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HELP Session 1
CS4514
CS4514

• We expect that you have had a programming course similar to 2005 before coming into this class.
• Programs will be done in C or C++
• We also expect that you will have had OS before coming into this class
  – Fork()
  – Exec()
  – Malloc() or new
Programs

- Programs need to work on garden.wpi.edu
- This system is Digital Unix
- If you program on another platform you need to test the software on garden before turning in the assignment.
- Make sure you have the correct includes in your program
Client \rightarrow Oracle \rightarrow Server

1. list
2. register
3. ConnectOneService

Oracle

DNS

UDP

TCP
UDP Connection (Client)
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socket()

sendto()
recvfrom()

close()
**Example** -- UDP Connection (Client)

```c
if ( (sd = socket( AF_INET, SOCK_DGRAM, 0 )) < 0 ) {
    perror( strerror(errno) );
    exit(-1);
}

bzero( (char*)&client, sizeof(client) );
client.sin-family = AF-INET;
client.sin-port = htons(0);
client.sin-addr.s-addr = htonl( INADDR-ANY );
```

**NOTE:**

- `struct sockaddr_in client, server;`
- `struct hostent *hp;`
- *For more, see P78-79 of textbook.*
Example -- UDP Connection (Client) Cont.

\[\text{bzero( (char*)&server, sizeof(server) );}\]
\[\text{server.sin-family = AF_INET;}\]
\[\text{server.sin-port = htons( SERVER-PORT ); // May not always need}\]
\[\text{If ( (hp = gethostbyname(SERVER-NAME)) == NULL) }\]
\[\text{\{ \}
\text{ perror( strerror(errno) );}\]
\[\text{exit(-1);}\]
\[\text{\}}\]
\[\text{bcopy( hp->addr, (char*)&server.sin-addr, hp->length);}\]

\[\ldots\]
\[\text{sendto( sd, sBuf, data-size, 0, (struct sockaddr*)&server, sizeof(server) );}\]
\[\ldots\]
\[\text{recvfrom( sd, rBuf, MAXLEN, 0, (struct sockaddr*)&server, sizeof(server) );}\]

\[\ldots\]
\[\text{close( sd );}\]
TCP Connection (Client)
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- socket()
- connect()
- read()/write()
  - send()/recv()
- close()
**Example**: TCP Connection (Client)

```c
if ( (sd = socket( AF_INET, SOCK_STREAM, 0 )) < 0 ) {
    perror( strerror(errno) );
    exit(-1);
}

bzero( (char*)&client, sizeof(client)  );
client.sin-family = AF-INET;
client.sin-port = htons(0);
client.sin-addr.s-addr = htonl( INADDR-ANY );
```

**NOTE:**
- `struct sockaddr_in client, server;`
- `struct hostent *hp;`
- *For more, see P74-75 of textbook.*
Example: TCP Connection (Client) Cont.

```c
bzero( (char*)&server, sizeof(server) );
server.sin-family = AF_INET;
server.sin-port = htons( SERVER-PORT );
if ( (hp = gethostbyname( SERVER-NAME )) == NULL) {
    perror( strerror(errno) );
    exit(-1);
}
bcopy( hp->addr, (char*)&server.sin-addr, hp->length);
if ( connect( sd, (struct sockaddr*)&server, sizeof(server) ) < 0 ) {
    perror( strerror(errno) );
    exit(-1);
}
while (1) {
    ... 
    read/write()
}
close( sd );
```
Example  TCP Connection (Server)
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socket()  
bind()  
listen()  
accept()  
close()

sd = socket( AF_INET, SOCK_STREAM, 0 );
bzero( (char*)&server, sizeof(server) );
server.sin-family = AF-INET;
server.sin-port = YOUR-SERVER-PORT;
server.sin-addr.s-addr = htonl(INADDR-ANY);
bind( sd, (struct sockaddr*) &server, sizeof(server) );

listen( sd, backlog );

while (1) {
    new-sd = accept( sd, (struct sockaddr *) &client, sizeof(client) );
    read() / write();
    ...
}

close( sd );

NOTE:
• struct sockaddr_in server;
• For more, see P73 of textbook.
Send/recv the om struct

• ssize_t recv(int sockfd, void *buff, size_t nbytes, int flags);
• ssize_t send(int sockfd, const void *buff, size_t nbytes, int flags);
• Usage:
  struct om sendMsg, recvMsg;
  … set the field’s values in sendMsg first
  send(s, (void *)&sendMsg, lom, 0);
  recv(s, (void *)&recvMsg, lom, 0);
om struct

(struct om serv, newServ;)

• To Find a service info. in oracle:
  serv.ver = verCur;
  serv.cmd = cmdGet;
  serv.uid = ?;
  serv.sbServ = ?;

• Register a service:
  newServ.cmd = cmdPut;
  newServ.uid = ?;
  newServ.sbServ = ?;
  newServ.sbDesc = ?;
  newServ.sa = ?

• Clear a service:
  oldServ.ver = verCur;
  oldServ.cmd = cmdClr;
  oldServ.uid = ?;
  oldServ.sbServ = ?;
Some system calls –
gethostbyname & getservbyname

- gethostbyname: mapping from host name to IP address
  
  struct hostent *gethostbyname(const char *hostname)

- Getservbyname: looks up a service given its name
  
  struct servent *getservbyname(const char *servname, const char *
  *protoname)

  hostname = “garden.wpi.edu”
  servname = “netoracle”
Turnin your files

• Use
  
  /cs/bin/turnin submit cs4514 proj1 [all files]

• Files should include
  
  - source code which can be compiled without errors
  
  - a documentation file (include your compile command)
  
  - a result script showing the running result
  
  - Any custom include files that you used, including oracle.h if you have not used

  #include “/cs/cs4514/pub/lib/oracle.h”
UNIX Programming

• Some functions that you may need:
  – Fork
  – Bind
  – Sendto/send
  – Recvfrom/recv
  – Gethostbyname
  – Getservbyname
  – Strlen
  – Strtok
UNIX Programming (cont.)

- Accept
- Listen
- Select

- There are a large number of system calls that you will use in your programs
- Use man pages for help on a particular command or function
UNIX debugging

- Compile program with –g flag
  - g++ -g -o program program.cc
  - gcc -g -o program program.c
- gdb program {core}
- Set args (command arguments)
- run
- where
- list
- step
- Break
- inspect
- help
- quit
UNIX debugging (cont.)

• Many more options use help to learn more
• This will be useful to find out where a program crashes or seg faults
• Can set breakpoints to stop at specific line or function
• Can set specific data values in program
HELP

• Bring printouts to office hours
• Email to TA list with questions
• You CAN email a specific TA, but do not expect immediate results, better to use alias.
• We do have a class mailing list that could be used as a last resort