Tools for Deployment of DNSSEC

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(aka: SPARTA, Inc.)

08 December 2010

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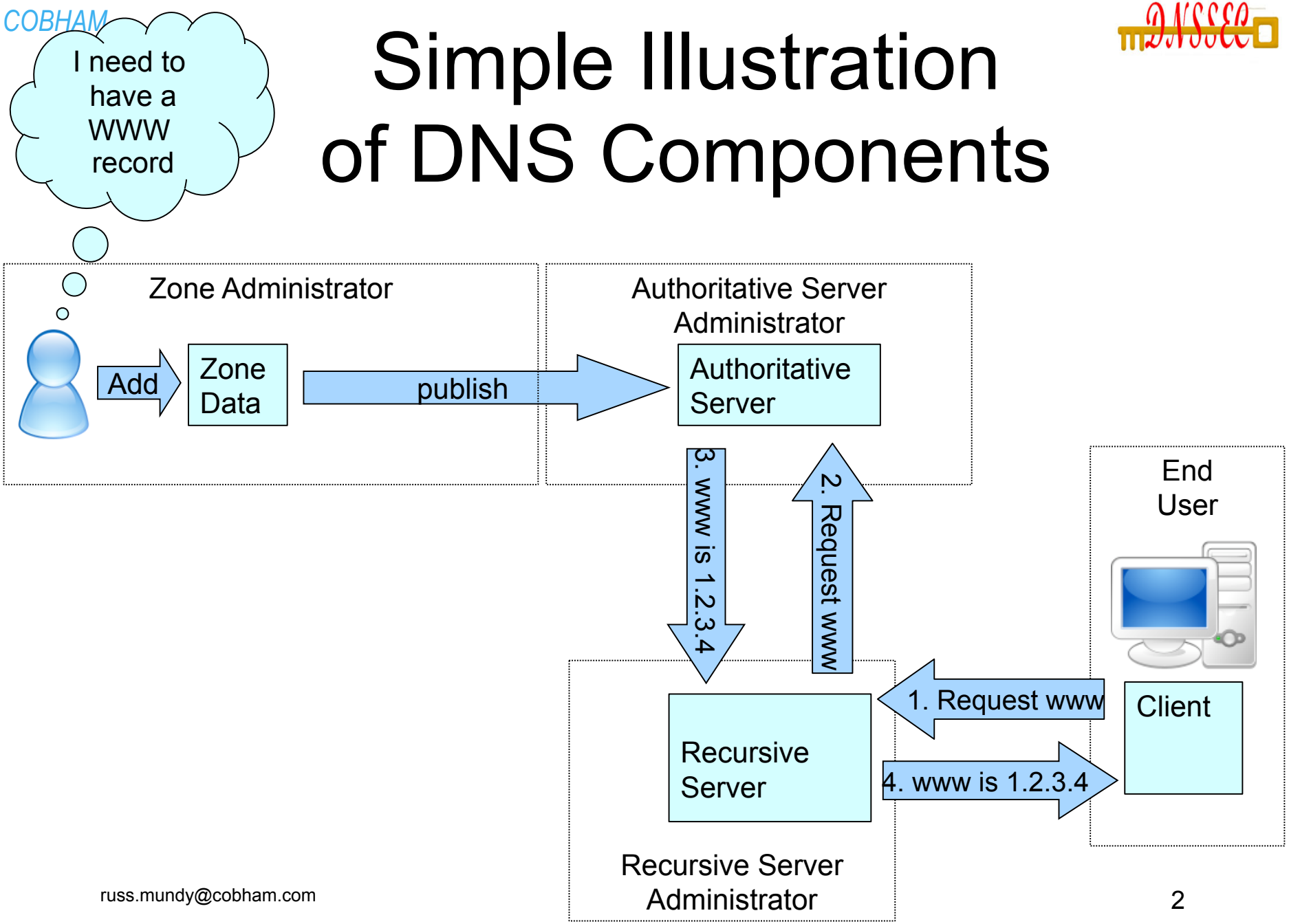
Simple Illustration of DNS Components



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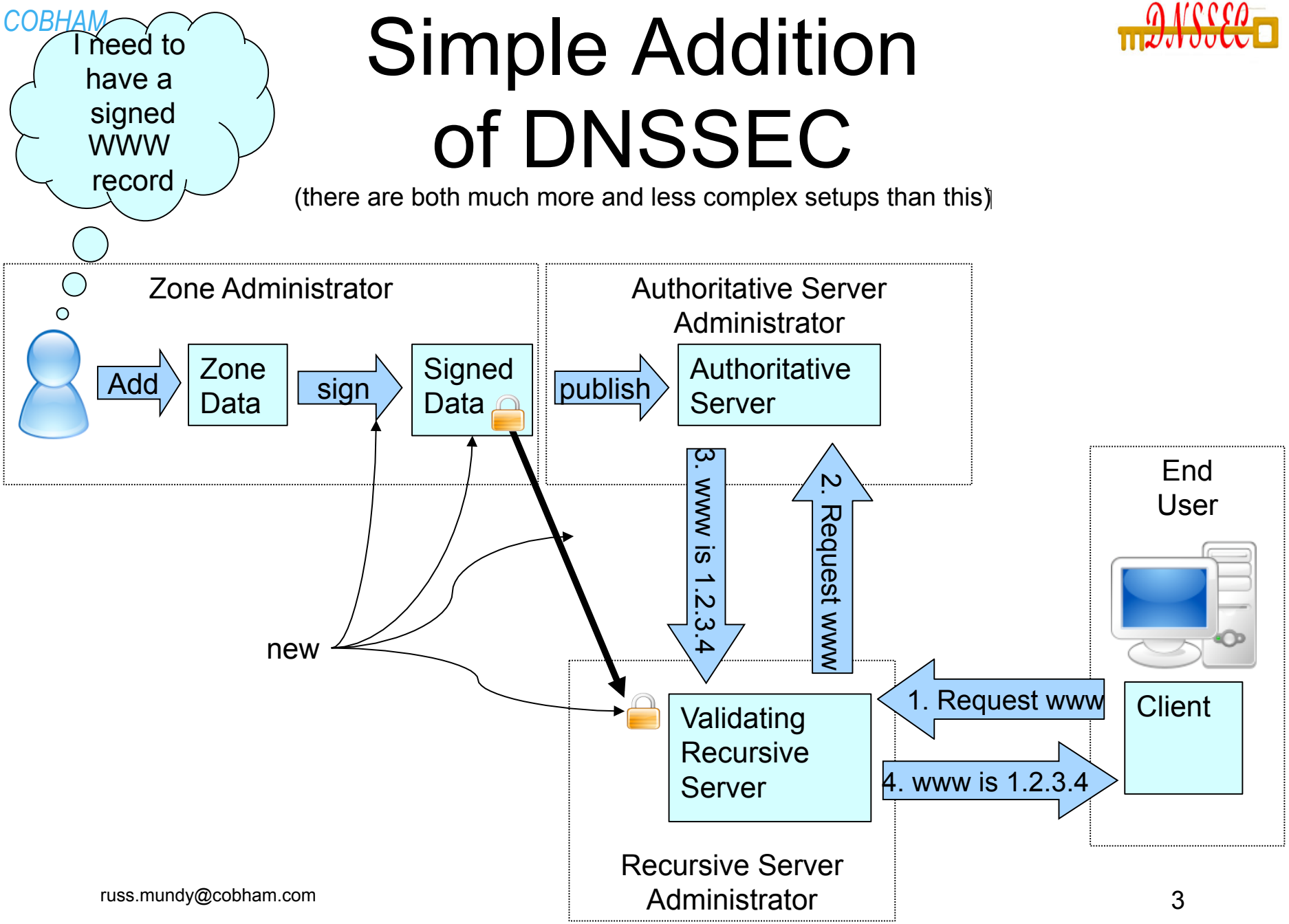
Simple Addition of DNSSEC

(there are both much more and less complex setups than this)



DNSSEC-Tools Suite

- Suite of tools developed by SPARTA
  - Open Source project sponsored by DHS S&T
  - http://www.dnssec-tools.org/
  - **Free! (BSD License)**
- Status
  - Designed to make DNSSEC “easy”
  - Many tools: Pick what you need
  - Grouping of Tools provided on project web site:

