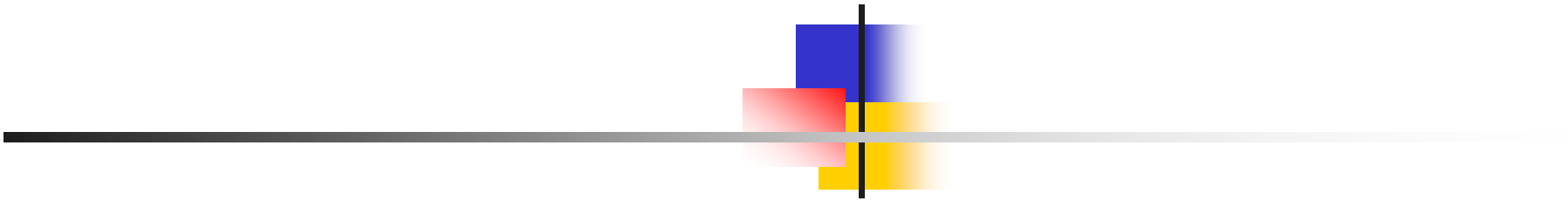
CSE398: Network Systems Design



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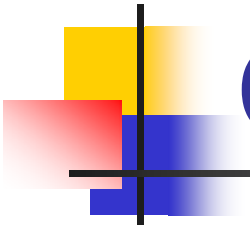
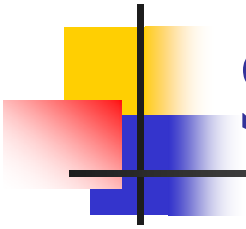


Outline

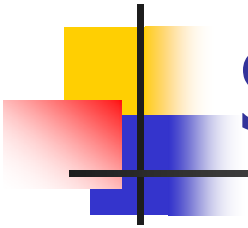
- Stateful network processor applications
- Course review and discussions



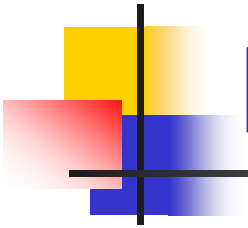
Stateless Fast-path Processing

- Stateless classification on the fast path matches fields in an incoming PDU using constant patterns and other fields in the PDU (e.g., header length).
- Stream editing makes constant changes and changes to dependent fields within a PDU (e.g., checksum).

Stateful Fast-path Processing

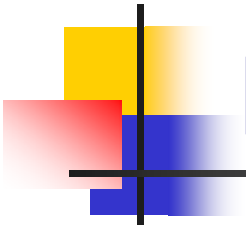


- Stateful applications require the classification and modification of a PDU to depend on both the PDU's contents and the contents of prior PDUs.
- State is the extracted / stored contents of prior PDUs.
- Application constraints require fast path (wire speed) update of state.
- Usually at Layer 4 and above.



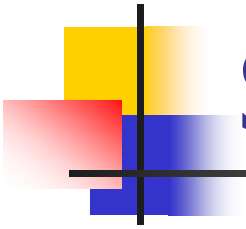
Example Application - NAPT

- Network Address Port Translation translates IP address + port source or destination, based on the state of an established connection.
- Small set of IP addresses and range of ports on public network map to large set of addresses and ports on private network.
- Mapping state established as new address/port pairs appear. Mappings time out if not used within some decay period.



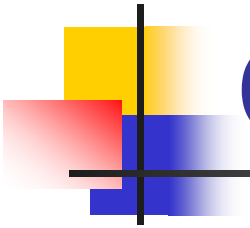
NAPT State Fields / Connection

- Private network address ranges (RFC 1918)
  - 10.0.0.0 - 10.255.255.255 (10/8 prefix)
  - 172.16.0.0 - 172.31.255.255 (172.16/12 prefix)
  - 192.168.0.0 - 192.168.255.255 (192.168/16 prefix)
- Connection establishment initializes state entry, timeout removes an entry.
  - IP source address and source port
  - IP destination address and dest. port
  - Connection status (SYN, FIN, RST, etc.)
  - Timestamp
- Each entry is like a C struct in an array.



Some Other Stateful Apps

- Reassembly entails some state
  - Sequence number, asiSequenceCheck
- Load balancer for server pool
  - One public web address (port 80) to multiple web server machines
- Stateful firewall
  - Restrict access based on history



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