Benchmarking of authoritative DNS implementations

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CZ
nic
cz domain registry

Purpose of the work

- Bachelor thesis (B.U.T. + CZ.NIC)
  - Feedback
- Design methodology for DNS testing
- Benchmark the most popular DNS implementations

Methodology – theory (1.)

- Existing methodologies
    - Haven't found any suitable
- My methodology
    - Specialized on authoritative DNS servers
    - „Real life" tests
    - Complex
    - Comparative
    - Behavioral

Methodology – theory (2.)

- Variants
    - Normal DNS
    - DNSSEC
    - DNSSEC NSEC3
    - TCP
- Variables
    - Queries per second
    - Zone size

- Counters
    - CPU
    - Memory
    - Disk
    - Latency
    - Processes / Threads
   - Lost queries

Methodology - reality (1.)

- Missing tools
- Some technological problems
- Don't have to much time

Methodology - reality (2.)

- Variants
  - Normal DNS
  - DNSSEC
  - DNSSEC NSEC3
  - TCP
- Variables
  - Queries per second
  - Zone size

- Counters
  - CPU
  - Memory
  - Disk
  - Latency
  - Processes / Threads
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Tools

- Queryperf (BIND Contrib)
  - Good, but not enough
  - Added new feature
  - Fixed bug
- Munin plugins
- RRDtool
- Bash

Benchmarked implementations (1.)

