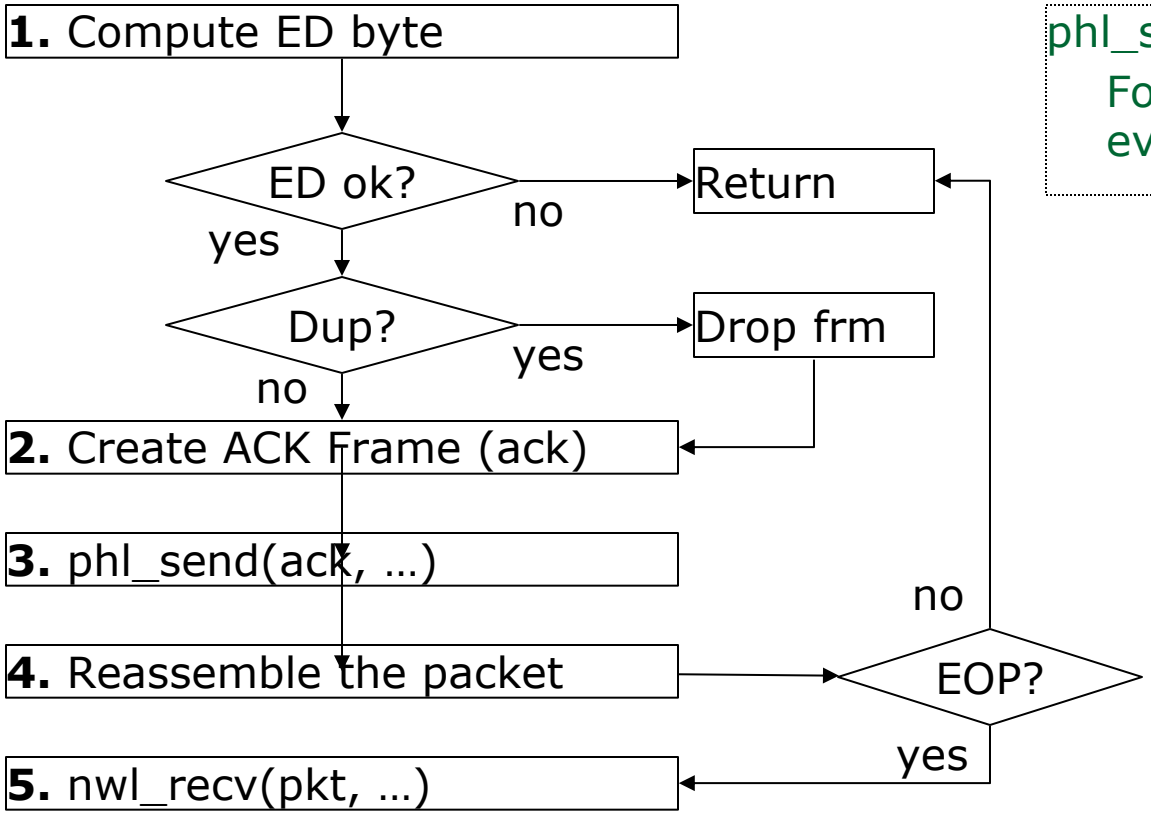
2. Error-Detection (ED) bytes (XOR on SEQ + FT + EOP + Data)



EOP: End of Packet
FT: Frame Type

ED: Error Detection
SEQ: Sequence Num

Server: dll_recv(frm, …)



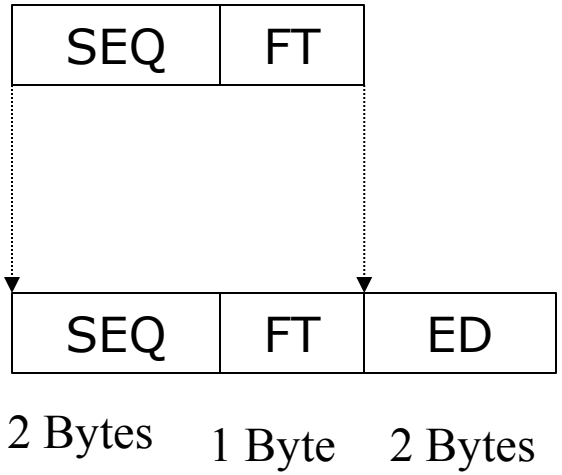
phl_send(ack, …):
Force bit error
every 7th Frame

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 nfds, fd_set *readfds, fd_set *writefds,fd_set
    *exceptfds, 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 <sys/time.h>

- Register a function to TIMEOUT signal

  int sigaction(int signum, const struct sigaction *act,
  struct sigaction *oldact);

- Create a timer and begin to run

  int setitimer(int which, const struct itimerval *new_value, struct itimerval *old_value);

Example: Signal and Timer

```
#include <signal.h>
#include <stdio.h>
#include <string.h>
#include <sys/time.h>

void timer_handler (int signum){
printf ("timer expired for %d",
    signum);
 exit(0);
}
int main ()
{
 struct sigaction sa;
 struct itimerval timer;
```

```
 /* Install timer_handler as the signal handler
    for SIGVTALRM. */
 memset (&sa, 0, sizeof (sa));
 sa.sa_handler = &timer_handler;
 sigaction (SIGVTALRM, &sa, NULL);

/* Configure the timer to expire after 250 ms*/
timer.it_value.tv_sec = 0;
timer.it_value.tv_usec = 250000;
timer.it_interval.tv_sec = 0;
timer.it_interval.tv_usec = 0;


setitimer (ITIMER_VIRTUAL, &timer,
    NULL);

 /* Do busy work. */
 while (1);
 return 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_IWUSR|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 windows 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?