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Weighted Fairness

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May 15, 2001

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Objectives

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- Bandwidth for high priority is provisioned
  - A total of less than 50% of line rate may be allocated for high priority
  - Same allocated bandwidth must be available to the high priority traffic during a single failure (single/dual fiber cut)
- Bandwidth for low priority is dynamically re-allocated based on node congestions
  - Each node gets a proportion of available ring bandwidth
  - Active nodes capture all bandwidth available
  - Available bandwidth to low priority during a failure may be substantially degraded – best effort
- Fairness algorithm must allow for maximum ring throughput

Fairness algorithm

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- All nodes are equal
  - Every node sources equal amount of low priority traffic
  - Every node responses same to the same congestion message
- Local fairness
  - All neighboring nodes contending for the same available bandwidth participate in fairness calculation (fairness domain)
  - Multiple dynamic fairness domains may be present
- Scalable
  - Distributed fairness algorithm
  - Node based fairness (does not keep track of micro-flows)
- Provides maximum possible throughput
- Does not adversely affect the delay/jitter bound performance of high priority traffic

Why weighted fairness

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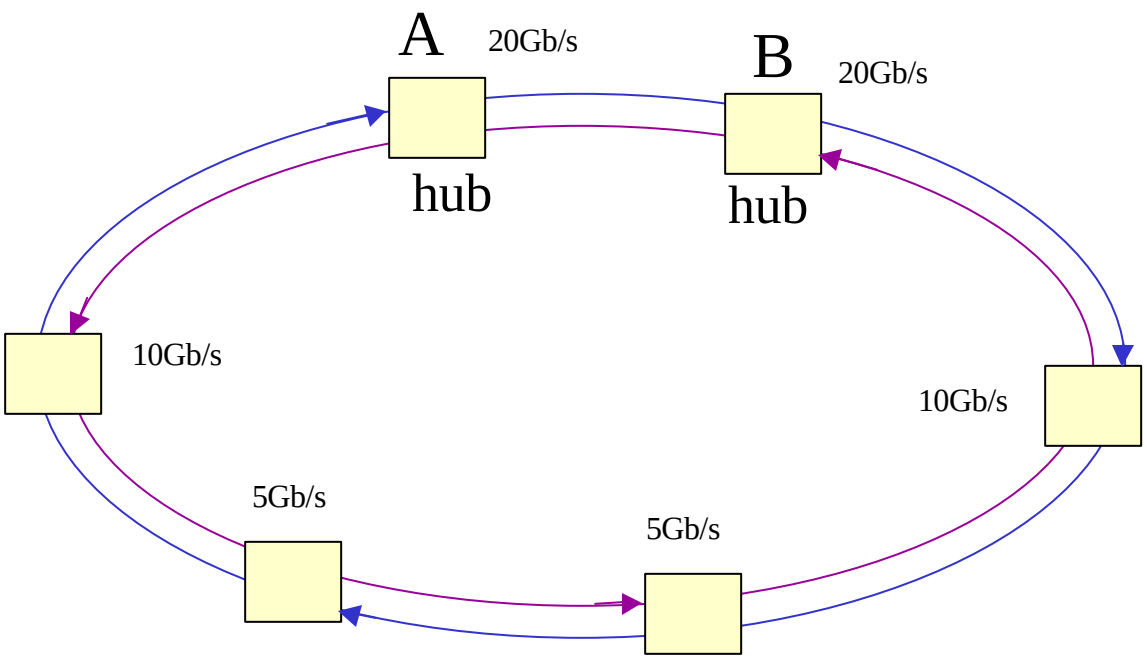

Congestion management and fairness parameters

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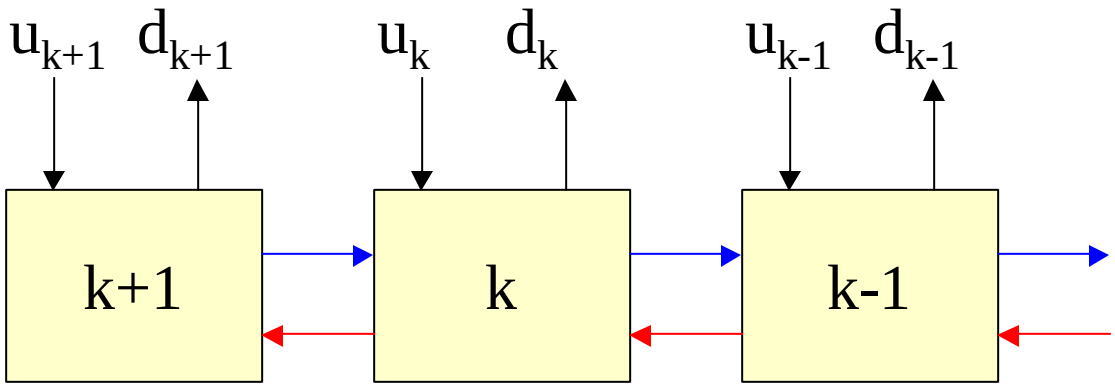

u_k : actual usage (sourced traffic rate) of node k
a_k : allowed usage (sourced traffic rate) of node k
d_k : drop traffic rate at node k
f_k : actual forward rate from node k+1 to node k-1
u_{max_k} : maximum provisioned usage rate factor for node k
u_{max} : maximum provisioned usage rate factor of downstream node
u : usage value received from downstream node

Node model

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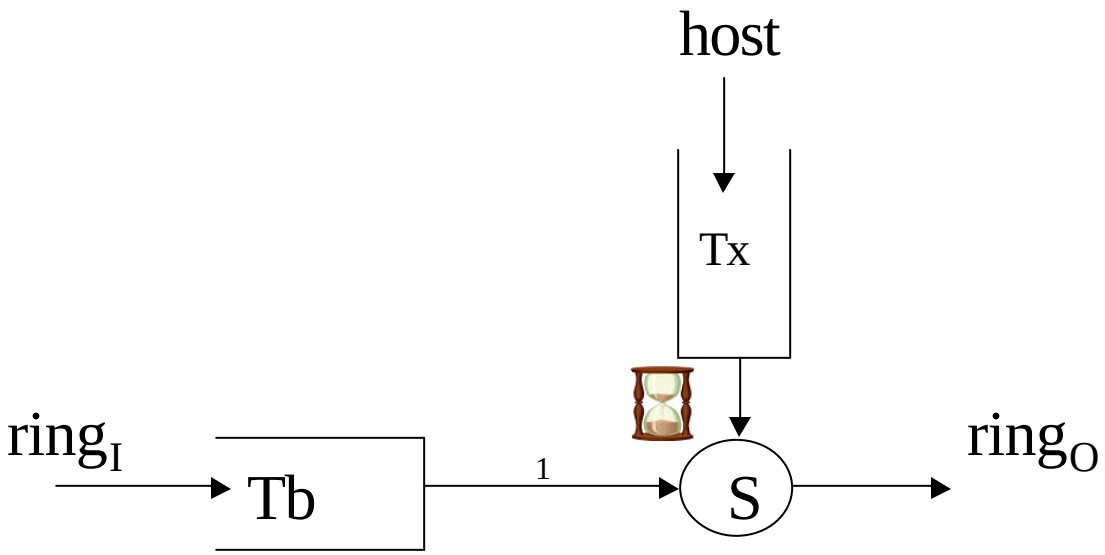
- Transit traffic (that is subject to weighted fairness) is stored in a FIFO queue Tb
- Transmit traffic (that is subject to weighted fairness) is stored in a FIFO queue Tx



Weighted fairness (OC-12, equal weights)

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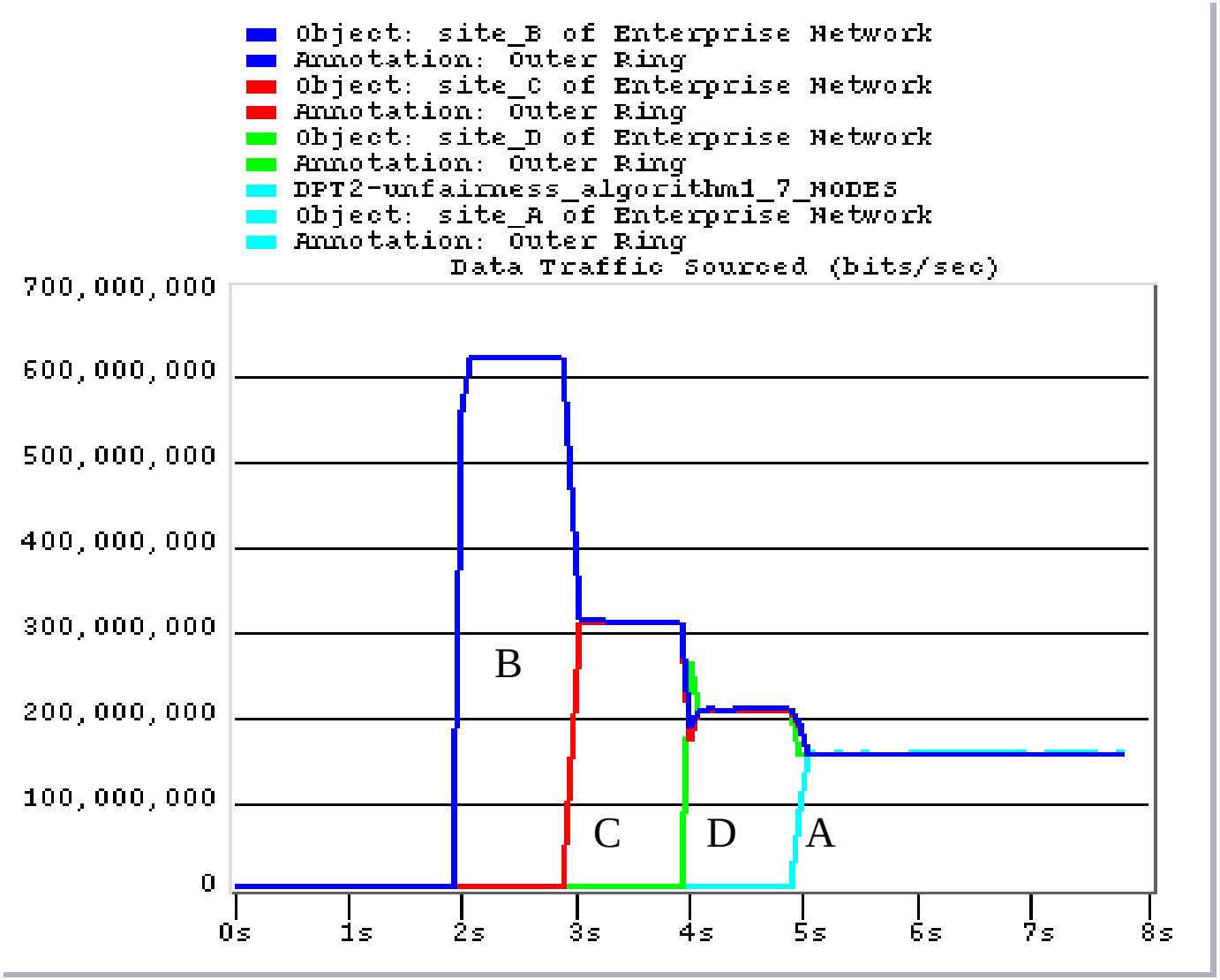

Weighted fairness (weights 4, 2, 1, 1)

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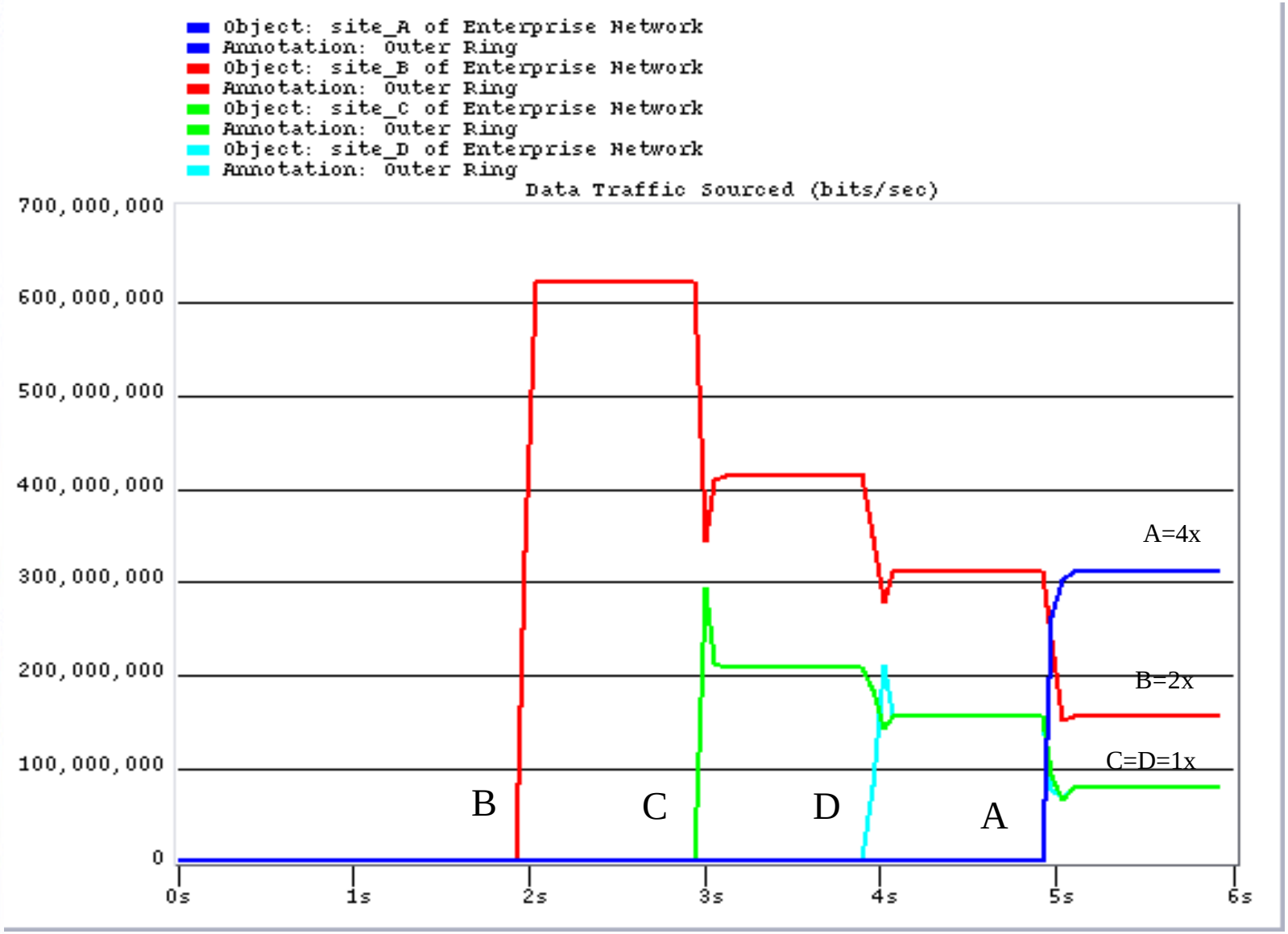

Summary

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- The proposed algorithm provides:
  - Fairness
  - Weighted fairness
  - Local fairness
  - Fast convergence
  - High throughput