Validating Caching Resolver

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Overview

- Introduction: *Why another resolver?*
- Features
  - Anchors and Authority
  - Paranoia
- Design
- Tests
  - Cache performance
  - Recursion performance
- Summary

Introduction

- Why a new resolver?
  - Code diversity in DNS server monoculture
  - Alternative validator choice for BIND 9
- Deployment targets
  - Workgroup local DNS resolvers
  - Large caching resolver installations (ISP)
  - Validating library for applications
- About NLnet Labs
  - A not for profit, public benefit foundation
  - Developed NSD; DNSSEC aware, high performance authoritative name server

Development History

- The first architecture and a Java prototype was developed between 2006-2007.
  - Matt Larson, David Blacka
  - Bill Manning
  - Geoff Sisson, Roy Arends
  - Jacob Schlyter

VeriSign EP.NET nominet kirei

- NLnet Labs joined early 2007
  - porting the prototype to C and taking on maintenance.
  - First public development release on http://unbound.net/ in jan 2008

- Current release candidate 0.11
  - Release of *1.0* expected within a month
  - Substantive testing and feedback of this and earlier versions by:
    - Alexander Gall (switch.ch)
    - Ondřej Surý (.cz)
    - Kai Storbeck (xs4all.nl)
    - Randy Bush (psg, iij)

Features: Basic

- DNS Server
  - Recursion
    - IPv4 and IPv6 dual stack support
    - Access control for DNS service: not open recursor
  - DNSSEC validation
    - NSEC, NSEC3, ready for SHA256
- Tools
  - Unbound-checkconf
  - Unbound-host: validated host lookup
- Documentation
  - man pages, website and in code (doxygen)
- Thread support (optional): scalable performance

Features: Anchors and Authority

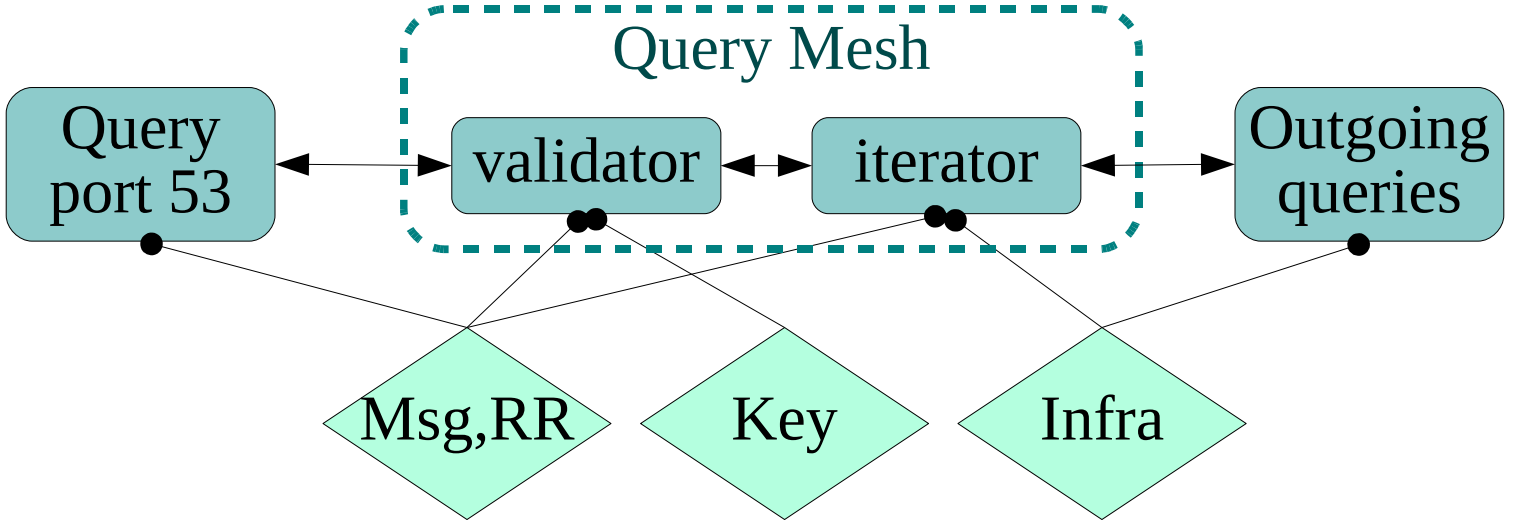
- Trust anchors: *feature rich*
  - Rbtree for anchors – many islands
  - DS and DNSKEY can be used for the anchor
  - Zone-format and bind-config style key syntax
- Authority service: *absent*
  - Localhost and reverse (RFC1918) domains
  - Can block domains
  - Not authoritative server, use stub zones

