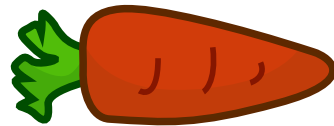# LocalRoot – Serve Yourself

Wes Hardaker
hardaker@isi.edu
USC / ISI

What Is LocalRoot?
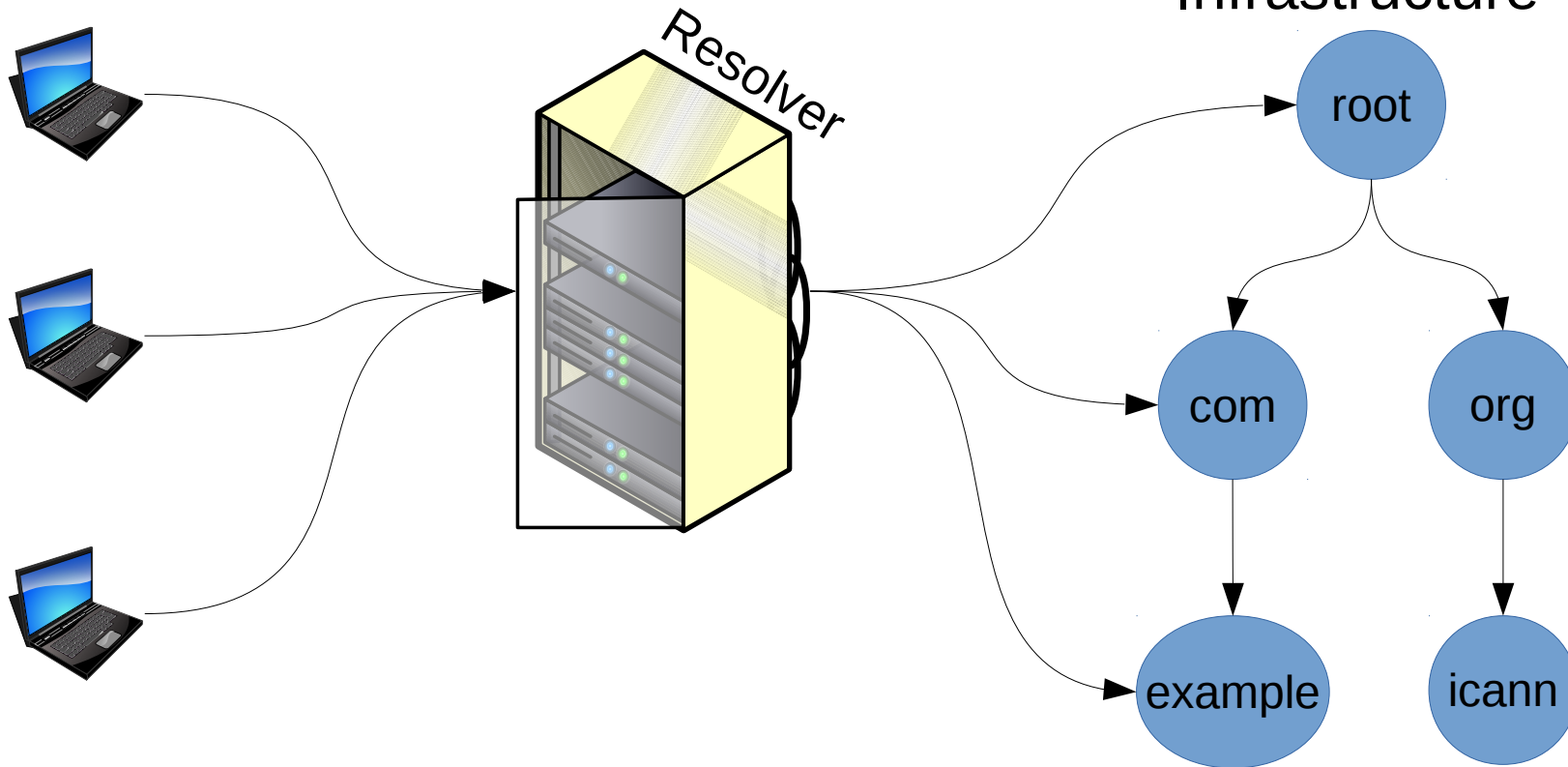
- A project to let you:
    - Run recursive resolvers with pre-cached root data
    - Eventually other data too