    http://www.dnssec-tools.org/

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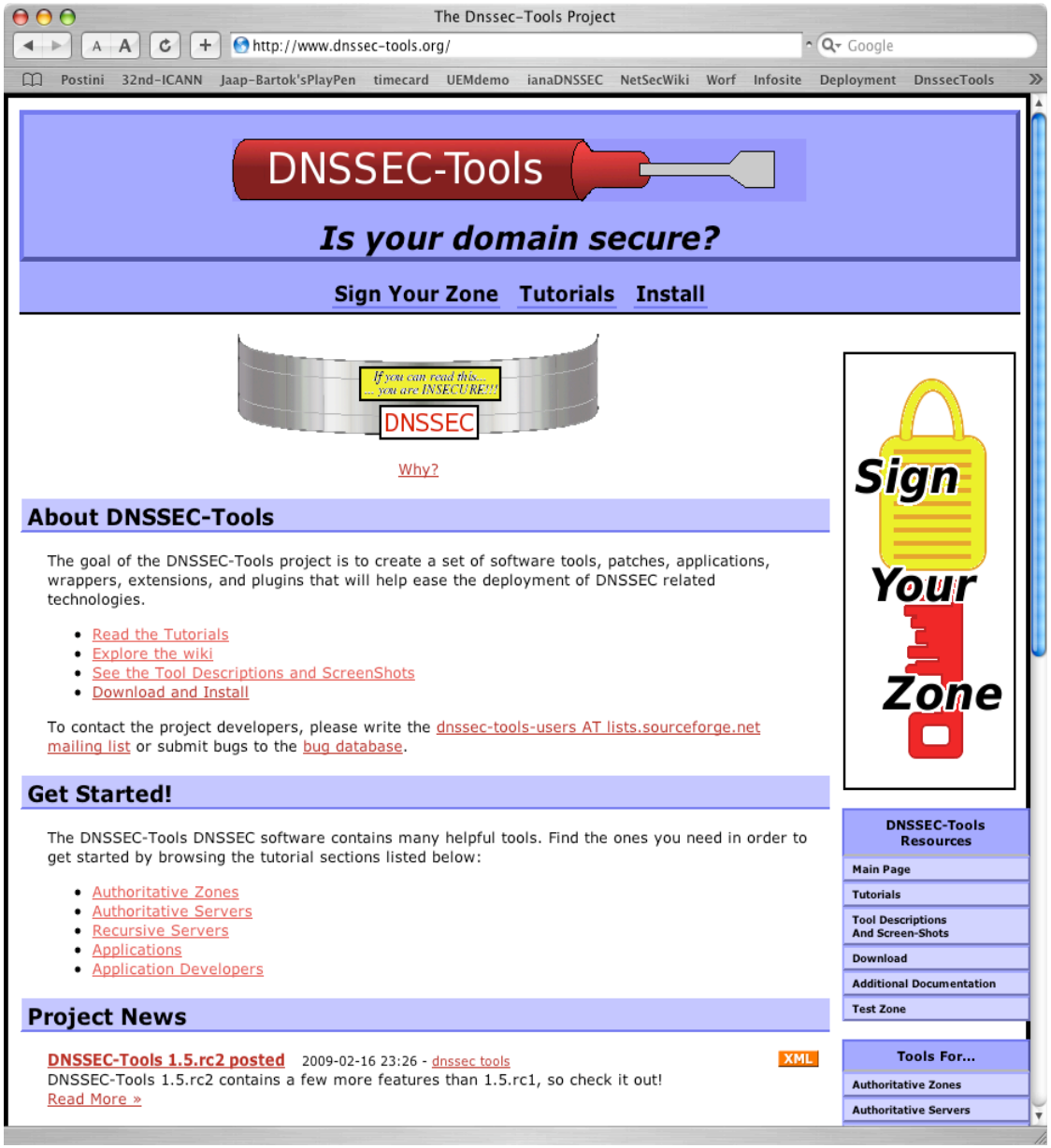
The Dnssec-Tools Project
http://www.dnssec-tools.org/
Google
Postini 32nd-ICANN Jaap-Bartok'sPlayPen timecard UEMdemo ianaDNSSEC NetSecWiki Worf Infosite Deployment DnssecTools
DNSSEC-Tools
Is your domain secure?
Sign Your Zone Tutorials Install
If you can read this... ... you are INSECURE!!!
DNSSEC
Why?
About DNSSEC-Tools
The goal of the DNSSEC-Tools project is to create a set of software tools, patches, applications, wrappers, extensions, and plugins that will help ease the deployment of DNSSEC related technologies.
Read the Tutorials
Explore the wiki
See the Tool Descriptions and ScreenShots
Download and Install
To contact the project developers, please write the dnssec-tools-users AT lists.sourceforge.net mailing list or submit bugs to the bug database.
Get Started!
The DNSSEC-Tools DNSSEC software contains many helpful tools. Find the ones you need in order to get started by browsing the tutorial sections listed below:
Authoritative Zones
Authoritative Servers
Recursive Servers
Applications
Application Developers
Project News
DNSSEC-Tools 1.5.rc2 posted 2009-02-16 23:26 - dnssec tools
DNSSEC-Tools 1.5.rc2 contains a few more features than 1.5.rc1, so check it out!
Read More »
XML
Sign Your Zone
DNSSEC-Tools Resources
Main Page
Tutorials
Tool Descriptions And Screen-Shots
Download
Additional Documentation
Test Zone
Tools For...
Authoritative Zones
Authoritative Servers

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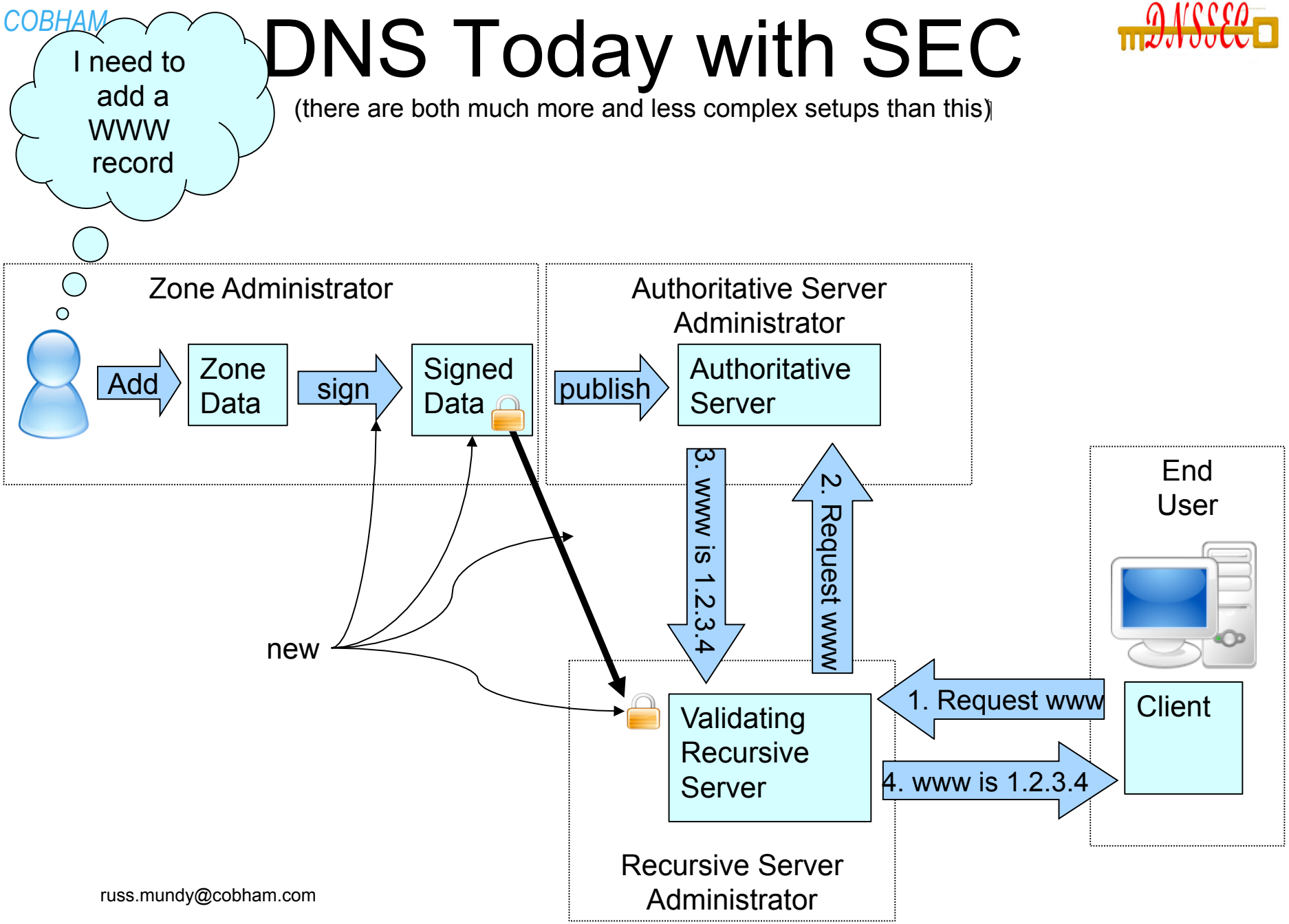
DNS Today with SEC

(there are both much more and less complex setups than this)



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Some New Aspects With DNSSEC

- Key maintenance
- Zone Signing Operation
- Provisioning: Memory, CPU, bandwidth
- Parent-child communication of DNSSEC-related information
- Trust Anchor Maintenance
- New error codes in applications
- Additional Troubleshooting

DNSSEC-Tools Components

- Infrastructure
  - (Libraries, Perl Modules, ...)
- Tools for managing zones
  - (signers, lint, debug, ...)
- Tools for managing resolvers
  - (trust anchor management)
- Applications
  - (firefox, ssh, ncftp, ...)
- Educational Materials
  - (***tutorials!!!***, documentation)

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Zone Administration Tools

- DNSSEC Maintenance:
  - Zonesigner
  - Rollerd
- Zone Data Quality Assurance:
  - Donuts
  - Mapper