Features: Paranoia

- Forgery resilience: *full featured*
  - Scrubber filters packets for out-of-zone content
  - Follows RFC2181 trust model
  - Follows all recommendations from dnsop draft
    - Query name matching
    - Strong random numbers for ID
    - UDP source port random
    - IP source address random
    - RTT banding

Design

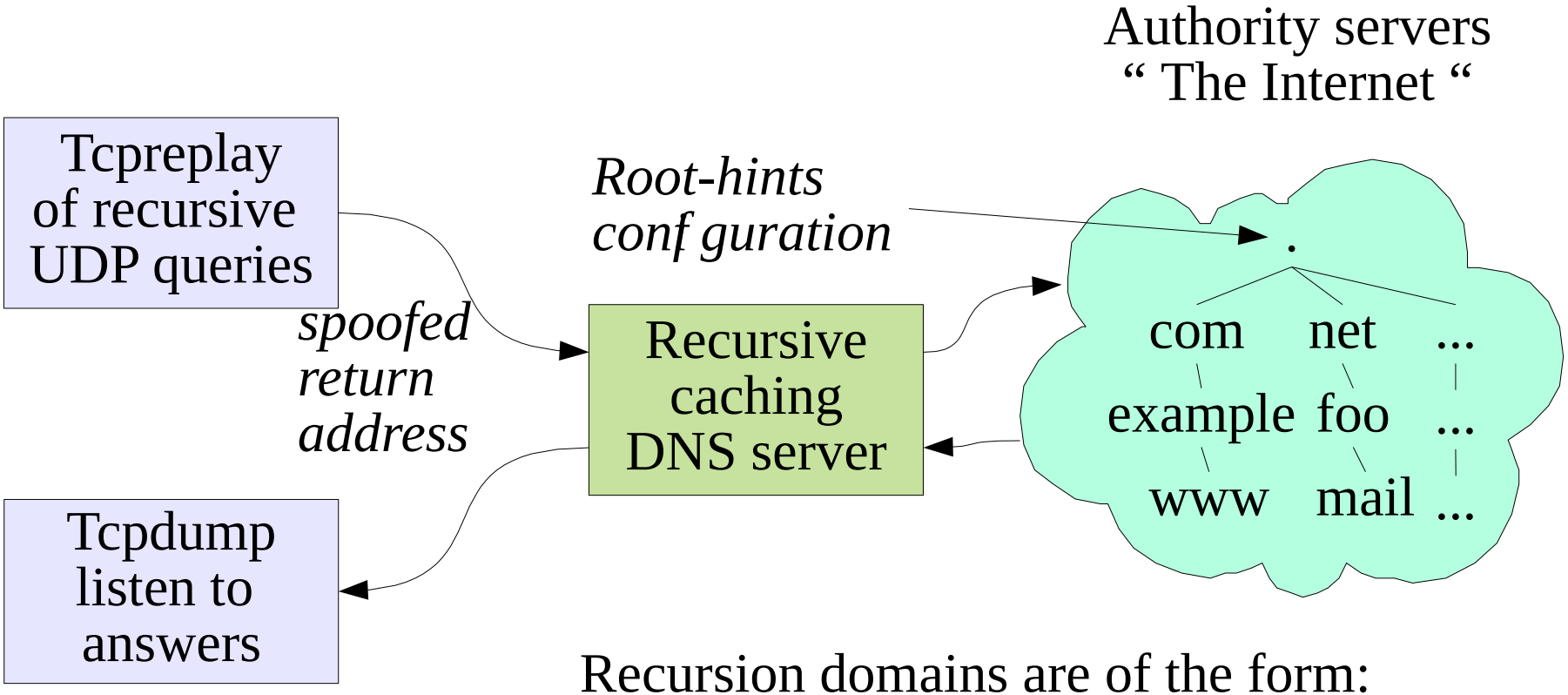
- Worker threads access shared hashtable cache
  - Cache LRU, memory use can be configured
- Modular design, state machines work on query
- Mesh of query dependencies