DNS Survey October 2009
http://dns.measurement-factory.com/surveys/200910.html
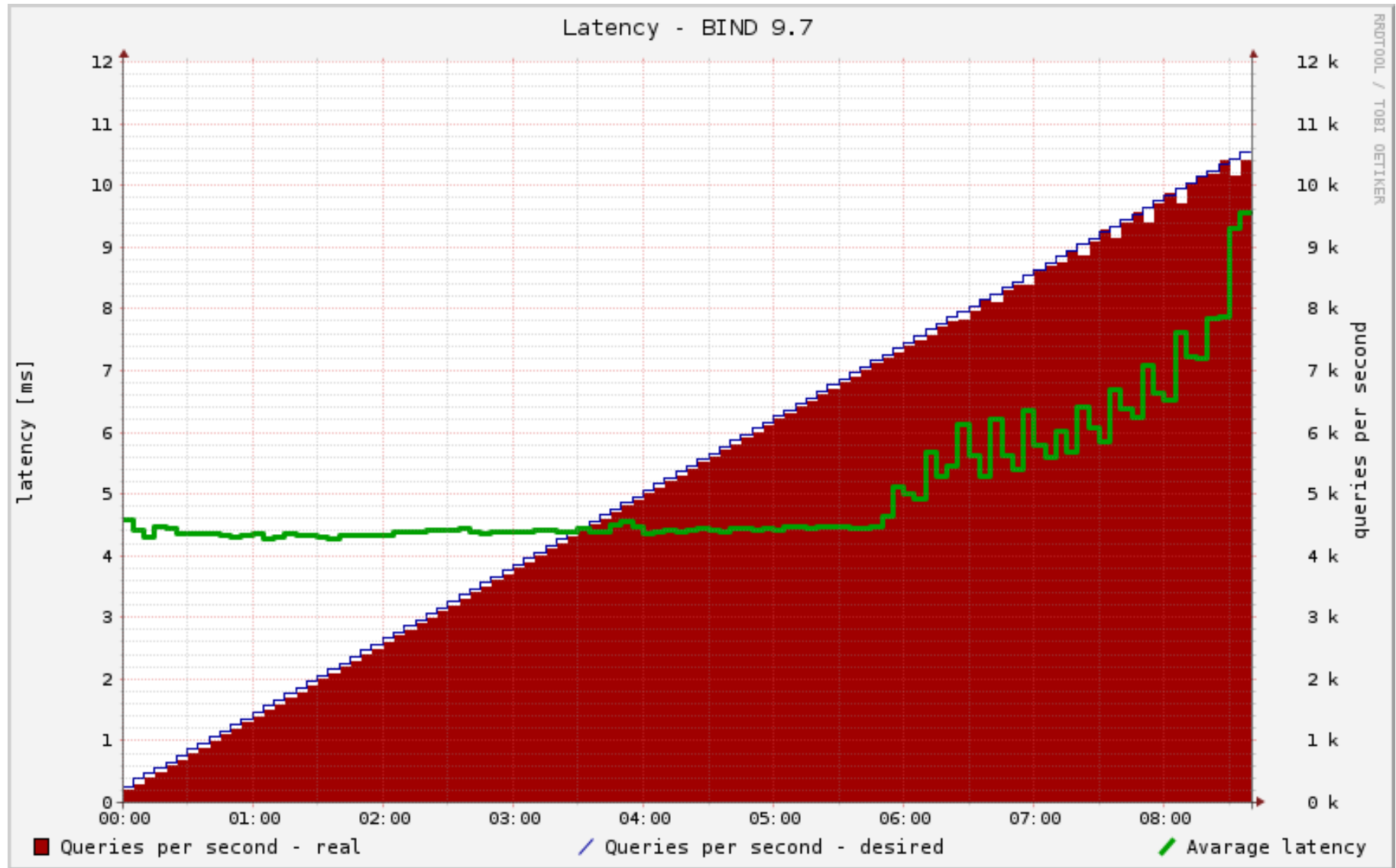
DNS implementations share
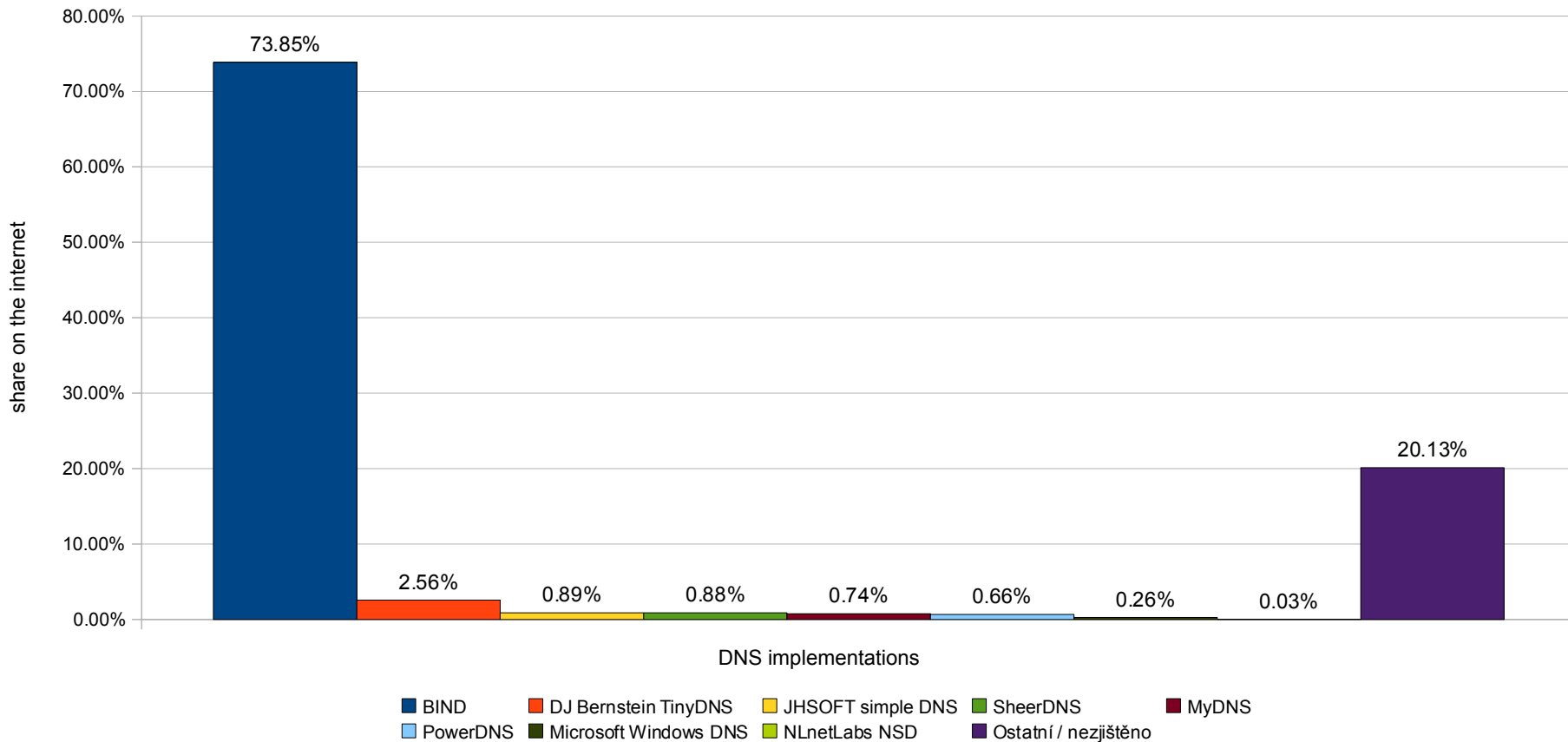
Benchmarked implementations (2.)

