Issues in Flexible Resource Management for Datagram Networks

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3rd Workshop on Very High Speed Networks

March 9, 1992

(Based in part on work by Van Jacobson,
Dave Clark, and other members
of the Internet End-to-End Research Group)

Goals:

- Support connections that require bandwidth guarantees (e.g., packet voice and video).

- Support ‘quality of service’ (e.g., interactive telnet vs. bulk data ftp).

- Support flexible link sharing.

Methods:

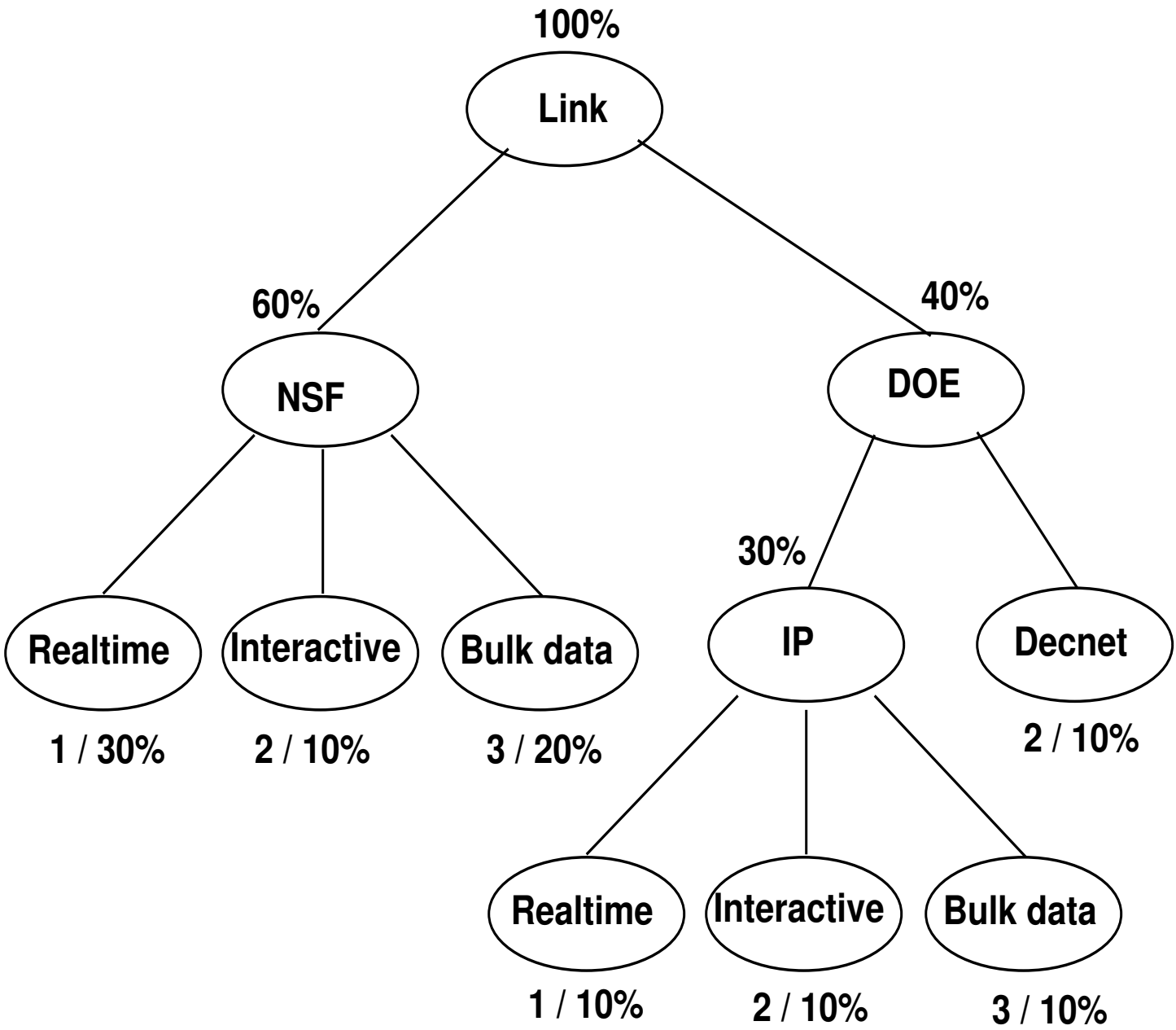
- Separate low-level mechanisms from high-level policy, to allow evolution.

- Aggregate connections in classes. Each class has a priority and a throughput allocation.

- Construct a hierarchy of classes.

- Avoid extensive per-conversation parameterization.

Example class hierarchy:



Priority/Allocation

Mechanisms:

- Classifier: Map packets to classes, using info in the packet header.

