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A Practical Evaluation of Load Shedding in Data Stream Management Systems for Network Monitoring

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- Outline
  1. Overview
  2. Motivation
  3. Experiment setup
  4. Tasks and results for TelegraphCQ
  5. Conclusion and future work

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Overview

- TelegraphCQ as a network monitoring tool
- Investigate load shedding in TelegraphCQ
  - "Black box"-testing
  - Two tasks
    - Design
    - Results

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Motivation: Passive network monitoring with DSMSs

- Capture data packets from the network
  - No insertion of own packets, just listen!
  - Obtain information from the captured data
- Send packets as *tuples* to the DSMS
  - A data packet can be viewed as a *tuple*
  - The packet's header fields can be viewed as *attributes*

- Real-time
  - Intrusion detection
  - Traffic engineering

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Motivation: Passive network monitoring and load shedding

- Reduces number of packets to be processed
- Network characteristics
  1. A considerable amount of traffic data
     - Gbit/s backbones used by ISPs
  2. Peak periods
     - Low activity at night
  3. Non-interesting data
- Several techniques
  - Simplest: Packet dropping

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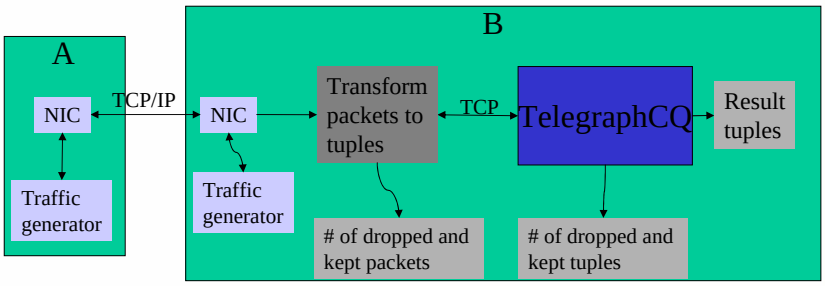
Experiment setup

- How does the tuple dropping start?
  - Stress the DSMS
- Generate TCP/IP traffic between two machines
  - Linux SuSE 9.2 (vanilla installation)
  - Two 3 GHz Intel Pentium 4 processors
  - 1 GB of memory



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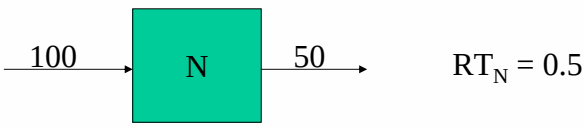
Experiment setup: definitions

1. *Network load* is specified by the number of observed bits per second on a link.
2. The *relative throughput* of node N, denoted RT_N, is the relation between the network load node N receives and the network load it manages to handle.



$RT_N = 0.5$

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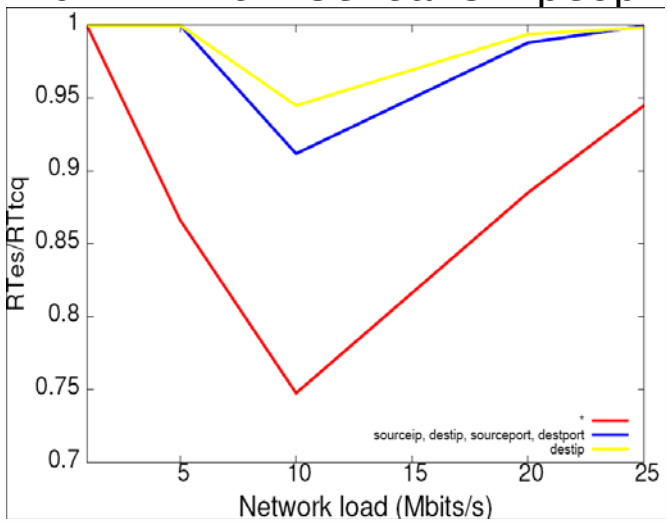
TCQ load shedder correctness:

`SELECT X FROM streams.iptcp`



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Average Load of Packets and Network Load

```
SELECT
  COUNT(*)/60, AVG(s.totalLength)*8
FROM
  streams.iptcp s [RANGE BY '1 minute'
  SLIDE BY '1 second']
```

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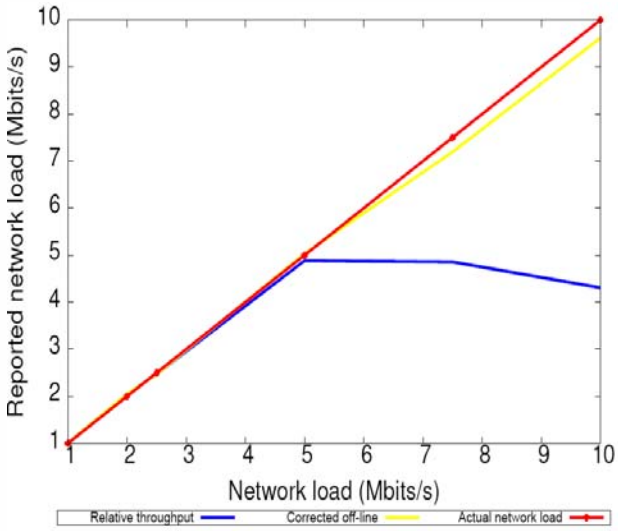
Average # of Packets and Network Load



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Conclusion and future work

- TelegraphCQ uses a simple and declarative query language
- TelegraphCQ only manages low network loads
  - Starts dropping tuples at 5 Mbits/s
- TelegraphCQ seems to report higher relative throughput than what is actually reached

- Currently, we run tasks on the Borealis stream processing engine
- We will extend the packet-to-tuple translator with more sophisticated load shedding techniques

- Questions?