- BIND (9.7)
  - DNSSEC, NSEC3
- NSD (3.2.5)
  - DNSSEC, NSEC3
- PowerDNS (2.9.22)
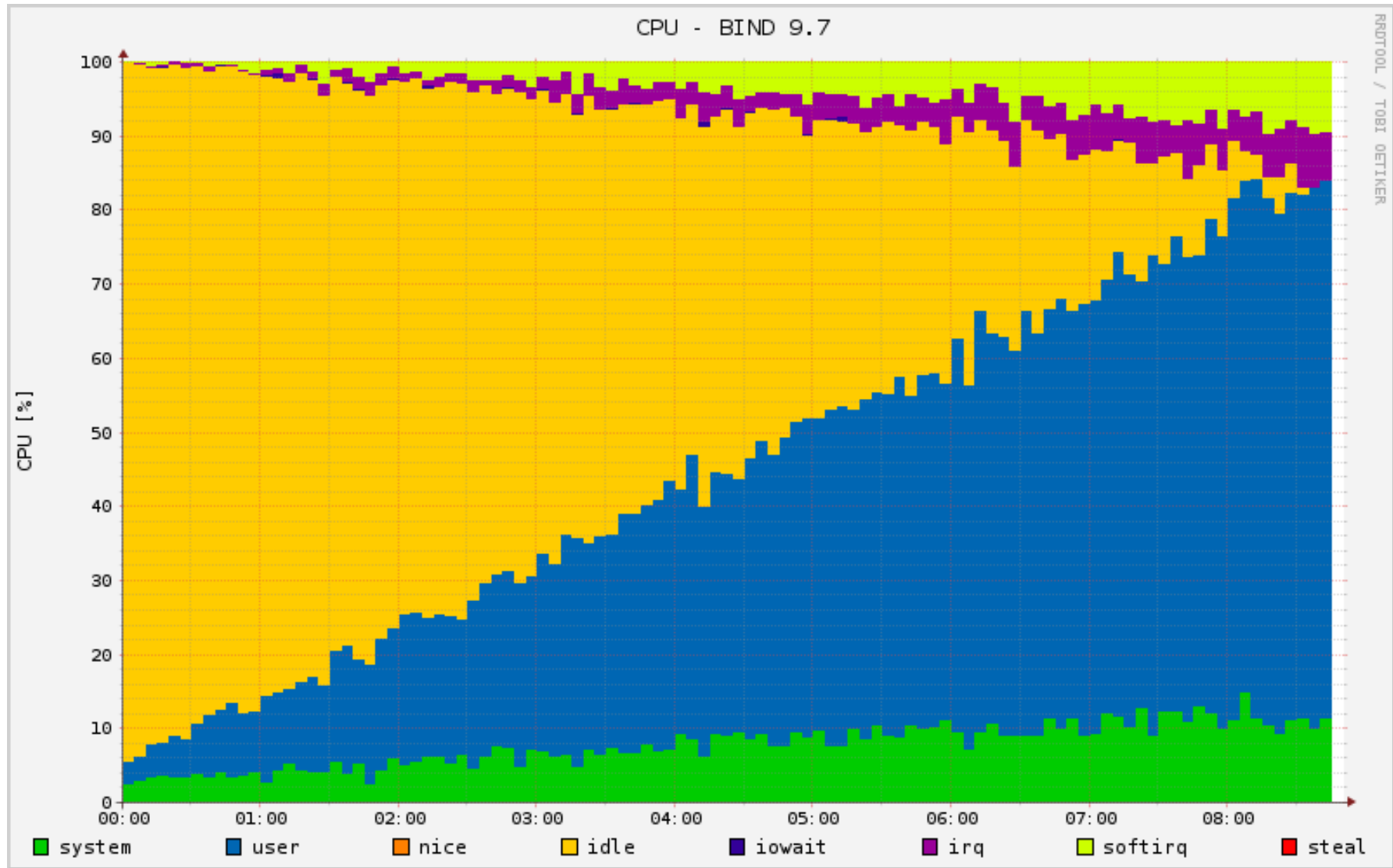 - DNSSEC (yes and no), BIND back-end
- MaraDNS (1.4.03)
  - Problems

Benchmark configuration

- Implementations
  - Disabled logging
  - One zone-file

- Zone-file
  - 550000 delegated domains (includes 100000 IDN names)
  - At total 1649349 resource records