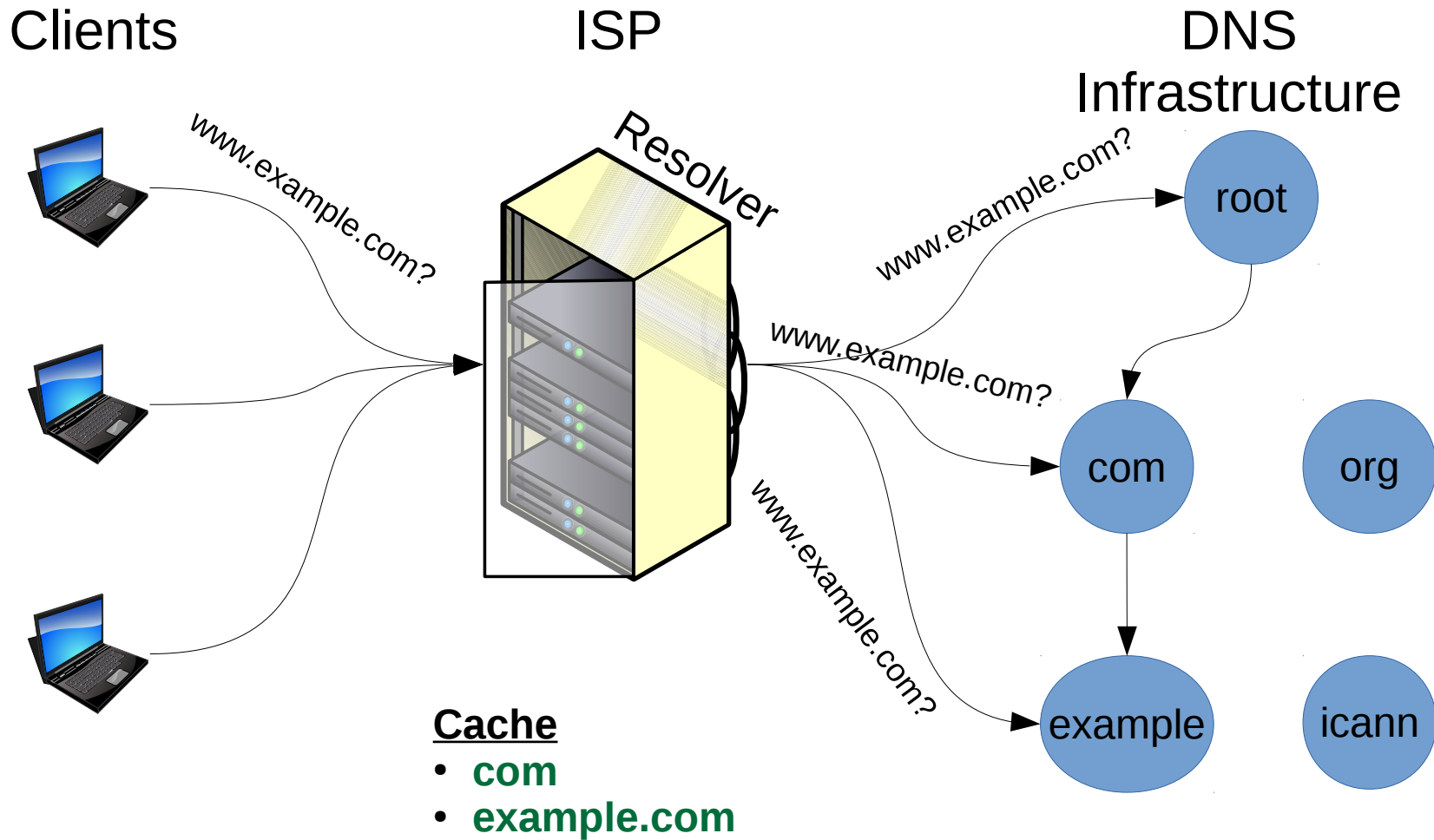# Classic DNS Resolution
