Per Hop Behaviors Based on Dynamic Packet State

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Two Types of Networks

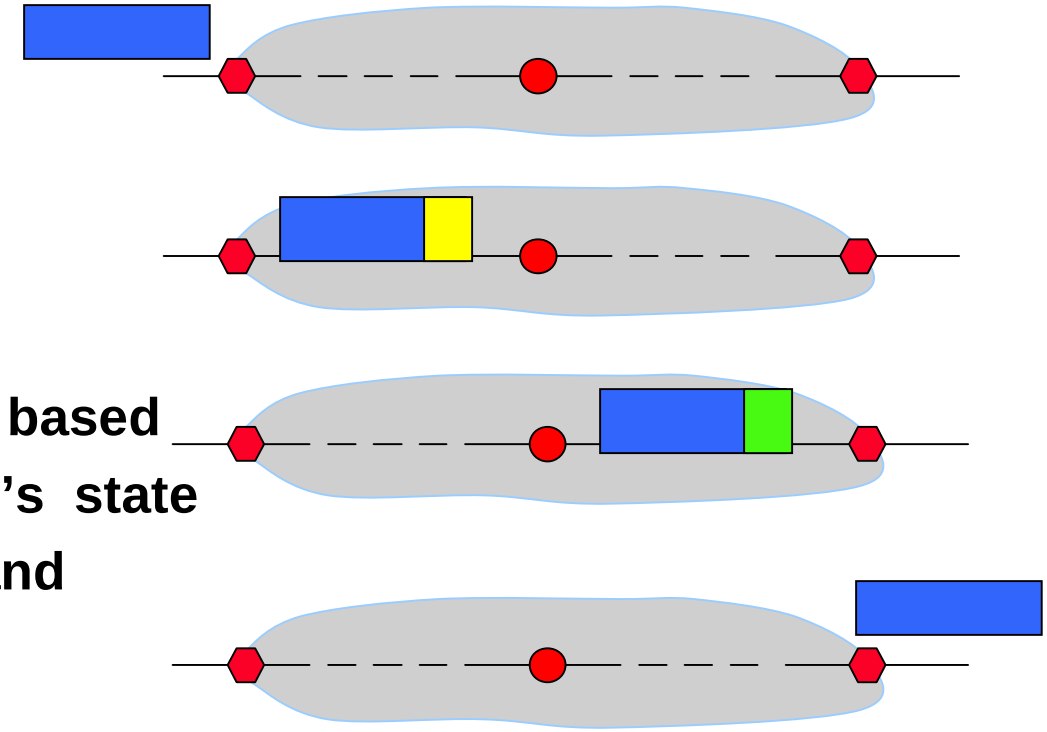
- **Stateful network: all routers implement per flow classification, queueing, buffer management**
  - + **provide powerful services**
    - **guaranteed service with mathematically proven bounds**
    - **fair allocation service with protected statistically multiplexing**
  - – **not scalable**
  - – **not robust**
    - – **dynamic maintenance of consistent per flow state in a distributed environment**
- **Stateless network: core routers do not perform per flow management**
  - + **scalable, robust**
  - – **services good enough?**

Synopsis of I-D

- **Services provided by existing stateless network may not be good enough in some environments**
  - **cannot provide hard guarantees and achieve high resource utilization in large-scale Diffserv networks**
- **A technique called Dynamic Packet State (DPS) used in a stateless network**
  - **provide services comparable to those provided by stateful networks**
- **PHB with DPS can implement interesting services**
  - **guaranteed service**
  - **distributed admission control service**
  - **proportional share service**
  - **penalty box service**

Dynamic Packet State (DPS)

- **Idea: have packets carry extra state in their header**
- **Ingress node**
  - **initialize state in packet's header**
- **Core node**
  - **process each packet based on its state and node's state**
  - **update both packet and node's state**



Encoding of State

- **How many bits are needed?**
  - **tradeoff between accuracy and number of bits**
  - **can work with as few as 13 bits**
- **Where to put them?**
  - **between layer 2 and layer 3, e.g. tag in MPLS**
  - **extension header in IPv6**
  - **IP option in IPv4**
  - **IP fragment offset field in IPv4**
    - **no visible effect outside DS domain**
    - **prototype FreeBSD implementation**

Summary

- **Dynamic Packet State (DPS) achieves the best of both worlds**
  - **high scalability and robustness of stateless network**
  - **high functionalities and QoS of stateful networks**
- **Can be used in the Diffserv framework**
  - **PHB's with DPS**
- **Practical issue**
  - **encode the state**
  - **a number of possibilities**
- **For more details:**
  - **http://www.cs.cmu.edu/~istoica/DPS**