- Benchmark
  - Measurement interval 5 second
  - Starting qps = 100
  - Each 5 second

    qps += 100
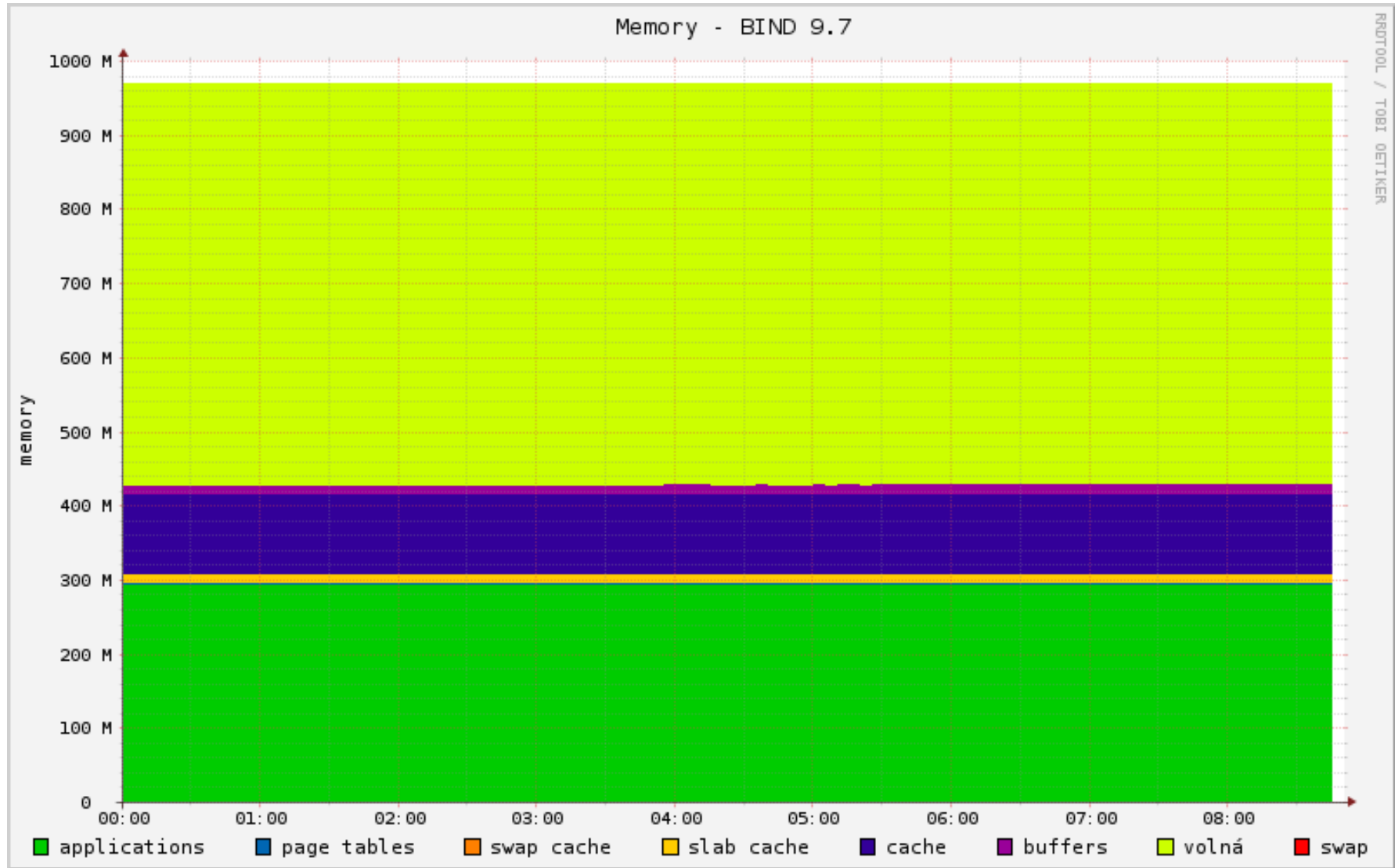 - End when qps reachs implementation maximum (measured by Queryperf)
