CSE 461: Final Review

The diagram below shows the network layers for two different machines.

Place the terms below on the diagram above, discussing their place in the network layer model.

<table>
<thead>
<tr>
<th>Application</th>
<th>ARP</th>
<th>ARQ</th>
<th>BGP</th>
<th>Bridge</th>
<th>CAT5</th>
<th>CIDR</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSMA/CD</td>
<td>Data Link</td>
<td>DHCP</td>
<td>DNS</td>
<td>Encapsulation</td>
<td>HTML</td>
<td>HTTP</td>
</tr>
<tr>
<td>IP</td>
<td>LAN</td>
<td>MAC</td>
<td>Nagel'ing</td>
<td>NAT</td>
<td>Network</td>
<td>NIC</td>
</tr>
<tr>
<td>Physical</td>
<td>Port</td>
<td>Port Binding</td>
<td>Presentation</td>
<td>Router</td>
<td>Session</td>
<td>Sliding Window</td>
</tr>
<tr>
<td>Socket</td>
<td>SSH</td>
<td>Stun</td>
<td>TCP</td>
<td>Telnet</td>
<td>Transport</td>
<td>UDP</td>
</tr>
</tbody>
</table>

In terms of the 7 layers: Compare 802.3 and 802.11. Compare p2p flickr to Bayou.

In your projects, which layers did you deal with?
Correctness
- Redundancy
- Bit encoding
- Framing
- Error Detection/Correction
- Addresses (UIDs)
- Header + Data
- IP: semantics
- Addressing
  - DHCP
  - ARP
  - DNS
  - NAT, Stun
- Layering
- Routing
- UDP: semantics
- Port
- Socket abstraction
- TCP: semantics
- ARQ
- Reorder buffer
- Stream vs Packet orientation

How does RFID fit in?

Distributed State
- P2P
  - TOMCAST: ordering
    - Lamport clocks
  - Bayou
  - p2p-flickr
- Client-Server
  - Don't distribute state
    - e.g. Lobby
  - Push state to client
    - e.g. web
    - e.g. IP routing
  - Stateless server
    - HTTP
    - NFS
- Connections
  - TCP: 2 node P2p or duplex client-server?

Scalability
- Size => heterogenous
  - Hardware / Performance
    - Speed; Error Rate
  - Administration / Policy
    - Standards commitees
  - Distance / Latency
- Size => dynamic
  - Independent Failures
  - Always in transient state
    - Dampering
      - Lan bridge algorithm
      - IP routing
- Size => long lived
  - Version # in header
- End-to-End argument
- Protocol Layering
- Routing basics
  - LAN Broadcast
    - Collision Resolution
      - Carrier Sense
    - Collision Detect
    - Ethernet
    - 802.11 wireless
  - Forwarding
  - DV/LS Routing
- Layered Routing
  - LAN bridging
  - DHCP / Gateways
  - NAT
  - Subnets; Supernets (CIDR)
  - BGP
- Congestion Control (TCP)
  - RTT estimation
  - AIMD (+↑, *↓)

Performance
- Buffering
  - Avoid layer crossing
- Timeouts
  - RTT estimation
  - Lost data detection
- TCP
  - Nagel'ing
  - Flow Control
    - Sliding window
      - Bandwidth x delay
  - Congestion Control
    - AIMD
    - Slow start
    - Fast retransmit