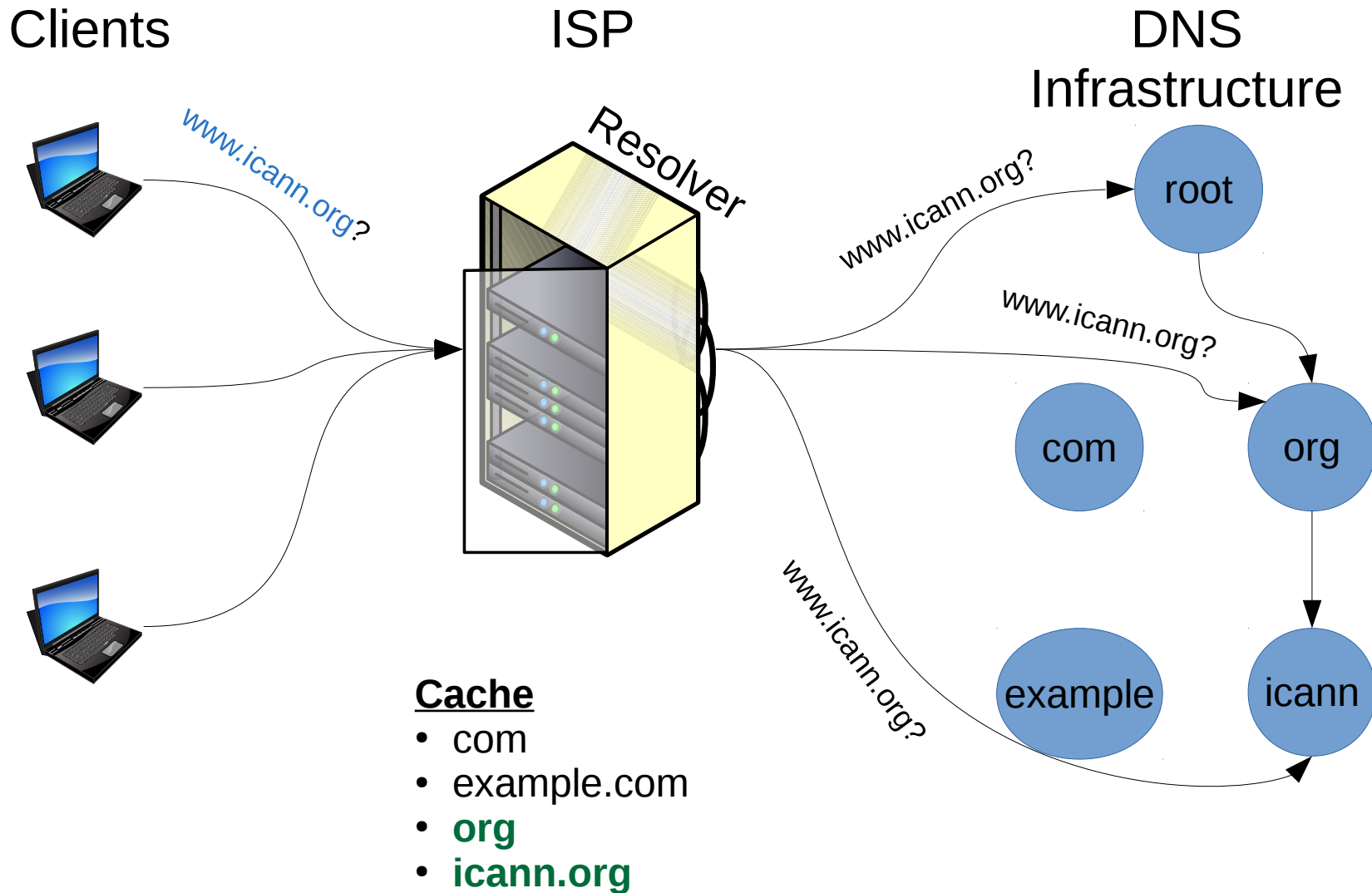
Classic DNS Resolution: Request 1