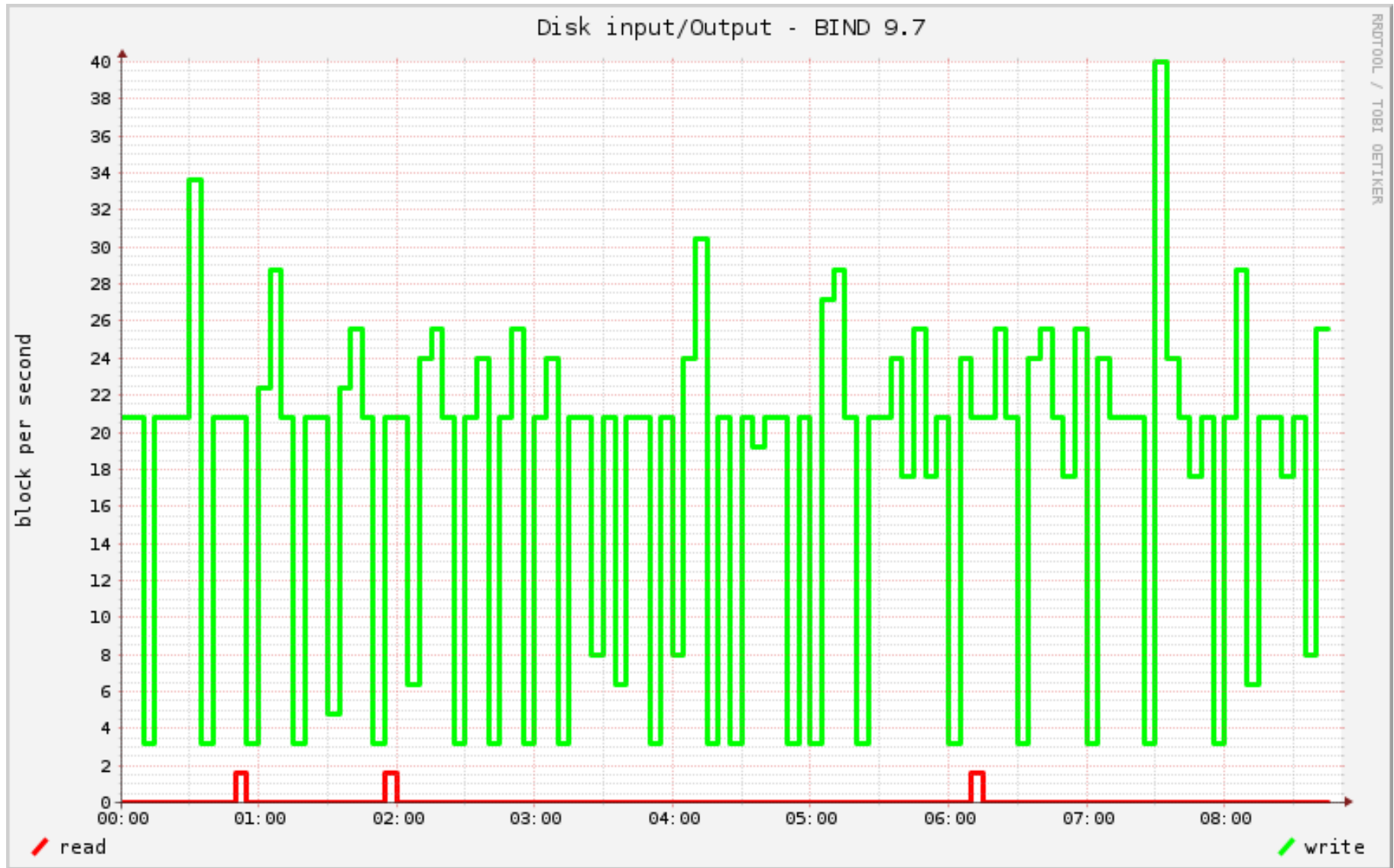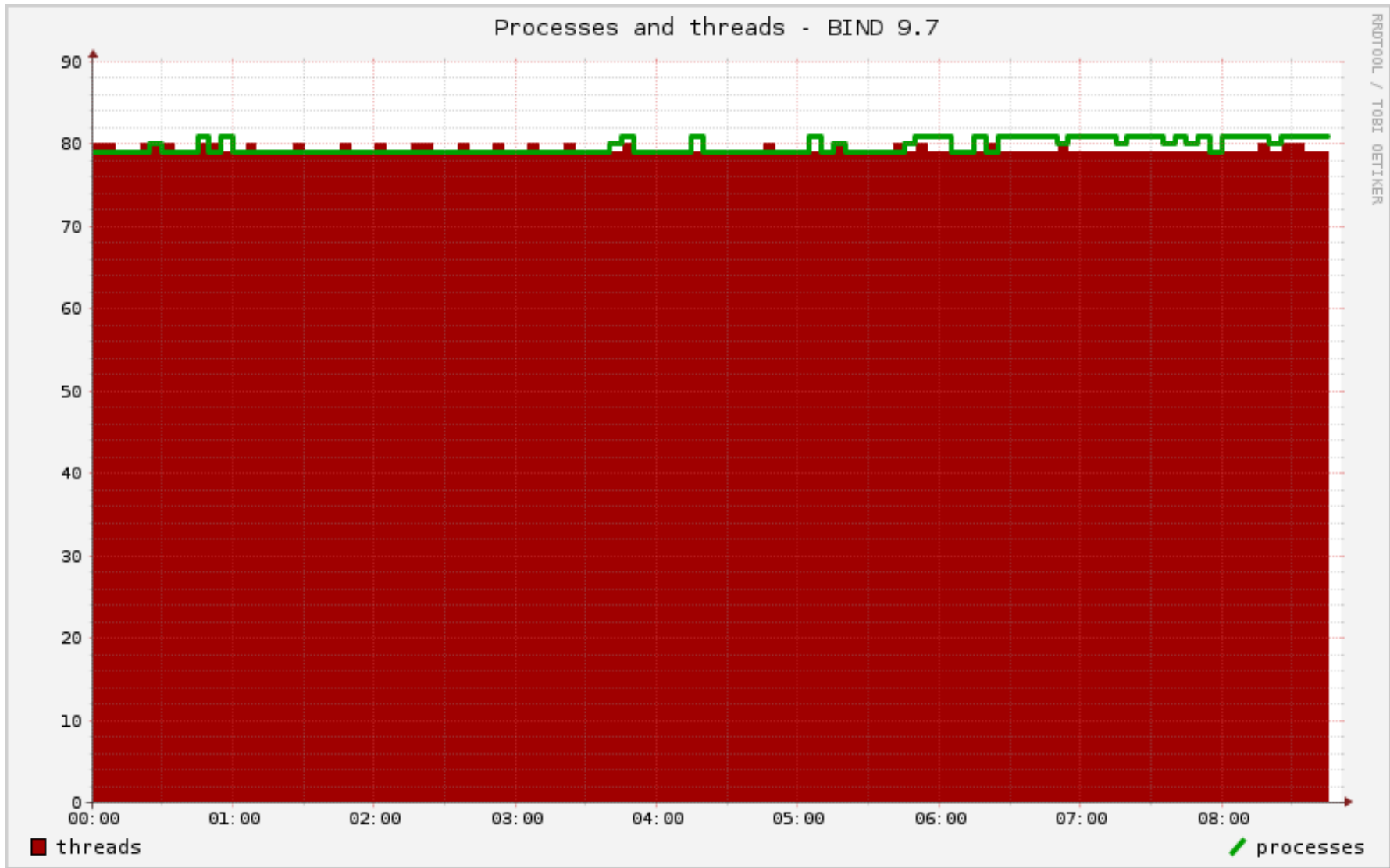
BIND 9.7 – Latency, QPS
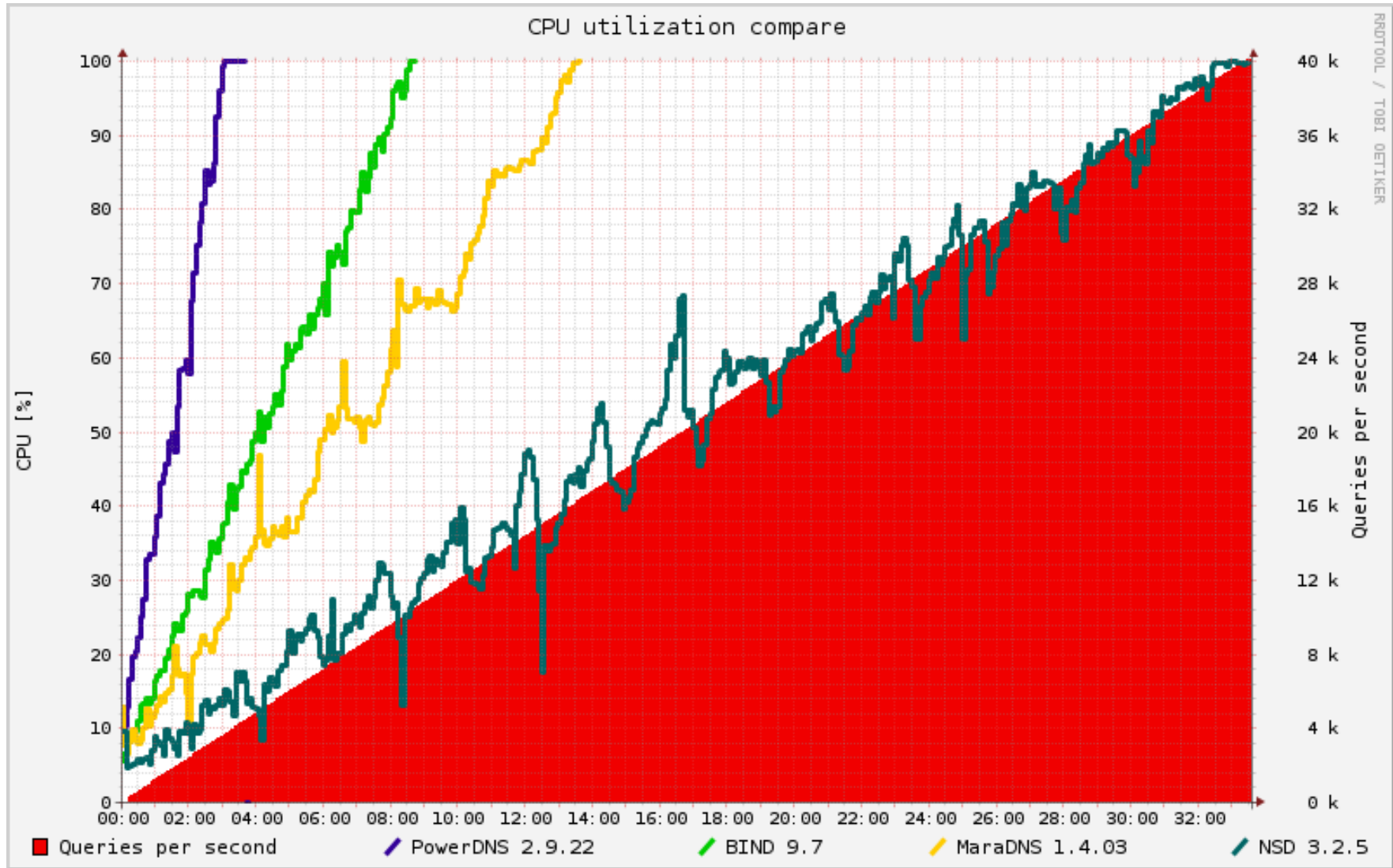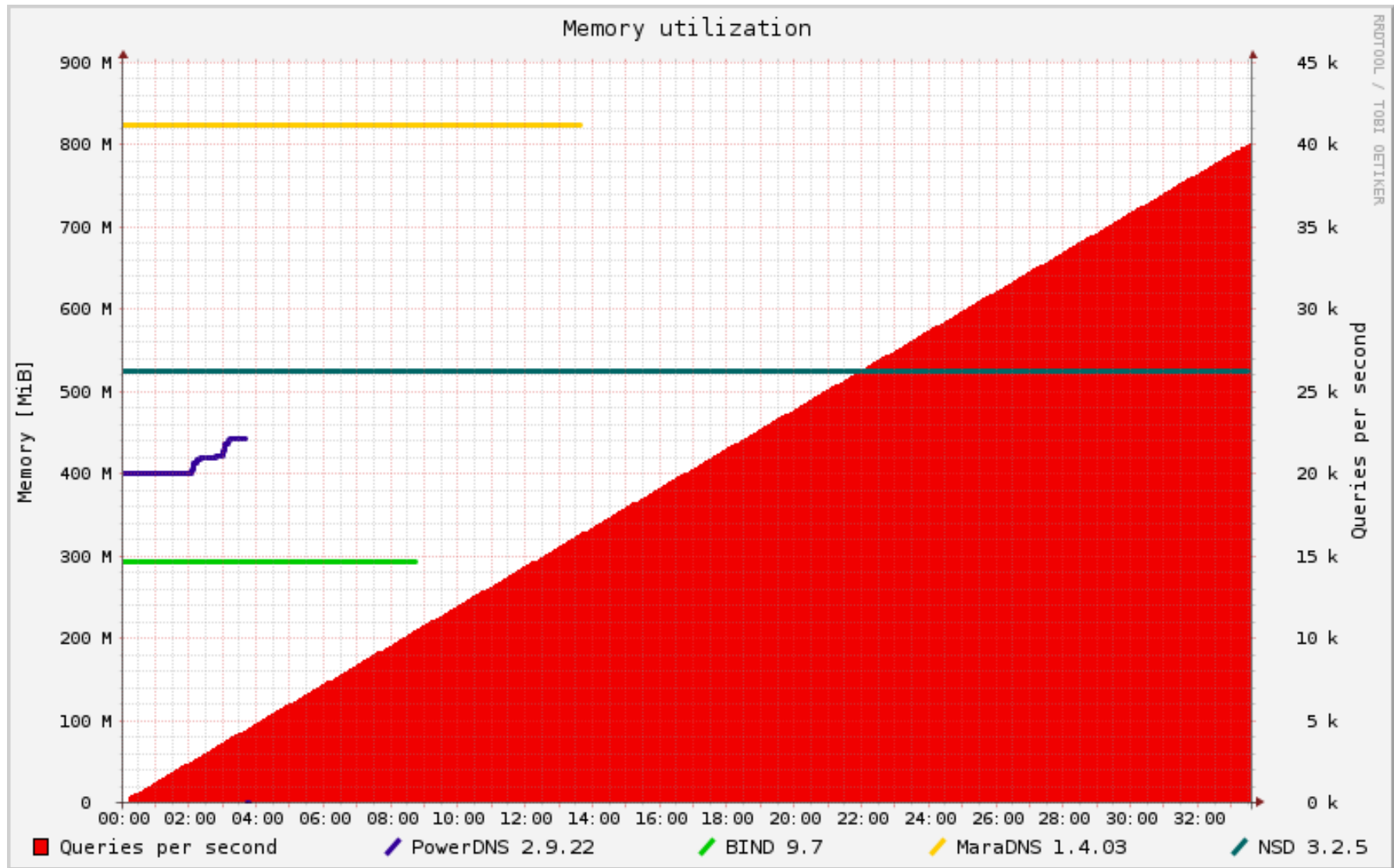
BIND 9.7 – CPU