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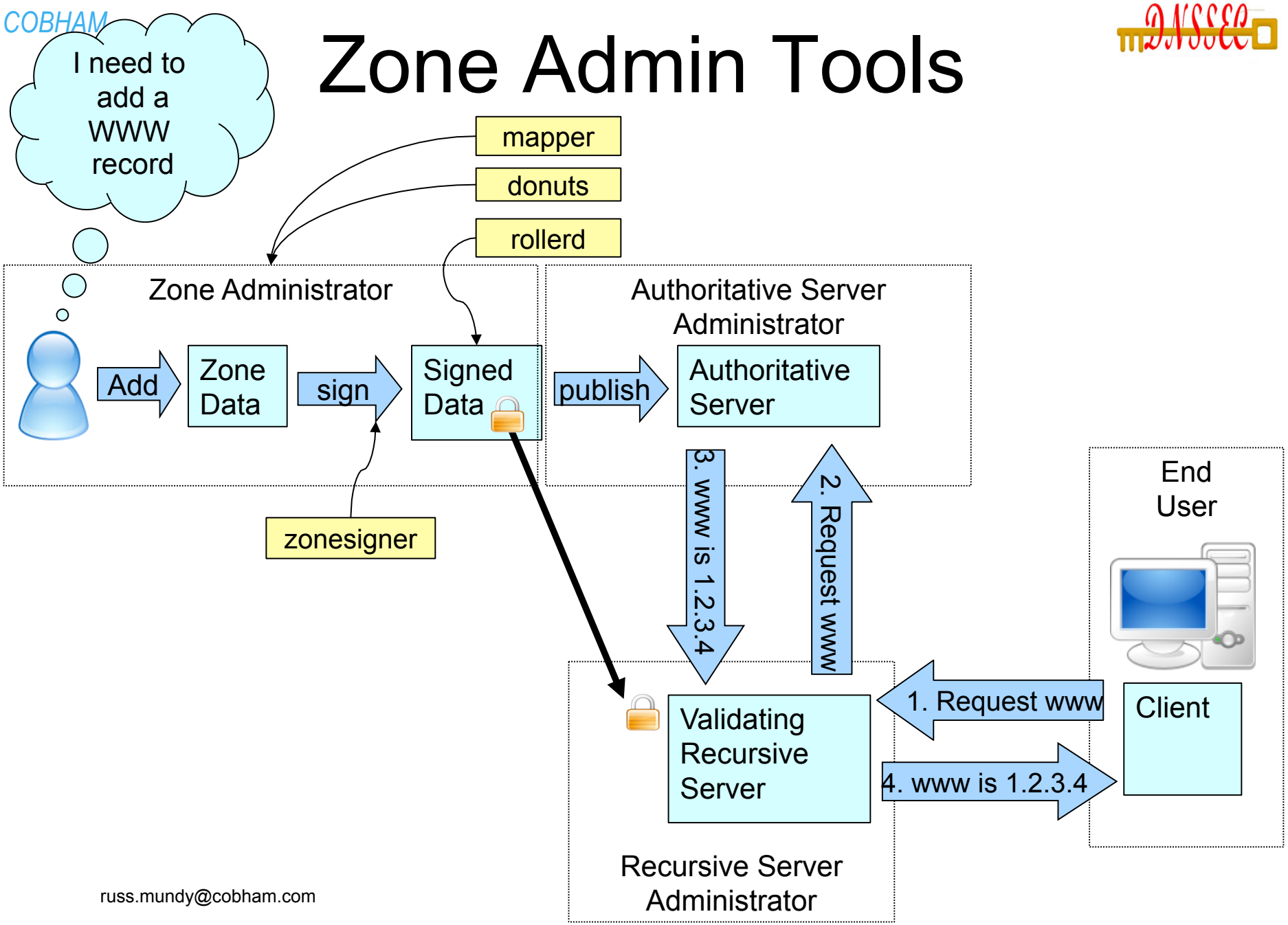
Zone Admin Tools



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zonesigner

- Signs zones in one step
- Defaults do the “right thing”
- Wraps around the bind tools
- Keeps track of state, keys, etc

- Getting started:

  First time: zonesigner --genkeys example.com

  There after: zonesigner example.com

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rollerd

- Automatic key-rollover and signing daemon
  - Follows a defined policy for how often to roll keys
  - Handles both ZSK and KSK keys
- Regular scheduled calls to zonesigner
- Runs as a Daemon
- Includes a separate utility to talk to the daemon
  - Check status
  - Start something “now”

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donuts

- DNS Zonefile error/lint checker
  - Validates all DNSSEC records
  - donutsd for running on a regular basis
- Extendible:
  - Easily create your own site-specific rules (see tutorial)
  - Site specific configuration
  - Add/Remove specific types of features/checks
- Expects the data to be readable
  - Zone data must be parsible
  - Doesn't report syntax errors

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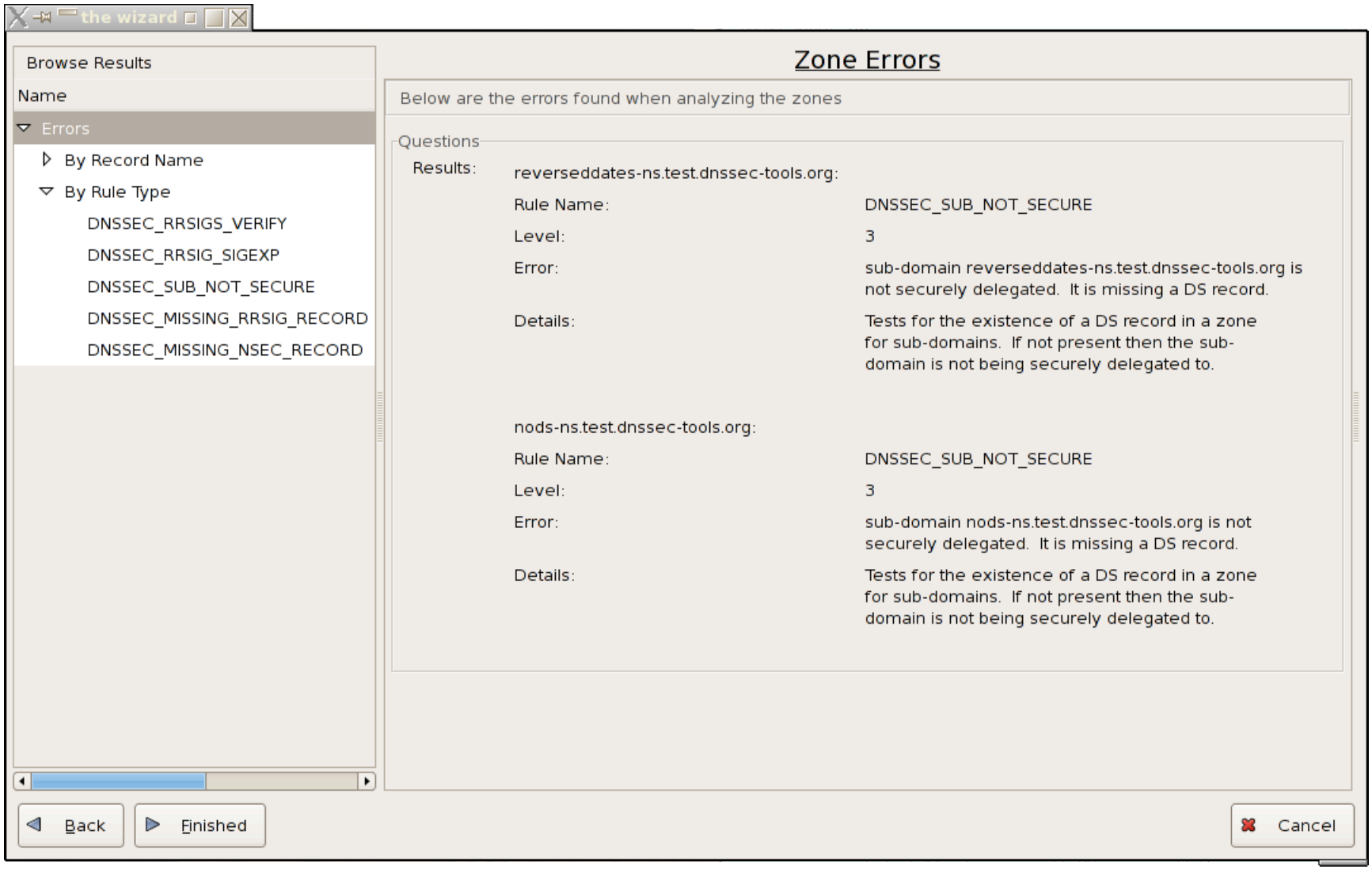
donuts: Browsable GUI example



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mapper

- Graphical map generator of zone data
- Color codes zone data and relationships
- Understands DNSSEC record types
  - Currently doesn't validate data
  - Just checks for existence and dates

