

CS 360

Lecture 2

# Vocabulary (incomplete list)

- Socket
- octet
- Port
- Stream
- Protocol
- State
- Client/Server
- Reliable/unreliable
- Connection-oriented

# Application Layer

- Define how two processes communicate
  - on different hosts
  - IP Address
  - Port number

# Application Architecture

- Client/Server
- Peer to Peer (P2P, distributed, decentralized)

# Socket

- Interface between application and Transport Layer

# Transport layer

- What, not how
  - encapsulation!
- Describe Transport Layer in terms of
  - Reliable data transfer
  - Throughput
  - Timing
  - Security

# Transport Protocols

- TCP
- UDP
- Datagram vs Bytestream

# Application Protocols

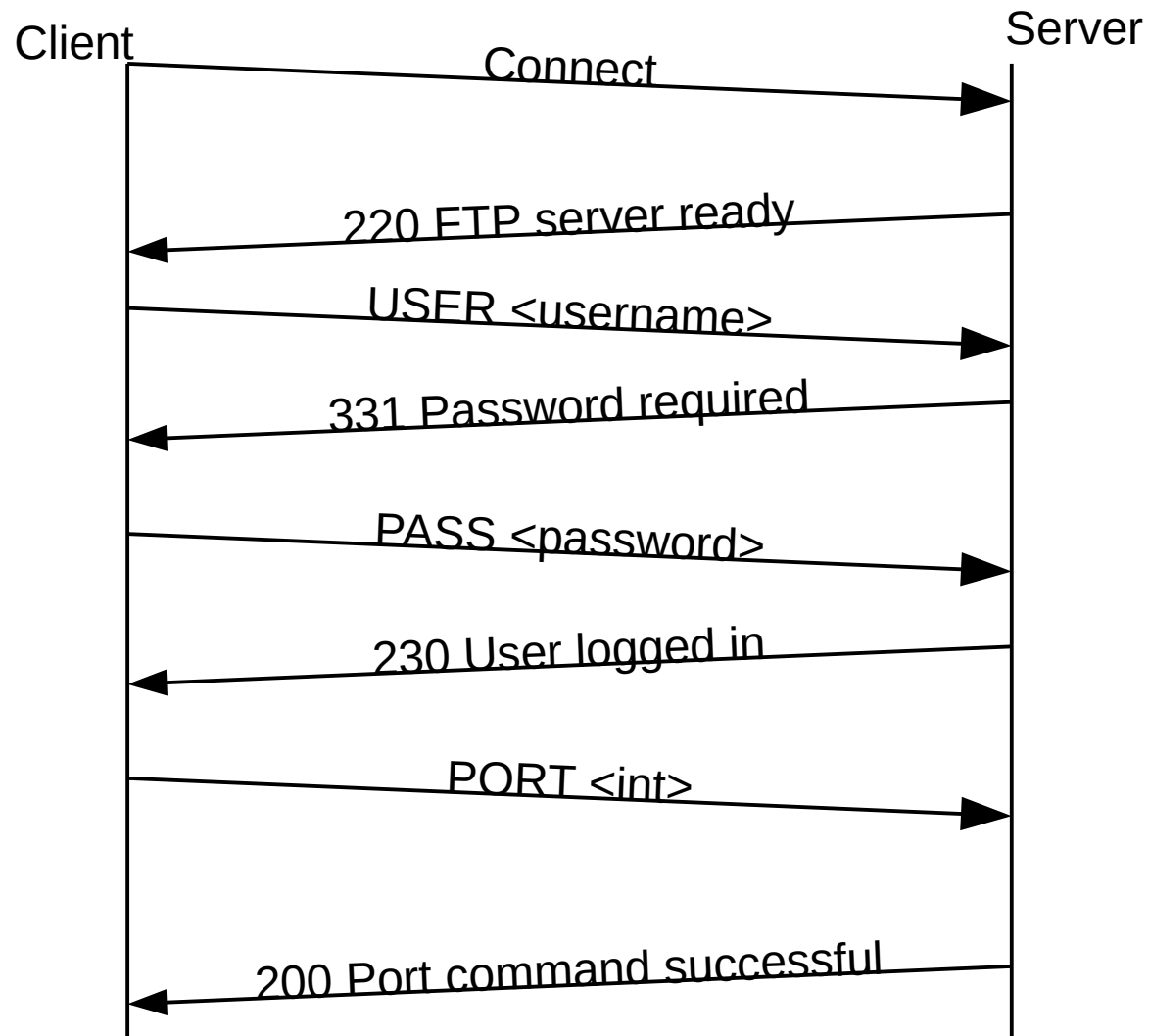
- HTTP - web protocol
- FTP - file transfer protocol
- DNS - directory name service
- SMTP - email
  - POP3 / IMAP - email access
- BitTorrent - peer to peer file sharing