Clients

ISP

DNS Infrastructure

www.example.com?

Resolver

www.example.com?

root

www.example.com?

com

org

www.example.com?

example

icann

Cache
- **com**
- **example.com**

Classic DNS Resolution: Request 2

Clients

ISP

DNS Infrastructure

www.icann.org?

Resolver

www.icann.org?

root

www.icann.org?

org

com

www.icann.org?

example

icann

Cache
- com
- example.com
- **org**
- **icann.org**

Classic DNS Resolution: Request 3

Clients

ISP

Resolver

DNS Infrastructure

www.exam.com?

www.exam.com?

www.exam.com?

root

com

org

exam

icann

Cache
- **com**
- example.com
- org
- icann.org
- **exam.com**

Reused!

DNS Resolution With LocalRoot

Clients

ISP

Resolver

DNS
Infrastructure

Pseduo Cache
- com
- org
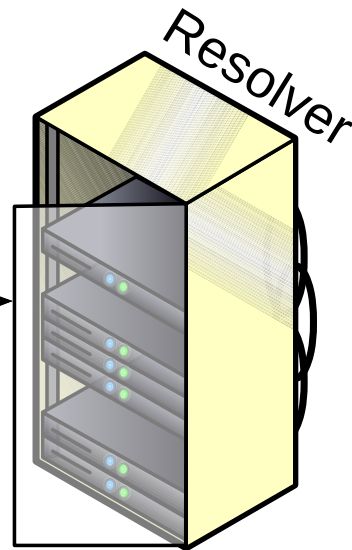- net
- pr
- horses
- ...

LocalRoot

root

com

org

exam

icann

DNS Resolution With LocalRoot

Clients

ISP

DNS Infrastructure

Resolver

www.exam.com?

www.exam.com?

www.exam.com?

root

com

org

exam

icann

Pseduo Cache
- com
- org
- net
- pr
- horses
- ...
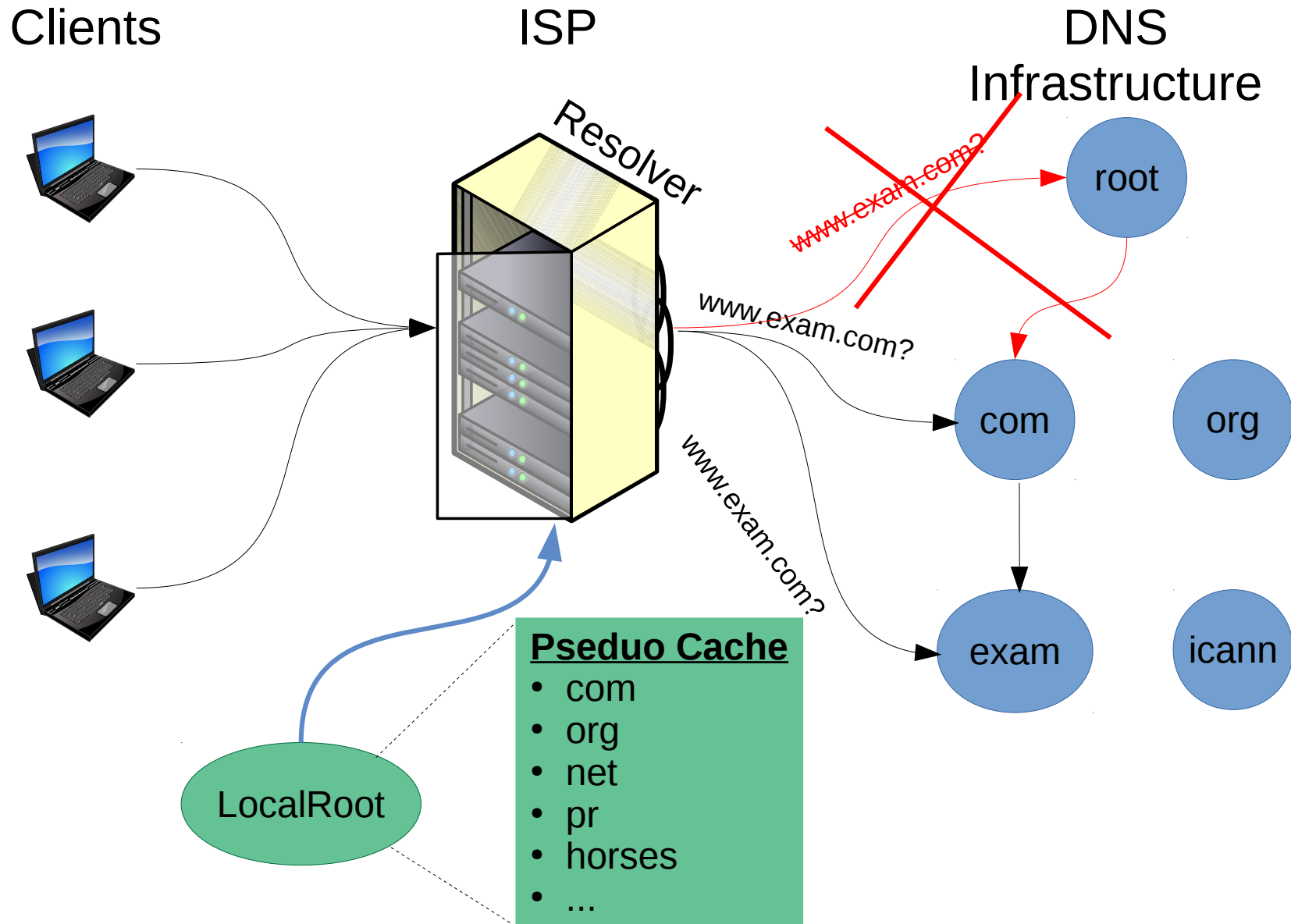
LocalRoot
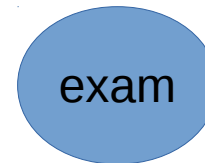
LocalRoot: Notifications on Change