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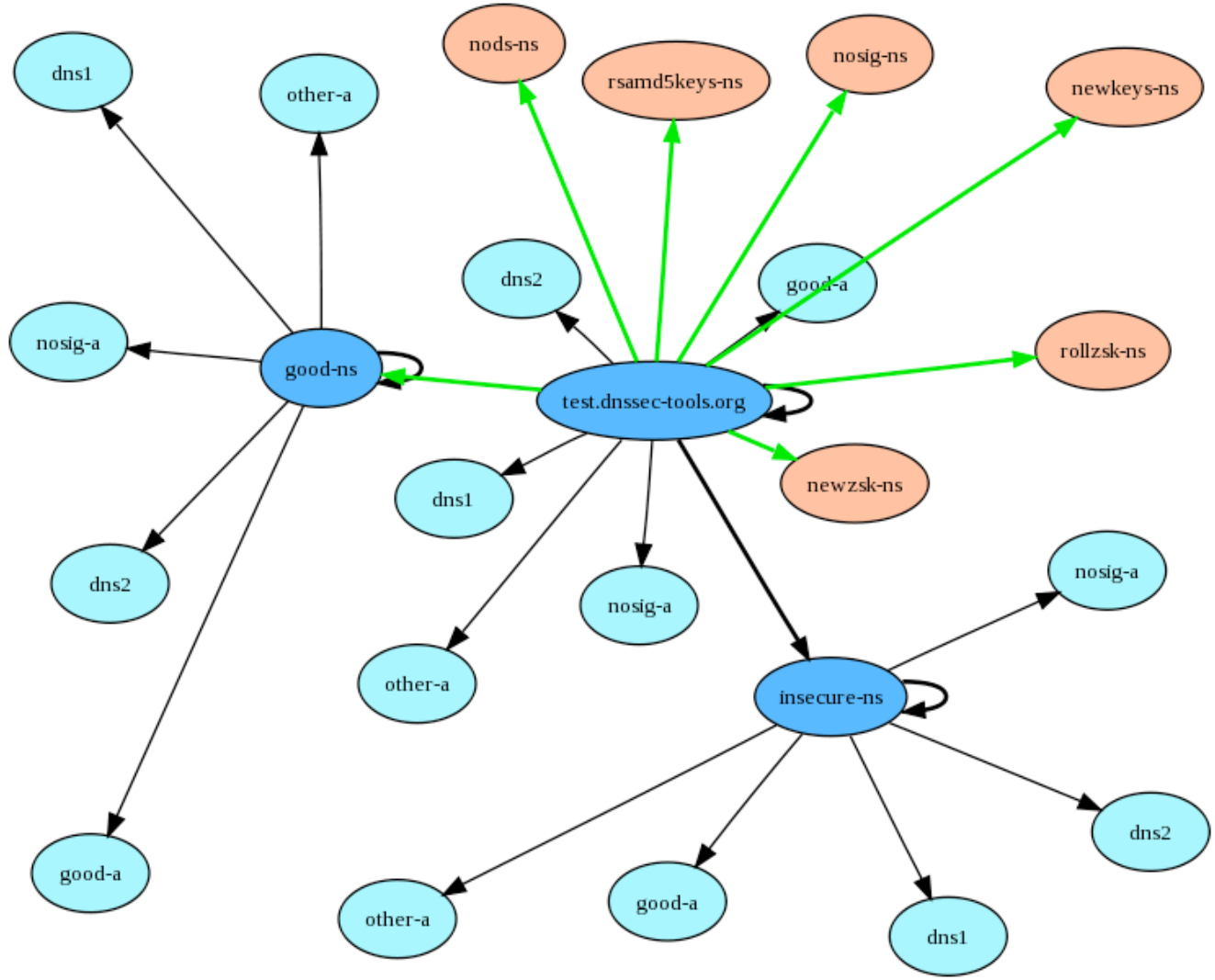
mapper: example

test.dnssec-tools.org



Authoritative Server Tools

A subset of the Zone owner tools:

- Zone Data Quality Assurance:
  - donuts
  - mapper
- Other tools, discused later may be useful too:
  - logwatch
  - dnspktflow

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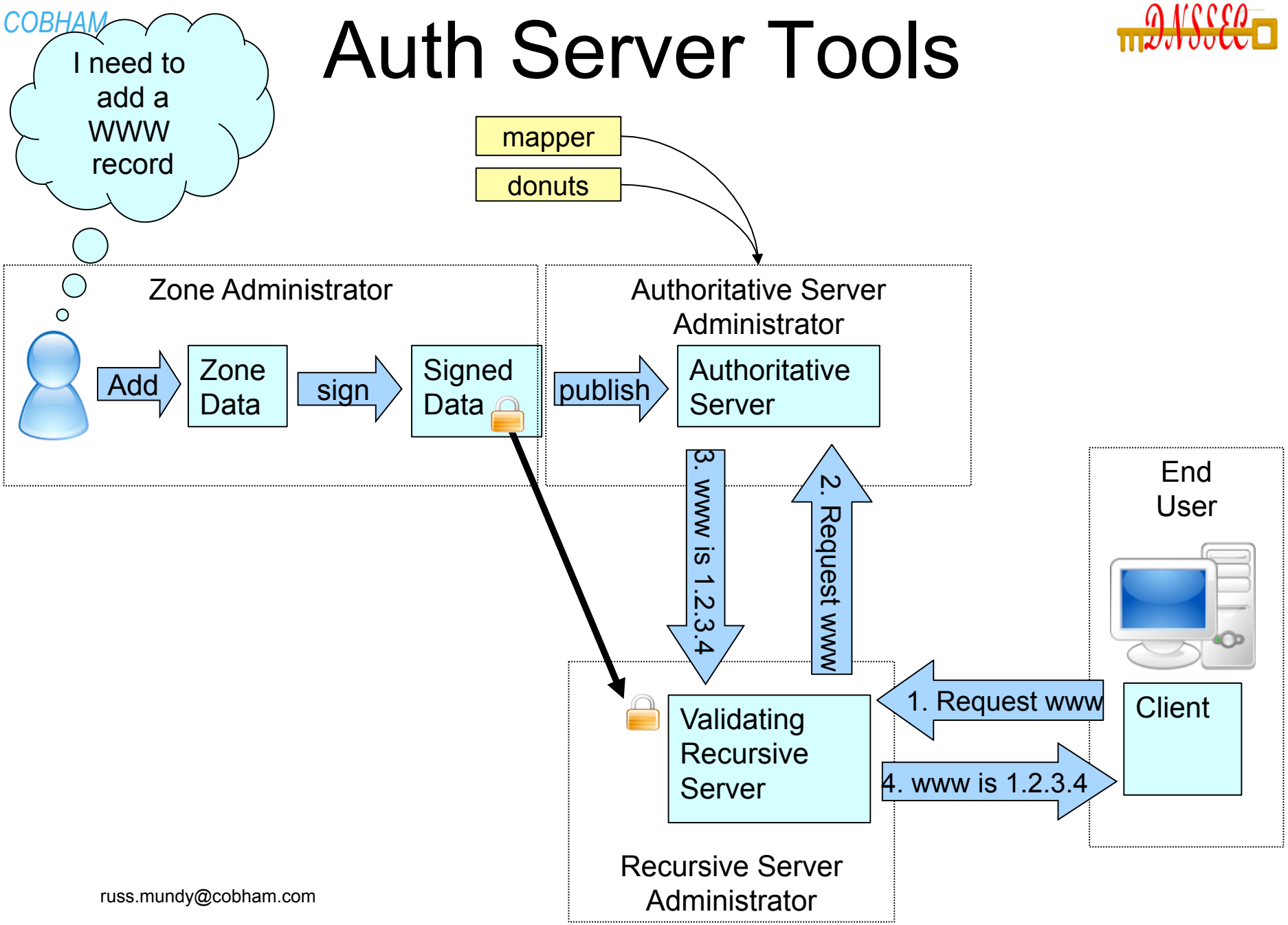
Auth Server Tools



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Validating Recursive Server Tools

- Trust Anchor Management
  - Trustman
- Debugging
  - dnspktflow
- Name Server Error Reporting
  - logwatch

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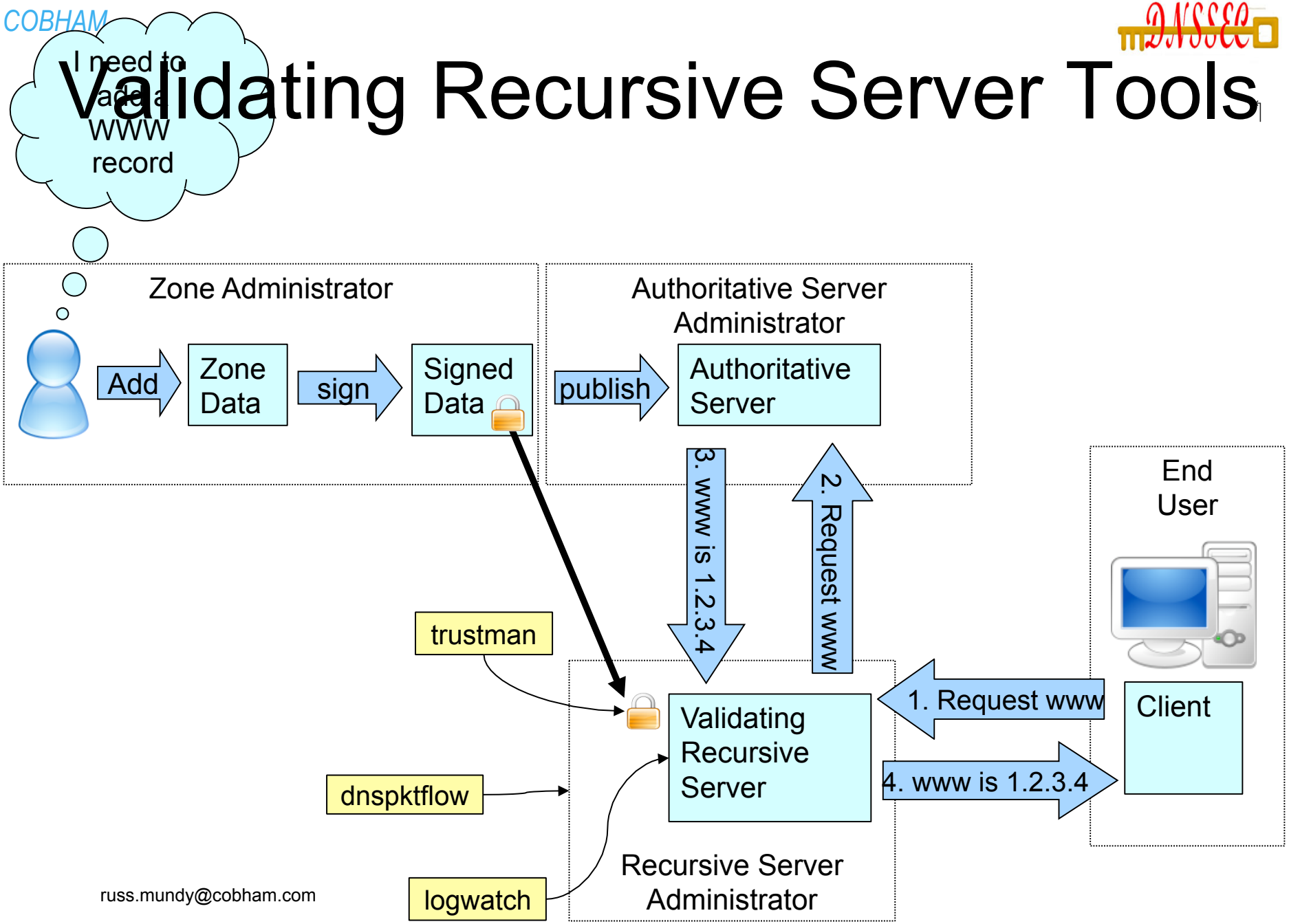
Validating Recursive Server Tools