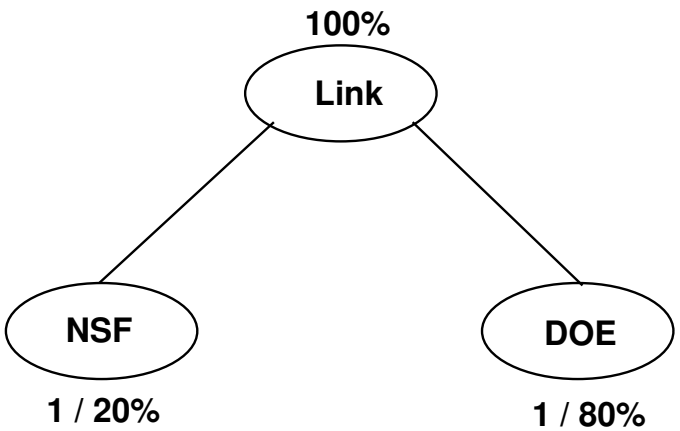
- Selector: Find a class that is either underlimit (under its throughput allocation) OR able to borrow. Highest priority first. Round-robin within same priority.

- Estimator: Compute a short-term estimate of the class's throughput. Average the inter-departure times between packets, using EWMA (exponential weighted moving average).

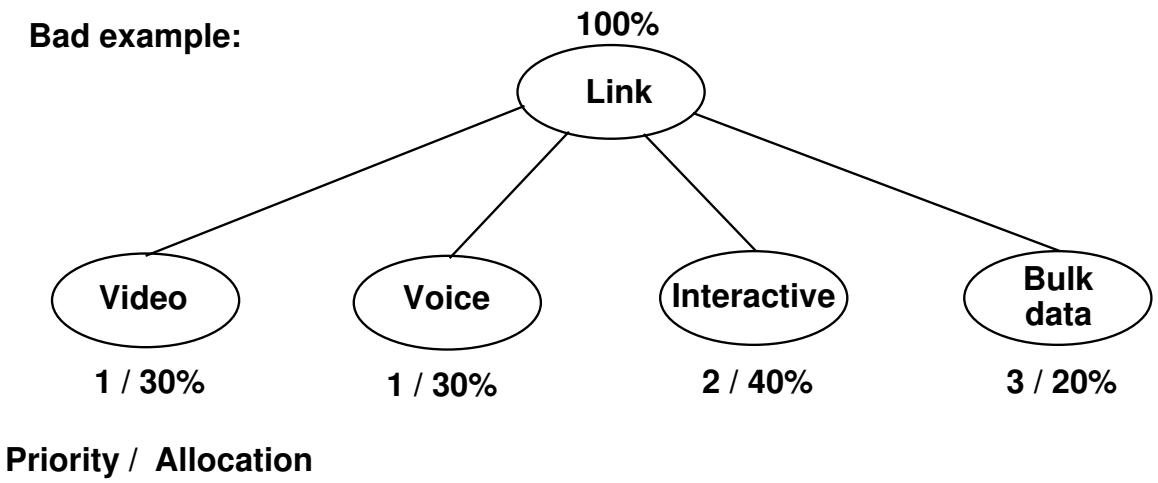
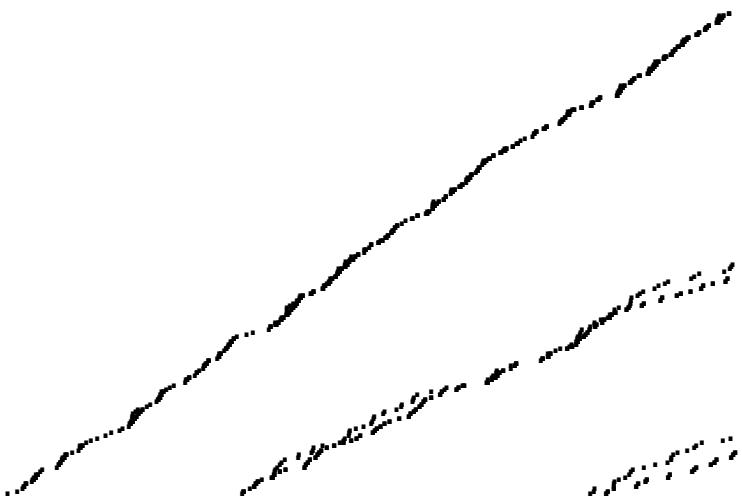
- Delayer: For a class that is overlimit AND unable to borrow, compute the next time this class is allowed to send a packet. A delayed class is limited to its allocated throughput.

Guidelines:

- Don’t allow borrowing from a parent class that is near its allocated bandwidth.



- The sum of the allocations to the leaf classes must not exceed the link bandwidth.



Simulations: