Modeling and Performance Evaluation of DRED (Dynamic Random Early Detection) using Fluid-Flow Approximation

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1. State Goals and Define the System

- ✓ Goals
  - ✓ Confirm validity of our approximate analysis
  - ✓ Investigate DRED's steady-state/transient-state performance
- ✓ System Definition
  - ✓ IP network including...
    - ✓ DRED routers and links
    - ✓ source and destination hosts

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2. List Services and Outcomes

- ✓ Services Provided
  - ✓ Congestion control for TCP flows
- ✓ Outcomes
  - ✓ High link bandwidth utilization?
  - ✓ Low packet loss probability?
  - ✓ Low packet transfer delay/jitter?

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3. Select Metrics

- ✓ Speed (case of successful service case)
  - ✓ Individual
    - ✓ TCP throughput, round-trip time, packet loss probability
  - ✓ Global
    - ✓ Queue occupancy, link utilization, packet loss probability
- ✓ Reliability (case of error)
  - ✓ None
- ✓ Availability (case of unavailability)
  - ✓ None

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4. List Parameters

- ✓ System parameters
  - ✓ Network related
    - ✓ Topology
    - ✓ Link bandwidth, latency, loss ratio
  - ✓ DRED router related
    - ✓ Control parameters (Δt, , , T, L)
    - ✓ Queue size
- ✓ Workload parameters
  - ✓ # of TCP flows, TCP traffic pattern
  - ✓ Background traffic pattern

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5. Select Factors to Study

- ✓ System parameters
  - ✓ Network related
    - ✓ Topology
    - ✓ Link bandwidth, latency, loss ratio
  - ✓ DRED router related
    - ✓ Control parameters (Δt, , , T, L)
    - ✓ Queue size
- ✓ Workload parameters
  - ✓ # of TCP flows, TCP traffic pattern
  - ✓ Background traffic pattern

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6. Select Evaluation Technique

- ✓ Use analytical modeling?
  - ✓ Yes
- ✓ Use simulation?
  - ✓ Yes
- ✓ Use measurement of real system?
  - ✓ No

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7. Select Workload

- ✓ TCP flows
  - ✓ Persistent traffic
    - ✓ # of TCP flows: 1 -- 1000
- ✓ Background traffic
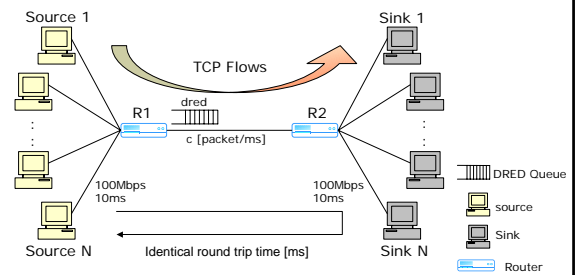 - ✓ 0 -- 70% of the bottleneck link bandwidth

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8. Design Experiments

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9. Analyze and Interpret Data

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10. Present Results

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Network Topology

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