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trustman

- Manages validating resolver trust anchors
  - Detects new keys being deployed
  - Updates/Notifies when new zone keys are detected
- RFC5011 compliant
- Runs as a Daemon
  - has a run-once mode

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dnspktflow

- Analyzes DNS packets within tcpdump files
- Requires wireshark
  - More importantly: tshark
- Draws a diagram with:
  - Numbered requests/responses
  - Request/response contents
  - Circles, arrows and implements of destruction

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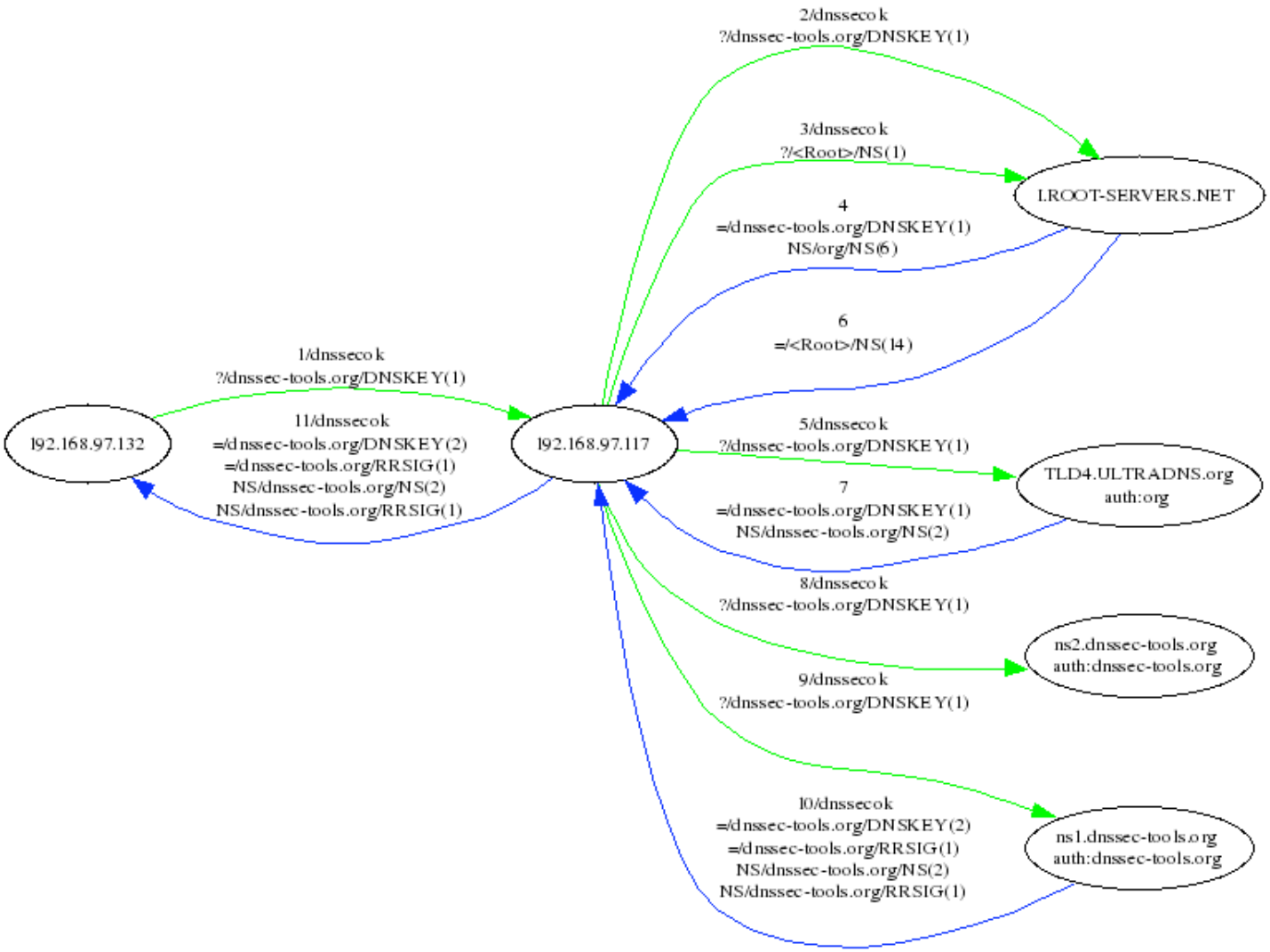
dnspktFlow: example



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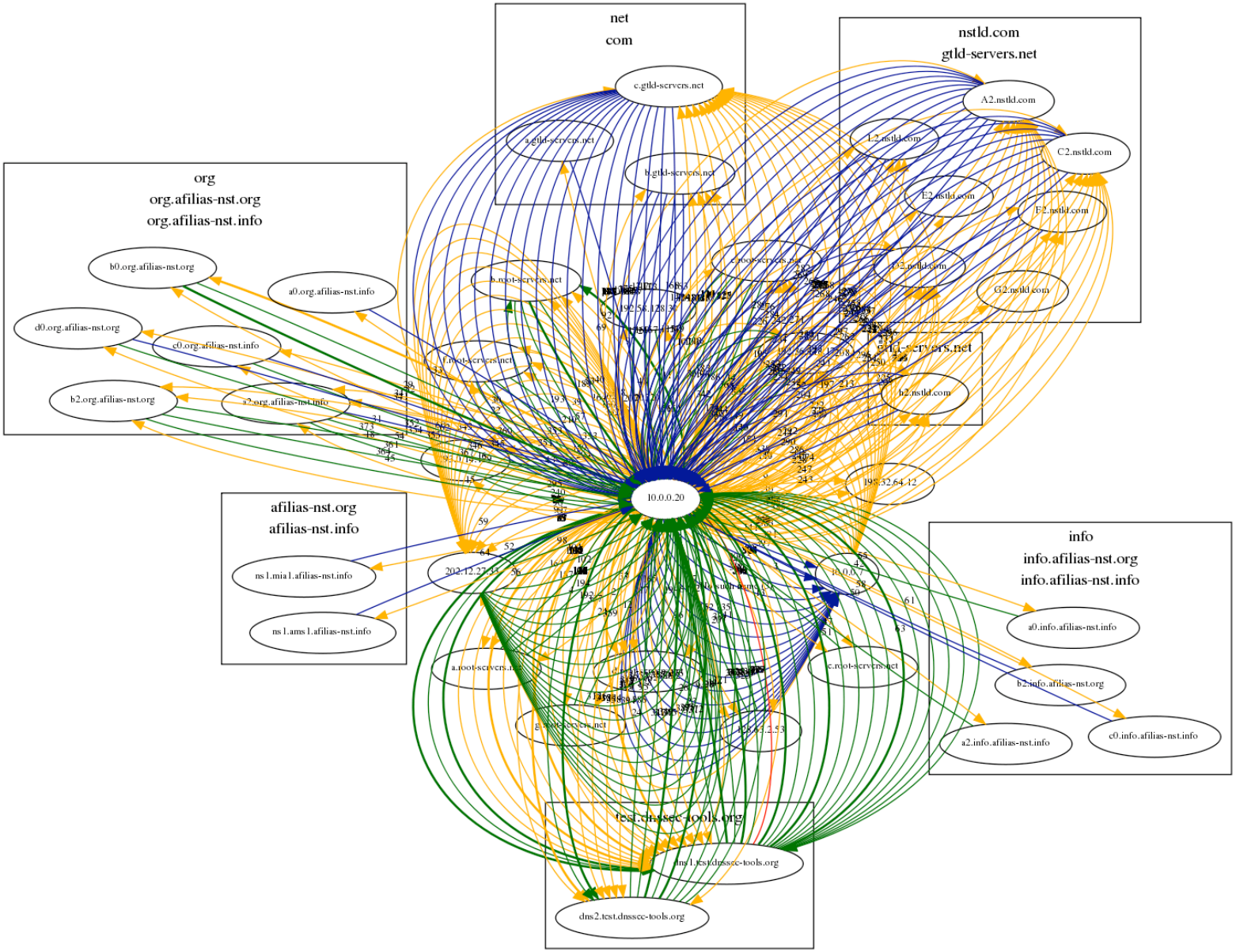
www.dnssec-tools.org



