

Less-than Best-Effort Services

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Overview

- The philosophy behind LBE
- LBE for which applications?
- Implementation and configuration examples
- Deployment scenarios
- Work programme

The phylosophy behind LBE

- *A very small percentage of network capacity is allocated to LBE so that under congestion best-effort traffic and any higher-priority traffic class is protected from LBE traffic, in other words, the large amount of remaining network capacity can be allocated to non-LBE traffic*
- **Result 1:** LBE is more penalized than best-effort under congestion
- **Result 2:** performance of best-effort and higher classes should be better under congestion in comparison with the performance experienced with a *flat* service model
- **QBone Scavenger Service:** based on the LBE phylosophy

LBE for which applications?

- LBE is suitable for applications tolerant of large
 - Packet loss
 - High delay
 - Jitter
- Not suitable for high-performance TCP-based applications (even if QBSS was successfully tested at SC2001 with HEP high-performance TCP applications)
- Could be very helpful to protect production traffic from test bulk traffic (DataGRID project)
- For applications based on non-TCP compliant stack implementations (debatable application case)
- The community of potential users has to be clear

Implementation

- QBSS codepoint: 001000
- WRR and WFQ schedulers can be used to control the amount of link capacity assigned to LBE traffic
- Independent queue dedicated to LBE if possible
- deployment of WRED for differentiation between best-effort and LBE not sufficient, for example for its impact on delay and IPDV of best-effort packets
- No policing and scheduling issues
- Marking: performed by the end-system

Examples of LBE configuration (from QBSS)

- CISCO (WRR, DRR, WFQ):

```
class-map match-all qbss
  match ip dscp 8
!
policy-map qos-policy
  class qbss
    random-detect
    queue-limit
    bandwidth percent 1
  class class-default
    random-detect
```

Examples of LBE configuration (from QBSS) - cont

- JUNIPER (WRR):