BIND 9.7 – Memory

BIND 9.7 – Disk

BIND 9.7 – Processes

Processes and threads - BIND 9.7

Summary - CPU

CPU utilization compare

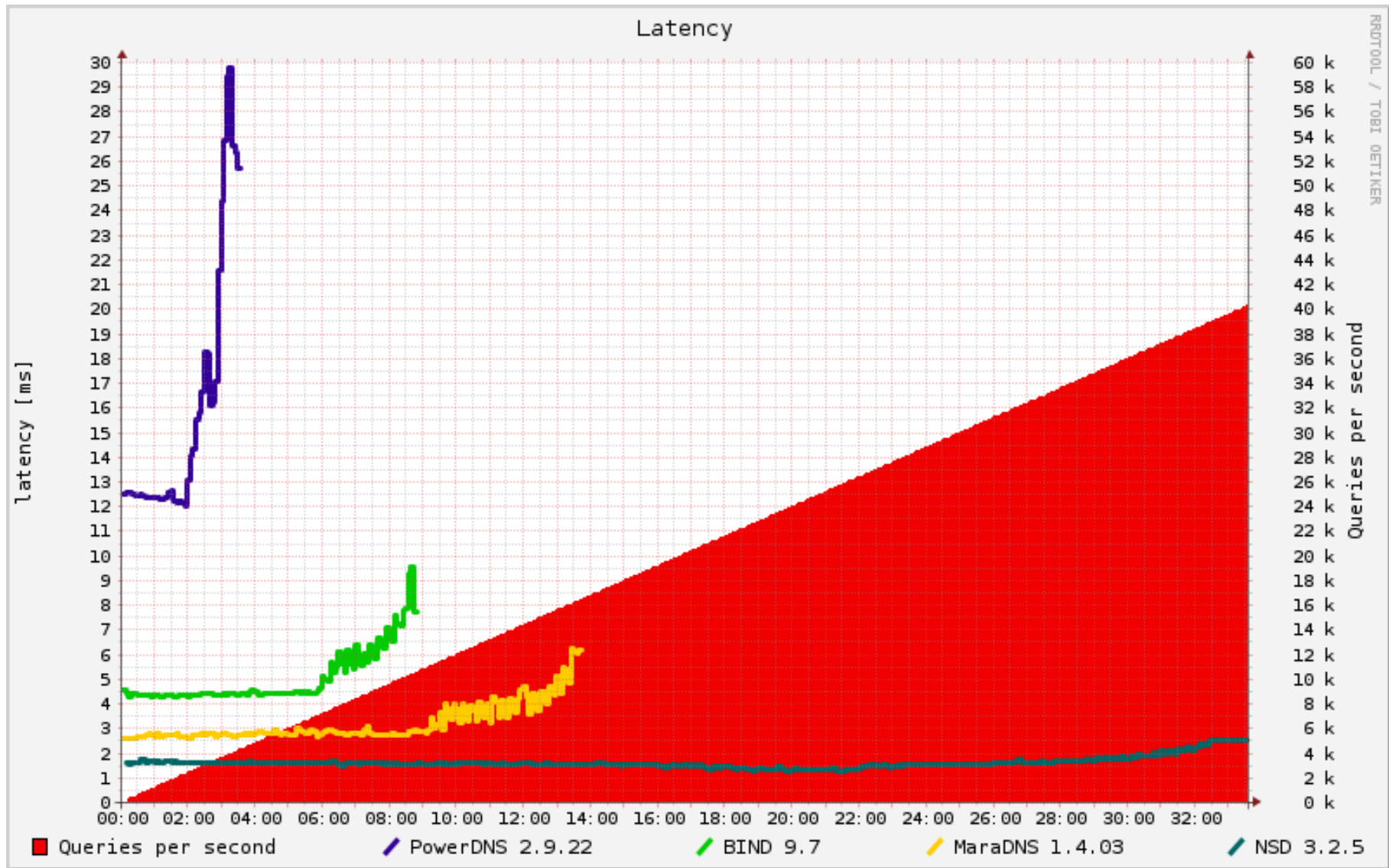Legend: Queries per second; PowerDNS 2.9.22; BIND 9.7; MaraDNS 1.4.03; NSD 3.2.5

Summary - Memory

Summary - Latency

Advice from source code

„If you have more than 100000 records in a single zone, please reconsider your zone management"

Sam Trenholme

(MaraDNS developer)

Registered CZ domains: 677654

Secured by DNSSEC: 97603