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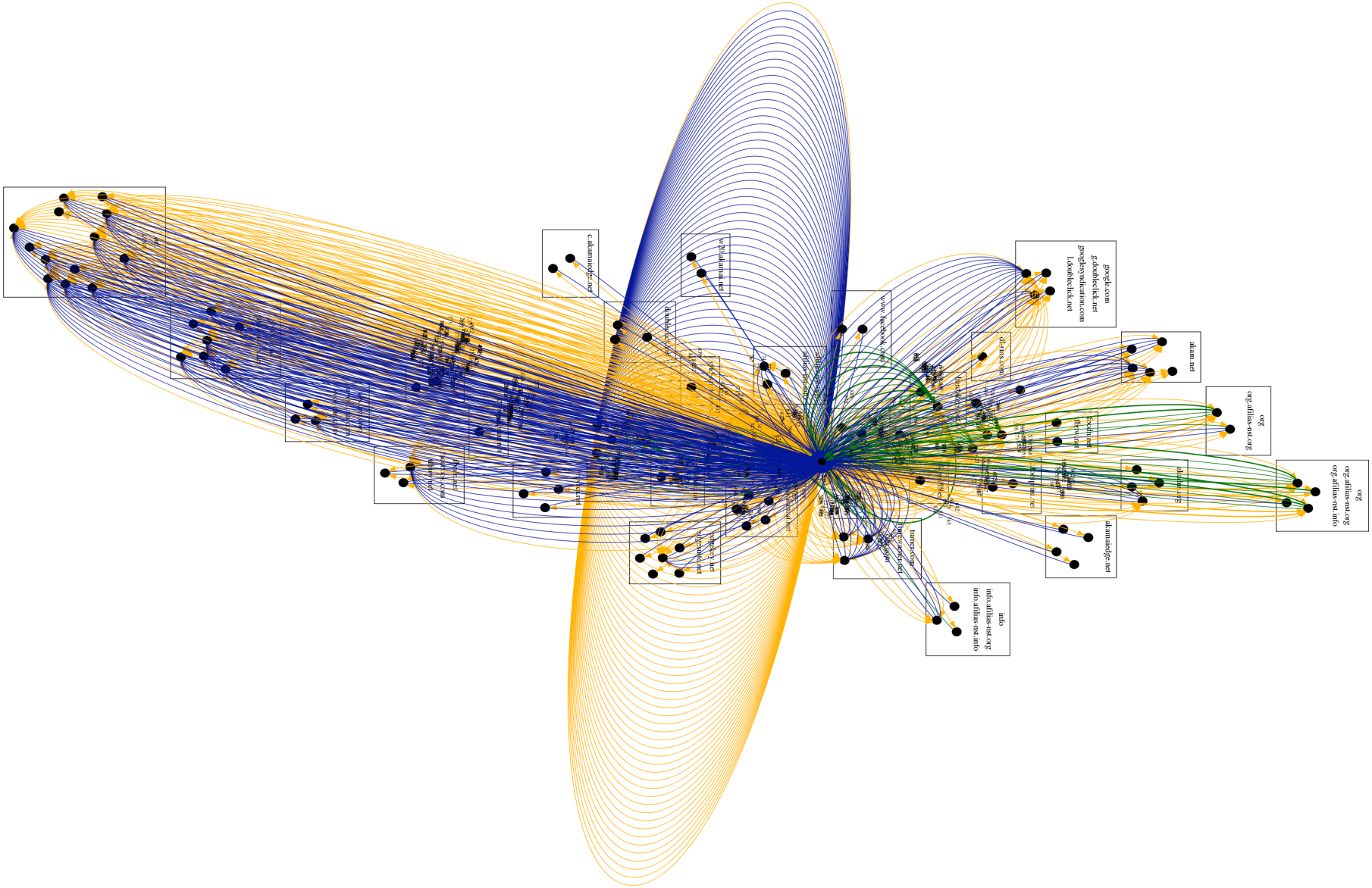
DNSSEC

www.cnn.com



logwatch

- Summarizes DNSSEC related output from bind
- Now included in logwatch 7.1 and beyond

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End-User Tools

- Libraries
  - Libval: a validating library for developers
  - Libval_shim:
    - system wide shim library
    - Forces all apps to be DNSSEC capable
- Perl modules
- Command-line troubleshooting utilities
- DNSSEC-enabled applications

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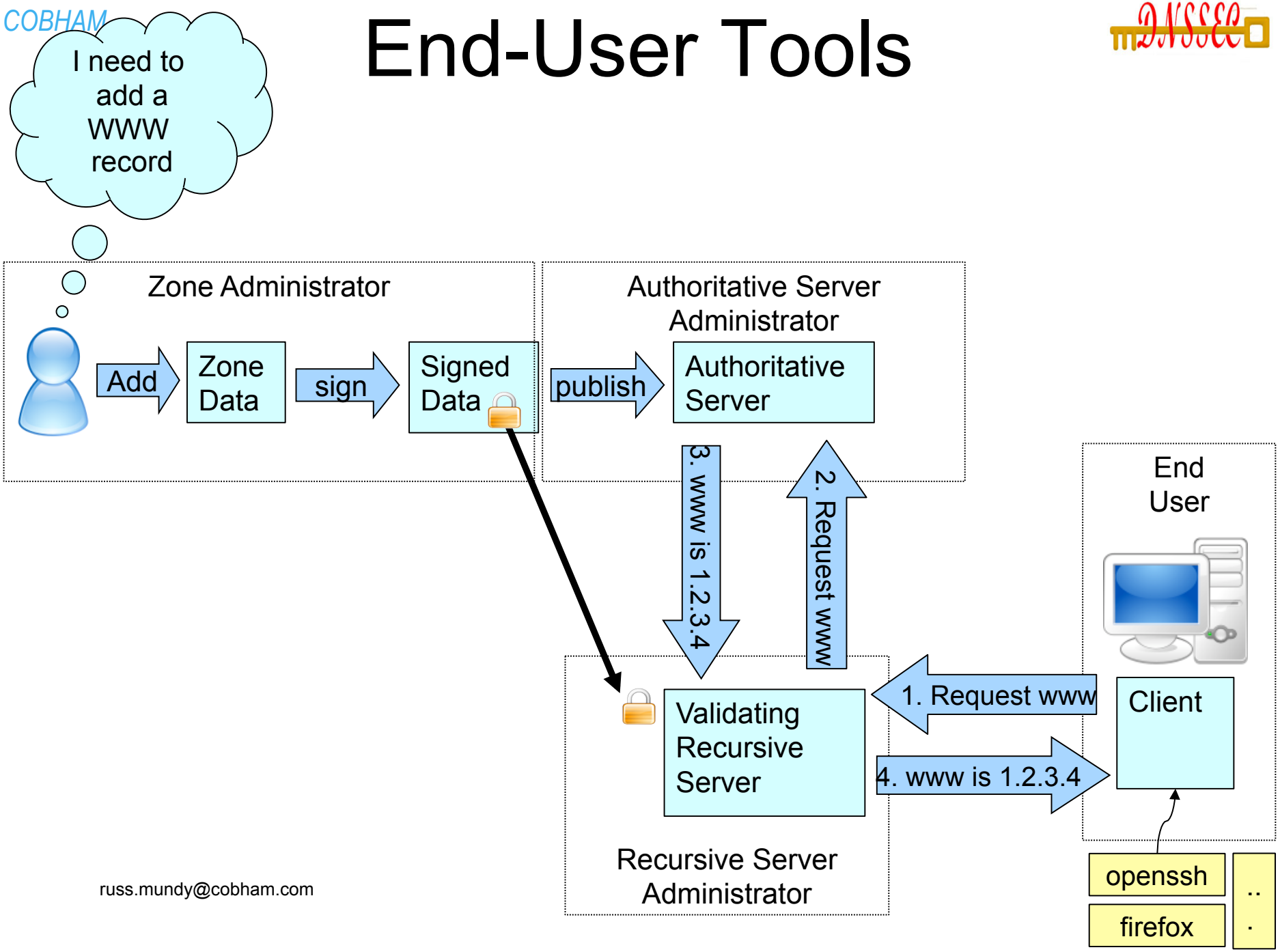
End-User Tools



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DNSSEC-Tools: Libraries

- DNSSEC validating resolver library - libval
  - Verifies DNS(SEC) data at the library layer
  - Portable-ish (getting more so)
  - Based on libbind
  - Thread-safe
  - Reentrant
  - Ca
    n
    p
    ull data directly or from a local caching resolver
  - BSD Licensed

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Libval_shim

- LD_PRELOAD-based approach for adding DNSSEC capability to existing applications
- The shim library implements most of the commonly-used resolver functions
  - Applications that use these functions can automatically become DNSSEC-capable if they run within an LD_PRELOAD environment with libval_shim.
  - Many applications are known to work out of the box with libval_shim

DNSSEC-Aware Applications

- DNSSEC-Tools contains patches to:
  - firefox
  - thunderbird
  - postfix, sendmail, LibSPF
  - wget, lftp, ncftp, proftpd
  - OpenSSH
  - OpenSWAN (opportunistic encryption)
  - Jabberd
- DNSSEC support provide through libval

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Developer Resources

- Test zone test.dnssec-tools.org
  - Contains many DNSSEC “errors” to test against
- Developers guide to using the validator and resolver libraries - work in progress
- PERL modules
  - Net::DNS::SEC::Tools
  - Net::DNS::SEC::Validator
  - Net::DNS::Zonefile::Fast
  - Net::addrinfo

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Validation Library API

- draft-hayatnagarkar-dnsext-validator-api-07.txt
  - Defines an API for interfacing with a validation library
  - Allows clients to state their policy
  - Allows clients to get DNS and validation results
    - High-level: val_gethostbyname
    - Low-level: val_resolve_and_check
    - Policy: val_istrusted
  - Implemented in DNSSEC-Tool's libval
- Not yet an IETF Working Group document