Tests

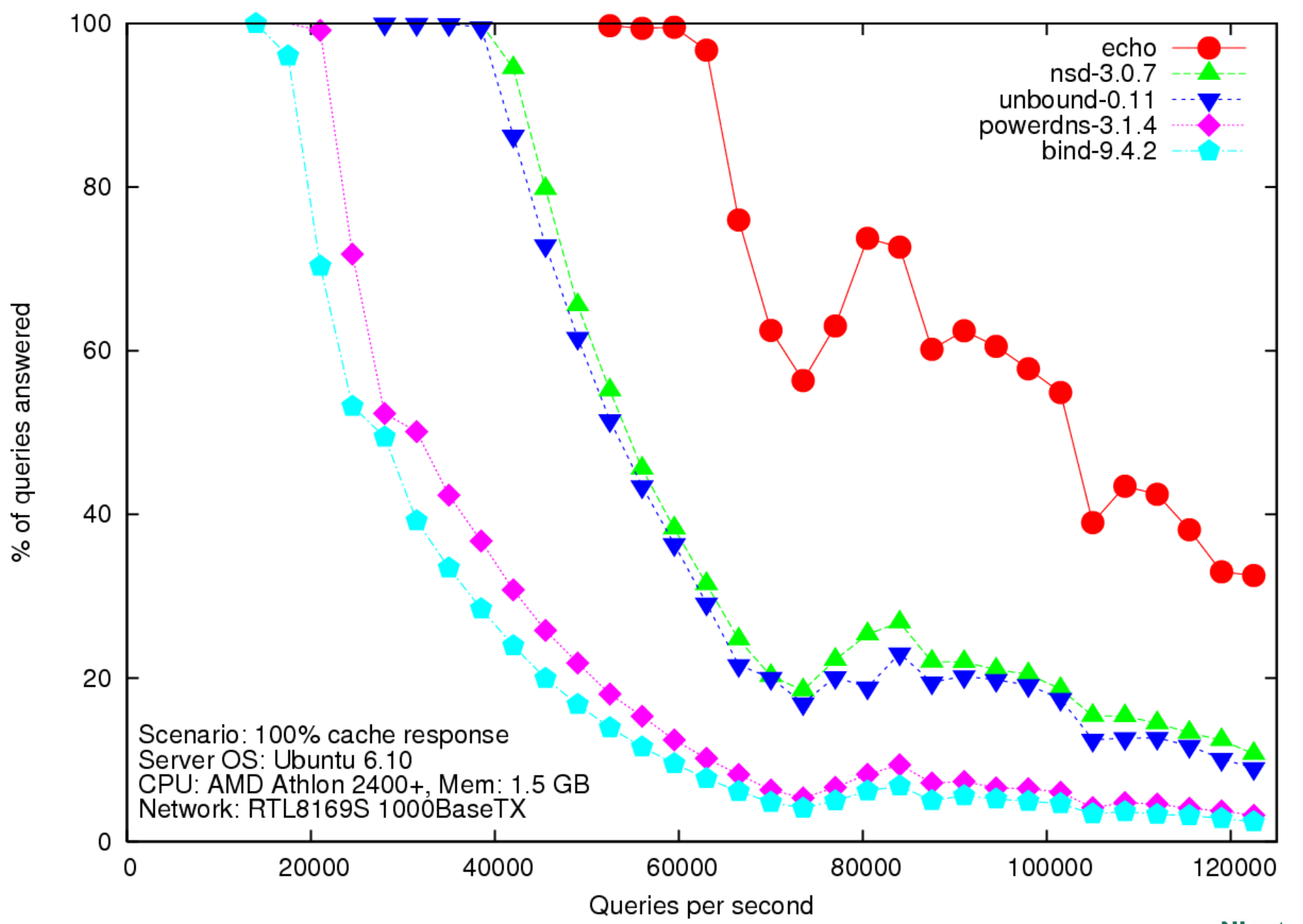
- Regression tests
  - Unit testing of code
  - State machines tested on replay traces
  - Functionality tests (start daemon, make query)
- Beta tests
  - Test in the real world
- Performance tests
  - Cache performance
  - Recursion performance
    - Test against a known, stable environment