Clients

ISP

DNS
Infrastructure

Resolver

root

com

org

exam

icann
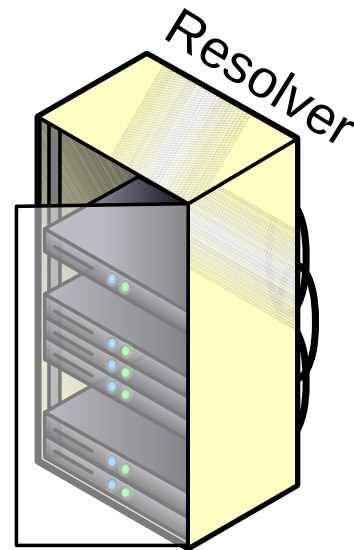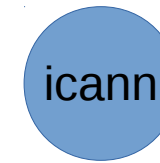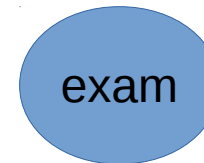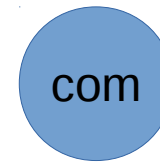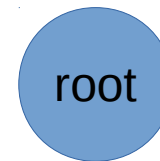
DNS Notification:
new root data

LocalRoot

DNS AXFR
Transfer new copy

Why Use LocalRoot?

- Benefits
  - "Psuedo-caching" of the root-data
  - Removes the need to contact the root
  - Faster DNS lookups for first TLD lookups
  - Faster NXDOMAIN results
  - Always up to date copy of the root
- Research project of your own?
  - Trigger events after root-change notification?

LocalRoot Security

- The root data is DNSSEC signed
  - You can get it from anywhere
- LocalRoot transfers data using TSIG security

Demo!

LocalRoot

Our *LocalRoot* service allows you to serve a copy of the DNS Root Zone from your recursive resolver. For more information about *LocalRoot*, please see our About LocalRoot page and Getting Started pages.

- About LocalRoot
- Getting Started
- Register
- Login

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Register

Email

Password

Password

I'm not a robot

reCAPTCHA
Privacy - Terms

Register

LocalRoot: Serve Yourself *{Alpha}*

hardaker@isi.edu
About LocalRoot
Getting Started
Your TSIG Keys
Your Servers
Logout

LocalRoot

Our *LocalRoot* service allows you to serve a copy of the DNS Root Zone from your recursive resolver. For more information about *LocalRoot*, please see our About LocalRoot page and Getting Started pages.

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LocalRoot: Serve Yourself *{Beta}*

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LocalRoot: Getting Started

To deploy the LocalRoot service within your recursive resolver, please follow these steps:

1   Create a **TSIG key** to protect the transactions.   [more info...]

2   Create a **server** entry for your recursive resolver using it's public IP address.

3   Add the configuration snippet from the link in the **Config** column of your list of servers page for ISC's Bind and add it to your recursive resolver's configuration file *(other nameserver configuration coming soon)* . *Note: If you are using views (eg, internal recursive and external authoratative), the configuration for the root zone copy will need to be put inside the internal view.*   [more info...]

4   Wait for your server to perform it's first AXFR transfer of the root zone (which should be immediate). Once the LocalRoot primary server sees your first transfer, it will start sending your server notifications. You can tell when everything is up and working properly as the final checkbox for your server in the your list of servers will change from a red X (✖) to a checkbox (✓) within about 5 minutes of the first transfer that the LocalRoot primary server sees.   [more info...]

LocalRoot: Serve Yourself *{Alpha}*

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About LocalRoot
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Your TSIG Keys
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Logout

TSIG List

No TSIG keys generated yet

Create New TSIG

LocalRoot: Serve Yourself *{Alpha}*

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Create a new TSIG key

Provide a name of your choice for the new TSIG to be created. The TSIG secret key and algorithm will be automatically assigned.

my cool TSIG key

Create New TSIG Record

LocalRoot: Serve Yourself *{Alpha}*

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TSIG List

Administrative Name	Algorithm	Value
my cool TSIG key	hmac-sha256	p9ibZHNqKIqxHbtav5OU6g==

Create New TSIG

LocalRoot: Serve Yourself *{Alpha}*

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Server List

No servers created yet

Add a New Server

LocalRoot: Serve Yourself *{Alpha}*

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Add a localroot-copy server

my enterprise server

192.0.1.1

TSIG to use:

my cool TSIG key -- p9ibZHNqKIqxHbtav5OU6g==

Create Server

LocalRoot: Serve Yourself *{Beta}*

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Server List

Administrative Name	Address	TSIG	Enabled	Active	Delete	Config
10.0.0.2	10.0.0.2	my cool TSIG key: p9ibZHNqKIqxHbtav5OU6g==	✓	✗	🗑	[get config]

Add a New Server

(Click on the enabled buttons to toggle)

*Servers will not be listed **active** until an hour after an initial AXFR has been seen.*

LocalRoot: Serve Yourself *{Beta}*

hardaker@isi.edu
About LocalRoot
Getting Started
Your TSIG Keys
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Configuration Generator

Select from the following parameters to change the configuration code generated below:

Full recursive resolver configuration ▾

Your generated bind configuration for **10.0.0.2** at **10.0.0.2 is:**

edit

```
//
// LocalRoot:
// ISC Bind Configuration File for Root-Zone RFC 7706 Support
//
// This configuration file was generated at http://localroot.isi.edu
// For server "10.0.0.2" at address: 10.0.0.2
//


//
// named.conf
//
// Modified version of the named.conf conf that was Provided by the
// Red Hat bind package to configure the ISC BIND named(8) DNS server
// as a caching only nameserver (as a localhost DNS resolver only).
//

options {
        listen-on port 53 {
            127.0.0.1;
            10.0.0.2;
        };
        listen-on-v6 port 53 { ::1; };
        directory  "/var/named";
        allow-query    {
            localhost;
            10.0.0.2;
            // Add your allowed network blocks here
            // eg: 10.0.0.0/8;
            // eg: 192.168.0.0/16;
```