# Representation

- State Diagram
  - comes later with TCP
- Sequence Diagram
- Grammar

# Sequence Diagram



### 5.3.2. FTP COMMAND ARGUMENTS

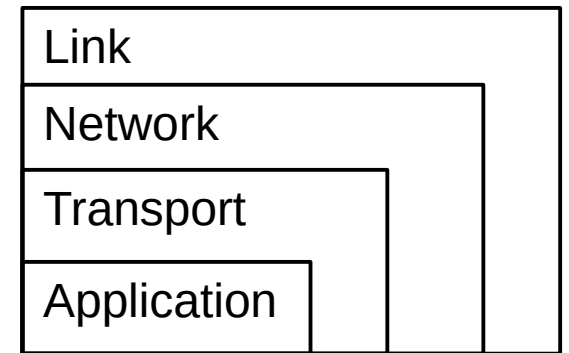
# Grammar

The syntax of the above argument fields (using BNF notation where applicable) is:

```
<username> ::= <string>
<password> ::= <string>
<account-information> ::= <string>
<string> ::= <char> | <char><string>
<char> ::= any of the 128 ASCII characters except <CR> and
<LF>
<marker> ::= <pr-string>
<pr-string> ::= <pr-char> | <pr-char><pr-string>
<pr-char> ::= printable characters, any
              ASCII code 33 through 126
<byte-size> ::= <number>
<host-port> ::= <host-number>,<port-number>
<host-number> ::= <number>,<number>,<number>,<number>
<port-number> ::= <number>,<number>
<number> ::= any decimal integer 1 through 255
<form-code> ::= N | T | C
<type-code> ::= A [<SP> <form-code>]
              | E [<SP> <form-code>]
              | I
              | L <SP> <byte-size>
<structure-code> ::= F | R | P
<mode-code> ::= S | B | C
<pathname> ::= <string>
<decimal-integer> ::= any decimal integer
```

# HTTP

- TCP / Byte Stream
- ASCII Text
  - MIME
- Request/Response
  - Pull
- Stateless
  - ?
- Persistent vs Non-Persistent Connection
- 1 vs 1.1 vs 2



# HTTP Request Message

- GET/POST/PUT/HEAD/DELETE

web-sniffer.cc

Firefox: Control-Shift-E to open the Network Monitor

[developer.mozilla.org/en-US/docs/Tools/Network\\_Monitor](https://developer.mozilla.org/en-US/docs/Tools/Network_Monitor)



# Persistent vs Non-Persistent

# Parallel Connections



# Pipelining

- Don't Use

# Cookies

- Set-cookie:
- cookie:

# Caching

- By the content provider
  - content distribution network (CDN)
  
- By the end user
  - web proxy
  - browser cache

# Conditional Get

- Caching on the local computer

# HTTPS

- HTTP encrypted via TLS
  - Transport Layer Security
    - sits between Transport & Application
    - sometimes called Presentation Layer
    - previously Secure Socket Layer (SSL)
  - TLS is a separate library used to encrypt various protocols
    - IMAP
    - FTPS