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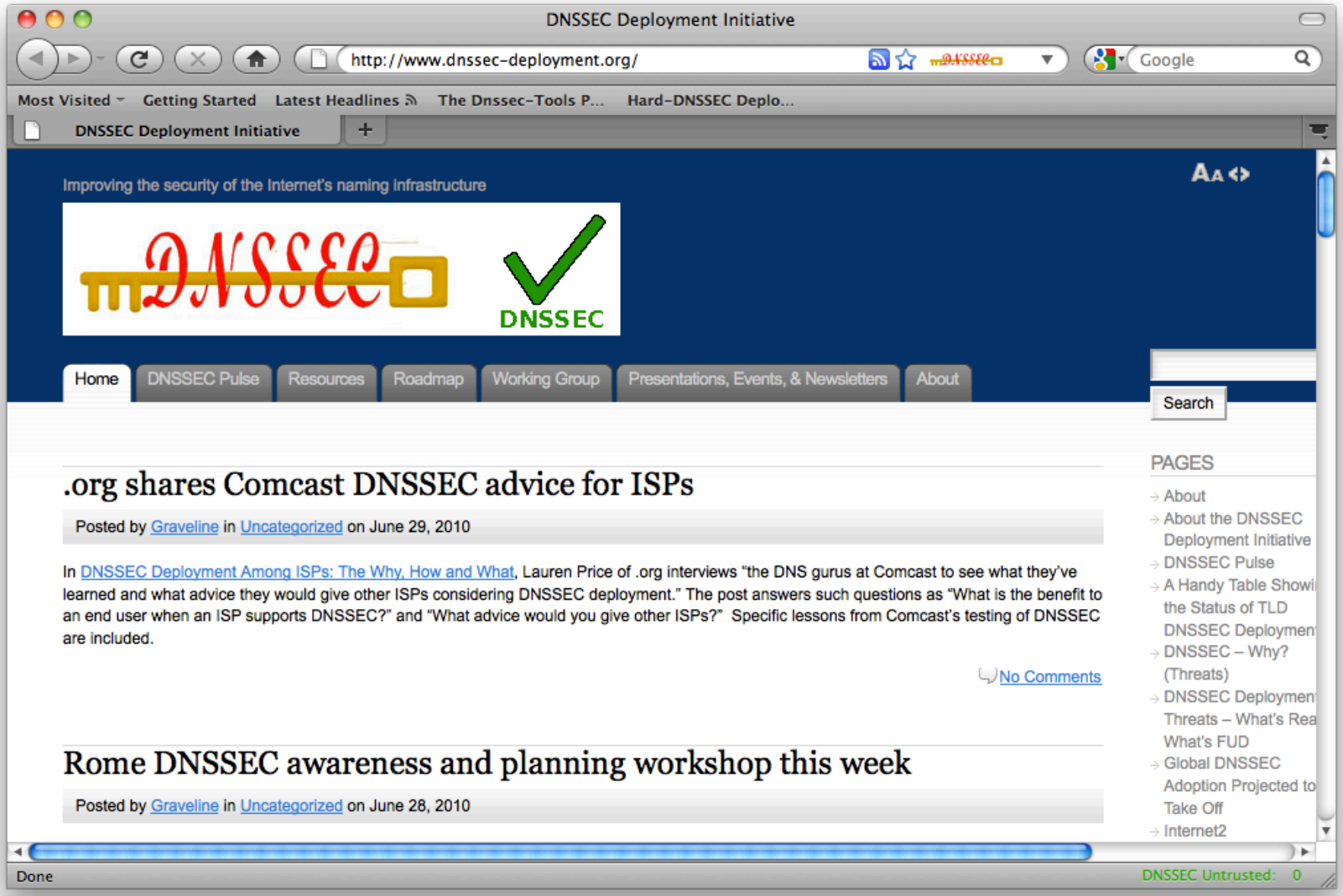
firefox


DNSSEC Deployment Initiative
http://www.dnssec-deployment.org/
Google
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The Dnssec-Tools P...
Hard-DNSSEC Deplo...
DNSSEC Deployment Initiative
Improving the security of the Internet's naming infrastructure
DNSSEC
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DNSSEC Pulse
Resources
Roadmap
Working Group
Presentations, Events, & Newsletters
About
Search
.org shares Comcast DNSSEC advice for ISPs
Posted by Graveline in Uncategorized on June 29, 2010
In DNSSEC Deployment Among ISPs: The Why, How and What, Lauren Price of .org interviews "the DNS gurus at Comcast to see what they've learned and what advice they would give other ISPs considering DNSSEC deployment." The post answers such questions as "What is the benefit to an end user when an ISP supports DNSSEC?" and "What advice would you give other ISPs?" Specific lessons from Comcast's testing of DNSSEC are included.
No Comments
Rome DNSSEC awareness and planning workshop this week
Posted by Graveline in Uncategorized on June 28, 2010
PAGES
About
About the DNSSEC Deployment Initiative
DNSSEC Pulse
DNSSEC – Why? (Threats)
Global DNSSEC Adoption Projected to Take Off
Internet2
Done
DNSSEC Untrusted: 0

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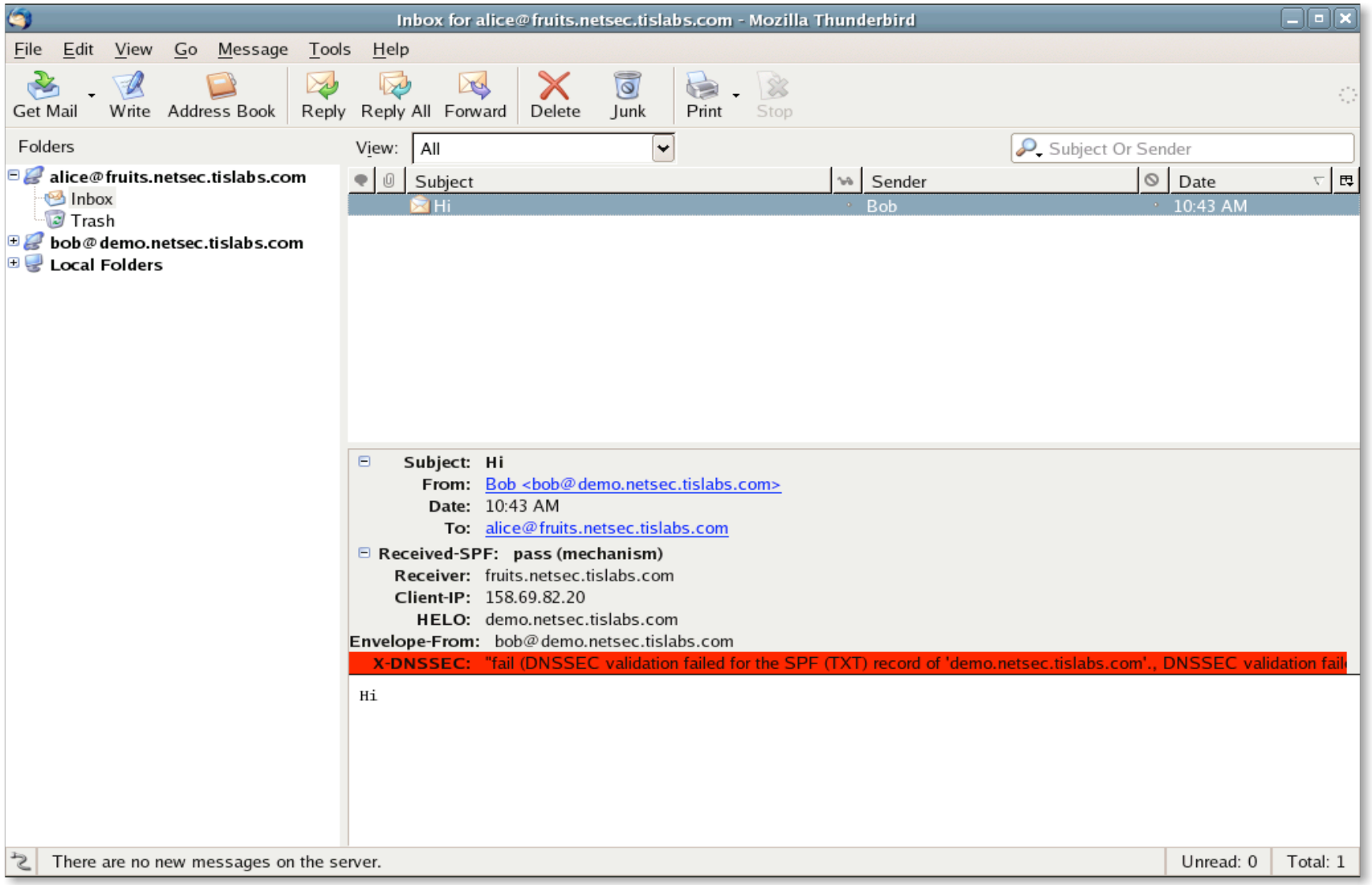
thunderbird