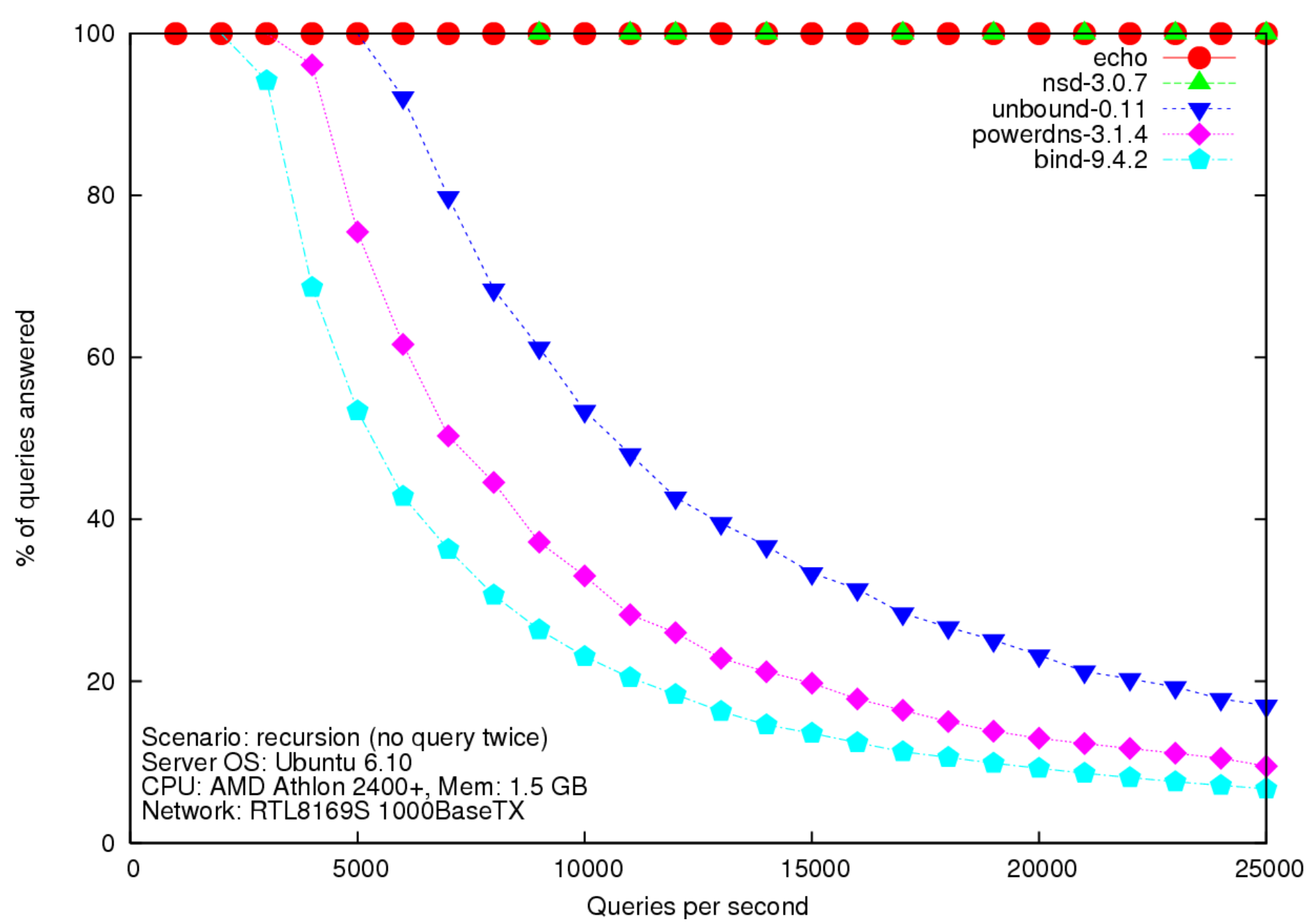
Testlab for Resolvers

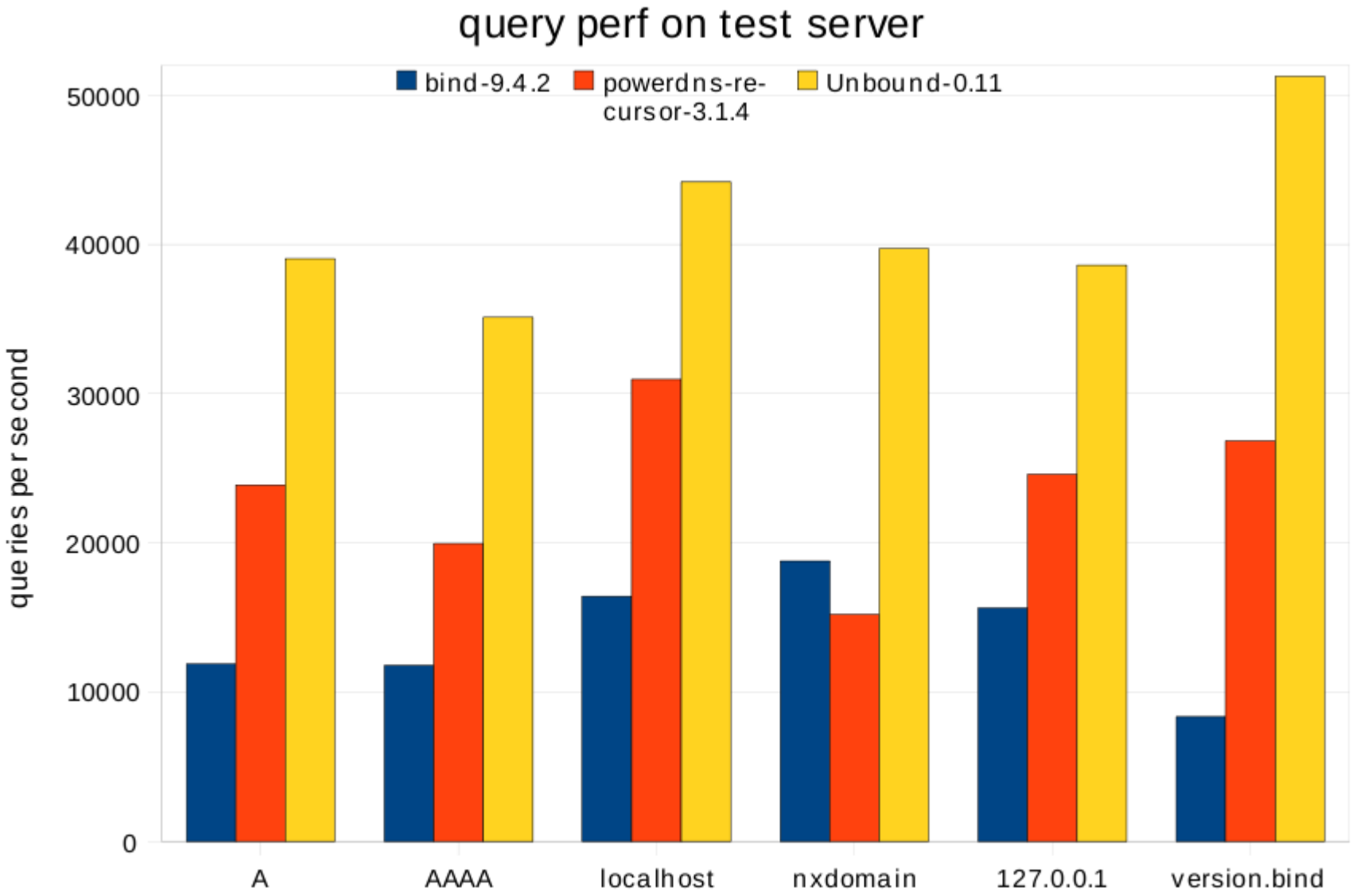


Recursion domains are of the form:

$$\text{www}_{\frac{1}{10}}.\text{example}_{\frac{1}{1000}}.\text{com}_{\frac{1}{10}}.$$


echo
nsd-3.0.7
unbound-0.11
powerdns-3.1.4
bind-9.4.2
% of queries answered
Queries per second
0
20
40
60
80
100
0
20000
40000
60000
80000
100000
120000
Scenario: 100% cache response
Server OS: Ubuntu 6.10
CPU: AMD Athlon 2400+, Mem: 1.5 GB
Network: RTL8169S 1000BaseTX


100
80
60
40
20
0
% of queries answered
0
5000
10000
15000
20000
25000
Queries per second
echo
nsd-3.0.7
unbound-0.11
powerdns-3.1.4
bind-9.4.2
Scenario: recursion (no query twice)
Server OS: Ubuntu 6.10
CPU: AMD Athlon 2400+, Mem: 1.5 GB
Network: RTL8169S 1000BaseTX


query perf on test server
bind-9.4.2
powerdns-re-cursor-3.1.4
Unbound-0.11
queries per second
50000
40000
30000
20000
10000
0
A
AAAA
localhost
nxdomain
127.0.0.1
version.bind

Summary

- Unbound – Validating Caching Resolver
  - Open source: BSD license
  - DNSSEC
  - Standards compliant
  - High performance
  - Portable: Linux, *BSD, Solaris, MacOS/X
- Support by NLnet Labs
  - Changes to support announced 2 yrs advance
- Get 0.11 at http://unbound.net

Questions


Unbound
BIND8 is DEAD
1997-2007
Internet Systems Consortium