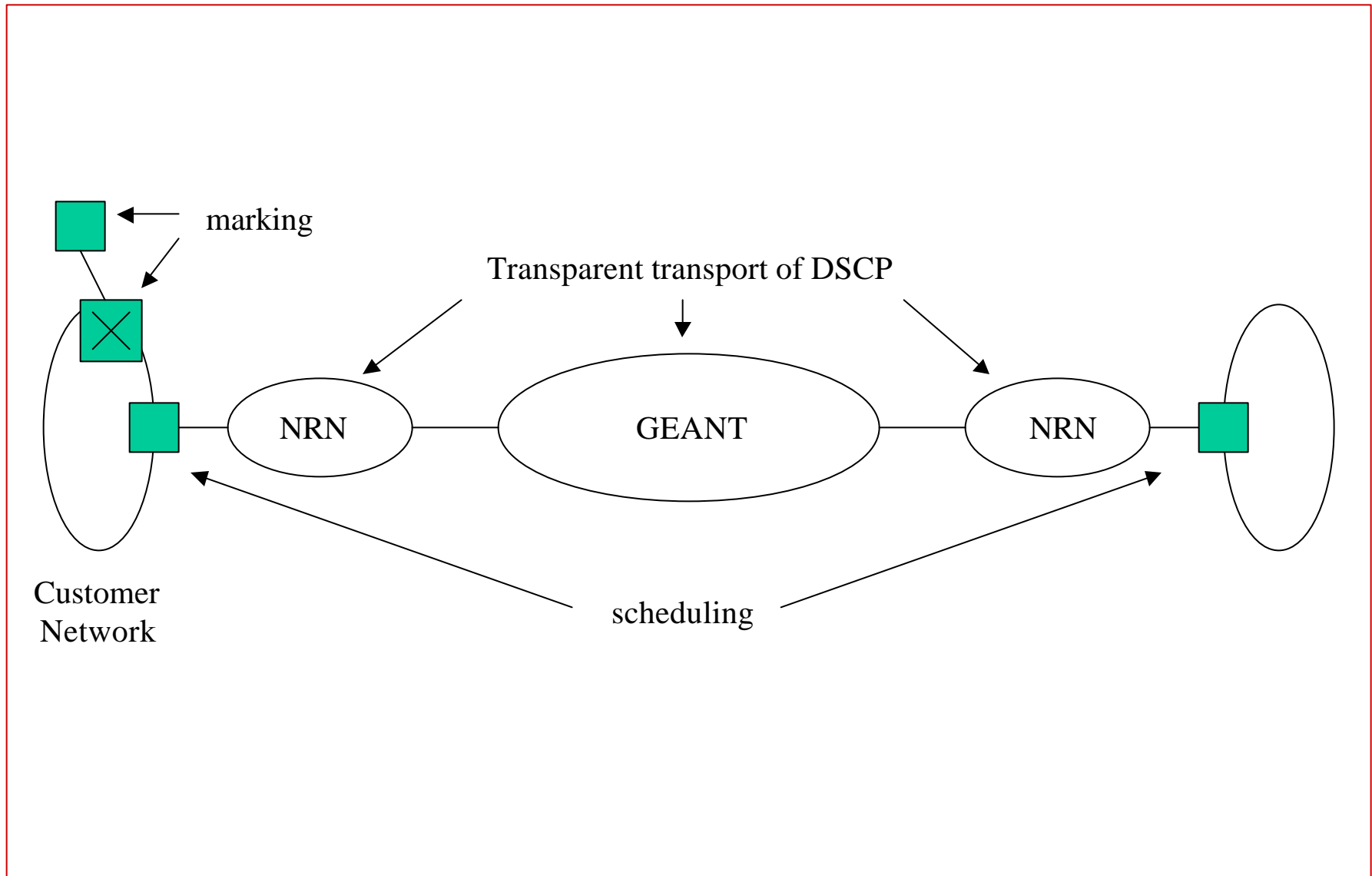
```
class-of-service {
  input {
    precedence-map qbss {
      bits 000 queue 1;
      bits 001 queue 0;
      bits 010 queue 1;
      bits 011 queue 1;
      bits 100 queue 1;
      bits 101 queue 1;
      bits 110 queue 3;
      bits 111 queue 3;
    }
  }

  fpc 1 {
    precedence-map qbss;
  }

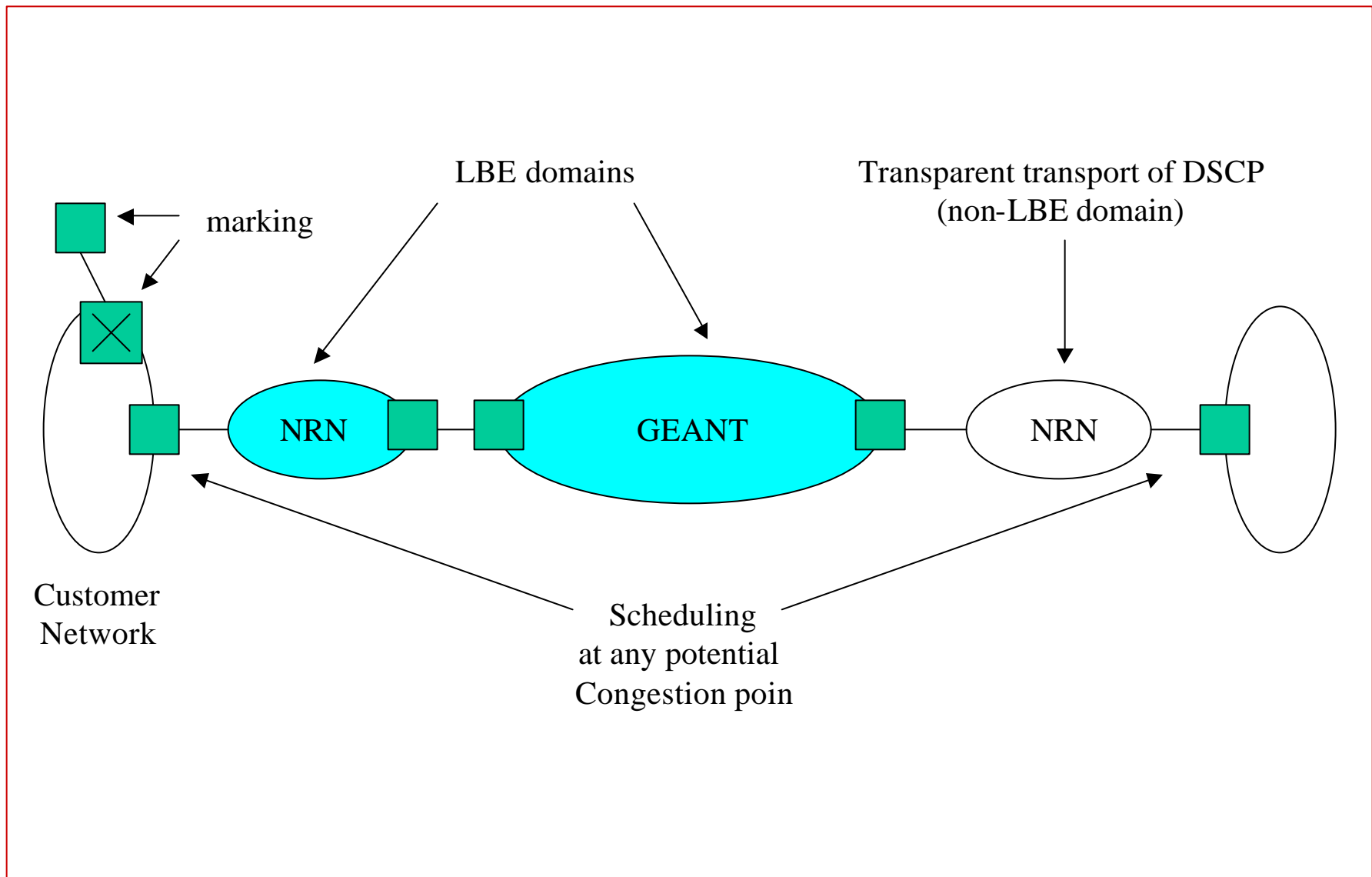
  interfaces {
    ge-1/0/0 {
      inet-precedence-map;
    }
  }
}

output {
  interfaces {
    so-1/0/0 {
      weighted-round-robin {
        output-queue 0 weight 1;
        output-queue 1 weight 94;
        output-queue 2 weight 0;
        output-queue 3 weight 5;
      }
    }
  }
}
```

Deployment scenarios (1): customer-based



Deployment scenarios (2): customer and NRN/GEANT-based



Work programme

- Identification of interested NRNs and end-users
- Phase 0: service specification
- Phase 1: baseline testing of implementation, study of LBE implementation feasibility (in GEANT and NRNs)
- Phase 2: performance analysis in user-based scenario (test cases to be identified, DataGRID testbed sites?) *supported by the production network*
- Phase 3: implementation of user and GEANT/NRN-based scenario, on *production network* if possible, preliminary lab tests where needed
- Experiments with USA partners (QBSS)