Real World Effects
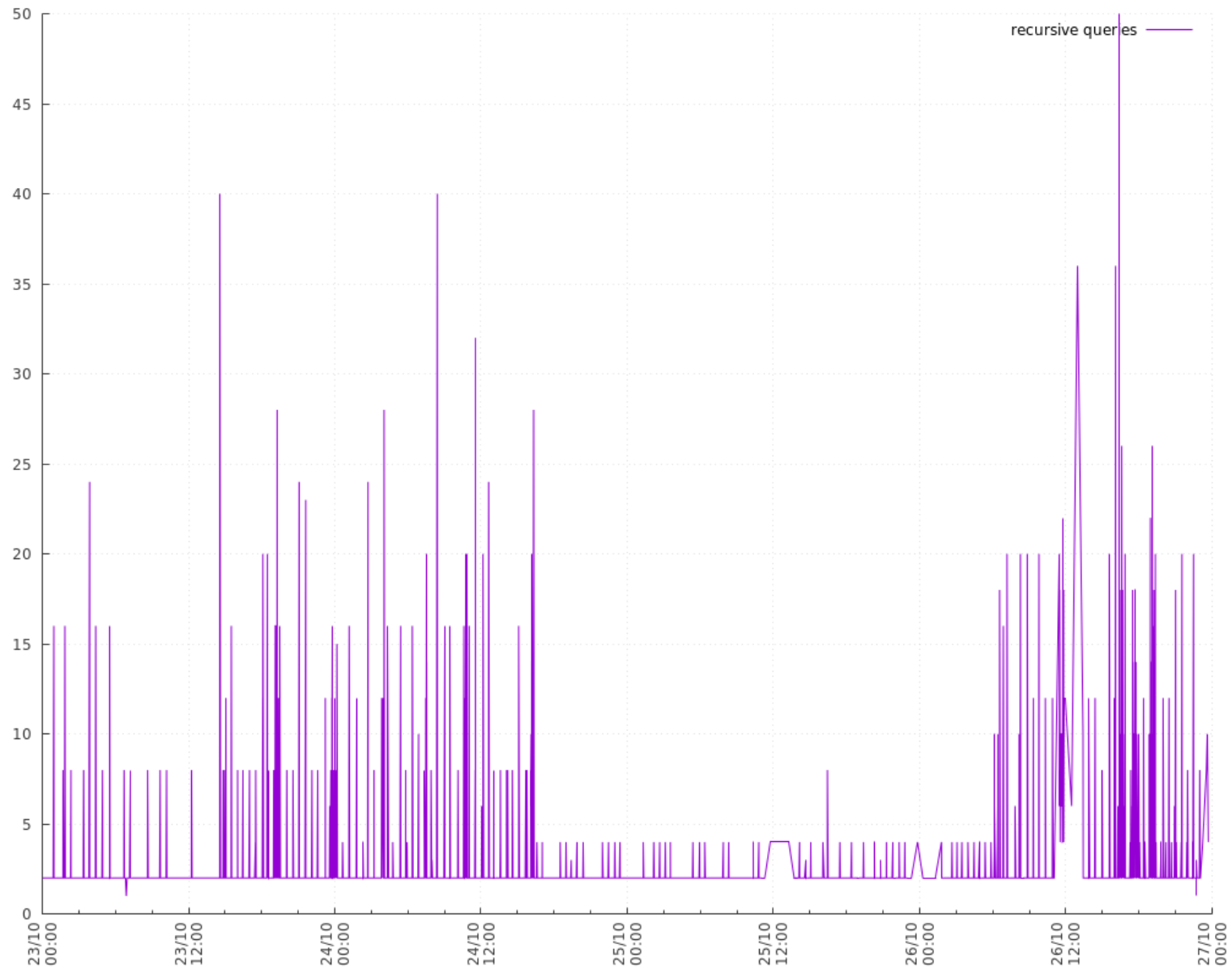
Future Work

- More DNS zone sources
    - Root-servers.net
    - Arpa
    - TLDs
- Other transfer mechanisms
- Variable-period update notifications
    - (e.g. only on change)
- Monitoring and error reporting
    - (are you sending DNS requests you shouldn't be?)

...

Questions?

- Please try it and let me know what you think
  - https://localroot.isi.edu/
- I would love feedback!
  - How are you using it?
  - If research-focused, what are you doing with it?
  - What other features would you like to see?