

```
#include <unistd.h>
#include <sys/types.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <netdb.h>
#define PORT 58000
...
int fd, newfd;
struct hostent *hostptr;
struct sockaddr_in serveraddr, clientaddr;
int clientlen;
...
```

TCP Client

```
fd=socket(AF_INET,SOCK_STREAM,0);
```

```
hostptr=gethostbyname("tejo.tecnico.ulisboa.pt");
```

```
memset((void*)&serveraddr,(int)'\0',
        sizeof(serveraddr));
serveraddr.sin_family = AF_INET;
serveraddr.sin_addr.s_addr = ((struct in_addr *)
    (hostptr->h_addr_list[0]))->s_addr;
serveraddr.sin_port = htons((u_short)PORT);
```

```
connect(fd,(struct sockaddr*)&serveraddr,
        sizeof(serveraddr));
```

```
write(fd,...);
...
read(fd,...);
...
close(fd);
```

TCP Server

```
fd = socket(AF_INET,SOCK_STREAM,0);
```

```
memset((void*)&serveraddr,(int)'\0',
        sizeof(serveraddr));
serveraddr.sin_family = AF_INET;
serveraddr.sin_addr.s_addr = htonl(INADDR_ANY);
serveraddr.sin_port = htons((u_short)PORT);
```

```
bind(fd,(struct sockaddr*)&serveraddr,
        sizeof(serveraddr));
```

```
listen(fd,5);
```

```
clientlen = sizeof(clientaddr);
newfd = accept(fd,(struct sockaddr*)&clientaddr,
    &clientlen);
```

blocks until connection
from client

connection establishment
TCP three-way handshake

```
read(newfd,...);
...
write(newfd,...);
...

close(fd); close(newfd);
```

```
#include <unistd.h>
#include <sys/types.h>
#include <sys/socket.h>
#include <netinet/in.h>
#include <netdb.h>
#define PORT 58000
...
int fd;
struct hostent *hostptr;
struct sockaddr_in serveraddr, clientaddr;
int addrlen;
char msg[80], buffer[80];
...
```

UDP Client

```
fd=socket(AF_INET, SOCK_DGRAM, 0);
```

```
hostptr=gethostbyname("tejo.tecnico.ulisboa.pt");

memset((void*)&serveraddr, (int)' \0',
        sizeof(serveraddr));
serveraddr.sin_family = AF_INET;
serveraddr.sin_addr.s_addr = ((struct in_addr *)
    (hostptr->h_addr_list[0]))->s_addr;
serveraddr.sin_port = htons((u_short)PORT);

addrlen = sizeof(serveraddr);
```

```
sendto(fd, msg, strlen(msg)+1, 0,
        (struct sockaddr*)&serveraddr, addrlen);
...
addrlen = sizeof(serveraddr);
recvfrom(fd, buffer, sizeof(buffer), 0,
        (struct sockaddr*)&serveraddr, &addrlen);
...
close(fd);
```

UDP Server

```
fd = socket(AF_INET, SOCK_DGRAM, 0);
```

```
memset((void*)&serveraddr, (int)' \0',
        sizeof(serveraddr));
serveraddr.sin_family = AF_INET;
serveraddr.sin_addr.s_addr = htonl(INADDR_ANY);
serveraddr.sin_port = htons((u_short)PORT);
```

```
bind(fd, (struct sockaddr*)&serveraddr,
        sizeof(serveraddr));
```

```
addrlen = sizeof(clientaddr);
recvfrom(fd, buffer, sizeof(buffer), 0,
        (struct sockaddr*)&clientaddr,
        &addrlen);
```

blocks until datagram
received from a client

```
...
sendto(fd, msg, strlen(msg)+1, 0,
        (struct sockaddr*)&clientaddr, addrlen);
...
close(fd);
```