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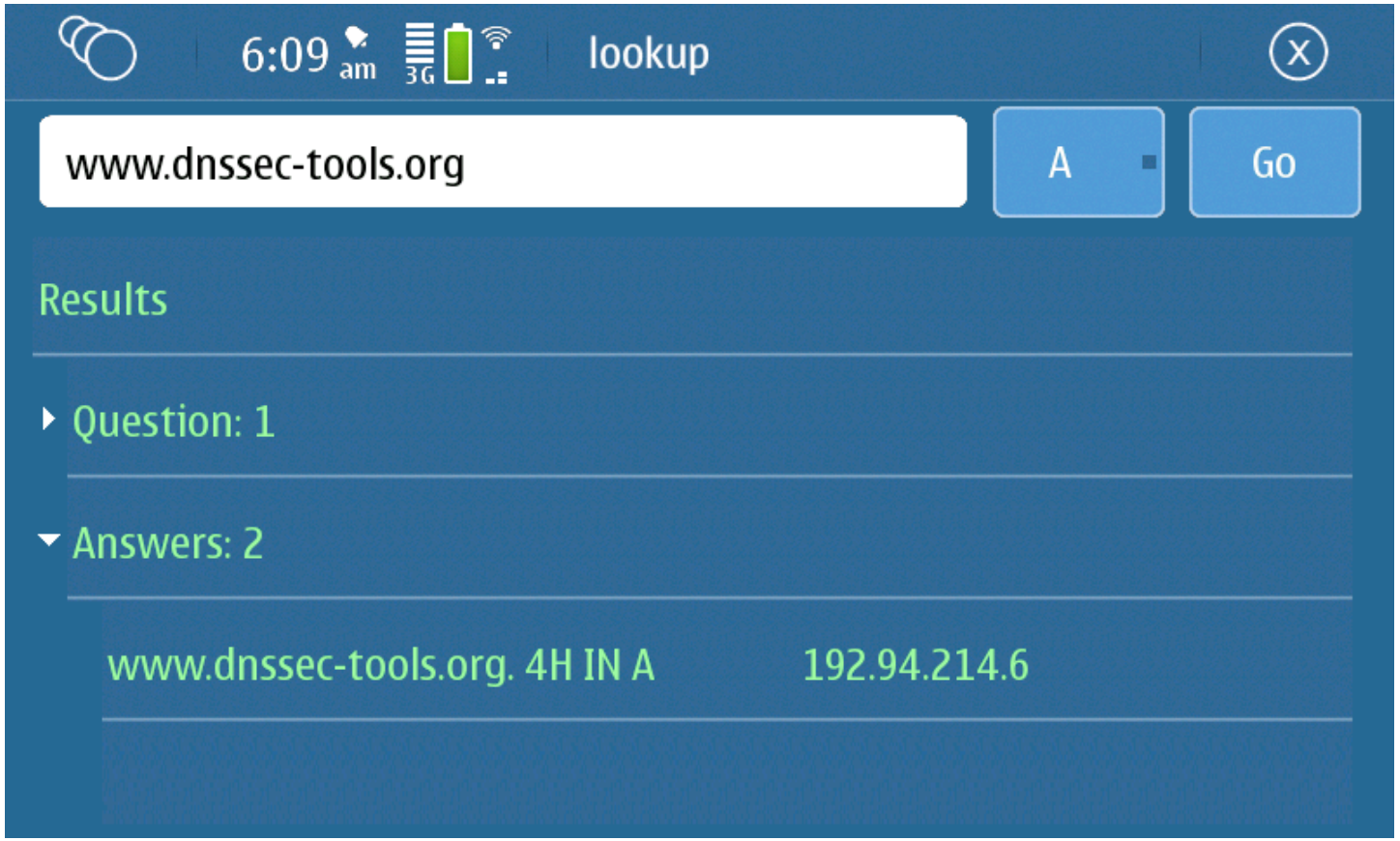
DNSSEC Aware Phone



N900 Users: it's “lookup” in extras-testing

postfix/sendmail/libspf

- Protects various attributes of mail processing
  - MX record lookups
  - SPF record lookups

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wget/lftp/ncftp

- Protects address lookup

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OpenSSH

- Protects address lookup
- Provides key discovery
  - Removes need for leap-of-faith
  - Protects against key reuse for key changes

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Documentation

- Step-by-step guide for DNSSEC operation using DNSSEC-Tools
- Step-by-step guide for DNSSEC operation using BIND tools
- Tutorials
- Wiki
- Manual pages
- User Documentation

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Where DNSSEC-Tools Fit

(illustration of only a few of the available tools)

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Survey of Resources Available for DNSSEC Deployment

https://www.dnssec-deployment.org/index.php/deployment-resources/survey/

Available Resources

- Various categories of resources are available
  - Tools for zone data administration
  - Tools for secure delegation registration
  - Tools for supporting operations at the validating systems including DNSSEC-capable applications
  - Developer resources
  - Operator guidance documentation
- Some of the available resources are catalogued at
  https://www.dnssec-deployment.org/index.php/deployment-resources/survey/
  - Approximately 100 tools listed in the catalogue

Available Resources (cont.)

- Good News:
  - Number of tools growing quickly
  - More challenging to keep the survey up to date
  - Check web site for updated information
- New people and organizations are releasing tools, e.g. Phreebird suite from Dan Kaminsky:

https://www.dnssec-deployment.org/index.php/deployment-resources/survey/

Name Servers

BIND	Authoritative, validating, recursive, and caching open source name server implementation	ISC	www.isc.org
NSD	Authoritative only, open source name server	NLNet Labs	http://www.nlnetlabs.nl/nsd
UNBOUND	Validating, recursive and caching open source name server	NLNet Labs, Verisign, Nominet, Kirei	http://unbound.net/
OpenDNSSEC	Open-source turn-key solution for DNSSEC	Collaborative effort, see website	http://www.opendnssec.org

Key Generation and Zone Signing

dnssec-keygen, dnssec-signzone	Standard tools provided with the BIND distribution	ISC	http://www.isc.org
jdnssec-keygen, jdnssec-signzone	Tools from the jdnssec-tools suite	Verisign Labs	http://www.verisignlabs.com/dnssec-tools/
ldns-keygen, ldns-signzone	Tools from the ldns tool suite	NLNet Labs	http://www.nlnetlabs.nl/ldns/
pdnssec-keygen, pdnssec-signzone,	Tools from the DNSSEC perltools distribution	Roy Arends	http://www.nsec3.org/cgi-bin/trac.cgi/browser/dnssec/perltools/
zonesigner	Wrapper around BIND tools, available in the dnssec-tools suite	Cobham	http://www.dnssec-tools.org/wiki/index.php/Zonesigner
dnssec-zkt and dnssec-signer -	Wrapper around BIND tools	HZNET	http://www.hznet.de/dns/zkt/
ldns-zsplit and ldns-zcat	Tool from the ldns package for enabling parallel signing a large zone	NLNetLabs	http://www.nlnetlabs.nl/ldns/
maintkeydb, dnssigner	Tools from the DNSSEC Key Management Tools suite	RIPE NCC	https://www.ripe.net/projects/disi/dnssec_maint_tool/
OpenDNSSEC	Open-source turn-key solution for DNSSEC	Collaborative effort, see website	http://www.opendnssec.org

Key Rollover

Rollerd and rollctl	Tool from the dnssec-tools package for managing different phases of ZSK and KSK rollover	Cobham	http://www.dnssec-tools.org/wiki/index.php/Rollerd
Maintkeydb	Command line interface to a database containing DNSSEC Keys	RIPE NCC	https://www.ripe.net/projects/disi/dnssec_maint_tool/
OpenDNSSEC	Open source turn-key solution for DNSSEC	Collaborative effort, see website	http://www.opendnssec.org

Hardware Interface

DNSSEC Smartcard Utility	Supports operations for storing keys to Any PKCS#15 smartcard supported by OpenSC and exporting them as DNSSEC records	.SE	http://opensource.iis.se/trac/dnssec/browser/pkcs15-dnssec
pkcs11HSMtools	Modifications to BIND for native PKCS-11 HSM support	IANA	http://www.xtcn.com/~lamb/pkcs11HSMtools.tar.gz
Software for interfacing with crypto hardware	EVP Perl Implementation	Nominet	www.nominet.com

Zone Troubleshooting

SZIT monitor extension	Tests the zone contents against best common practices and overall security	NIST	http://snad.ncsl.nist.gov/dnssec/
donuts and donutsd	A dnslint like application available in the dnssec-tools suite, for analyzing zone files.	Cobham	http://www.dnssec-tools.org/wiki/index.php/Donuts
Mapper	Tool in the dnssec-tools suite that maps DNS realms, color coding the results to allow for easy visual interpretation of the results	Cobham	http://www.dnssec-tools.org/wiki/index.php/Mapper
jdnssec-verifyzone	Verifies all of the signatures in a zone for cryptographic validity	Verisign Labs	http://www.verisignlabs.com/dnssec-tools/
named-checkzone	Standard tool provided with the BIND distribution	ISC, BIND	www.isc.org

DS Record Creation

dnssec-dstool	simple tool for generating DS (or DLV) records from DNSKEY records	Verisign Labs	http://www.verisignlabs.com /dnssec-tools/
ldns-key2dns	DNSKEY to DS conversion	NLNet Labs	http://www.nlnetlabs.nl/ldns/
Key2ds, Net::DNS::Sec	DNSKEY to DS conversion	Olaf Kolkman	http://www.net-dns.org/

Update to Parent

Regsoft	Front-end for updating contents of a registry	Shinkuro, Inc	
CADR	registrar software that can move keys from sub-zones to parent zones	Afilias, Shinkuro, SPARTA, EP.net	http://cadr.rs.net/
libepp-nicbr	library that partially implements the Extensible Provisioning Protocol (EPP), as described in the Internet Drafts RFC3730bis to RFC3734bis and RFC3735	NIC.br	http://registro.br/epp/index-EN.html

Fetching Key Information

ISC DLV registry	Trust Anchor Repository constructed through explicit zone owner registration	ISC	https://secure.isc.org/index.pl?/ops/dlv/
Secspider	Trust Anchor Repository populated by a crawler program	UCLA, Colorado State	http://secspider.cs.ucla.edu/
IKS Jena Survey	Trust Anchor Repository populated by a crawler program	IKS Jena	http://www.iks-jena.de/leistungen/dnssec.php
IANA TAR	(Currently) demo Trust Anchor Repository for SEP keys for TLDs	IANA	https://ns.iana.org/dnssec/status.html
ldns-keyfetcher	queries and retrieves DNSKEYs for a given domain	NLNet Labs	http://www.nlnetlabs.nl/ldns/
getdnskeys	Tool in the dnssec-tools suite for fetching, comparing and remembering a list of DNSKEYs from DNS zones	Cobham	www.dnssec-tools.org

Automated TA Rollover

trustman	Implementation of RFC 5011 for automated rollover of trust anchors in validating resolvers. Tool available in the dnssec-tools distribution	Cobham	http://www.dnssec-tools.org/wiki/index.php/Trustman

Troubleshooting

dig	Standard tool provided with the BIND software	ISC	www.isc.org
drill	Debugging/query tool for DNSSEC, similar to dig	NLNet Labs	http://www.nlnetlabs.nl/ldns/
validate	A tool that helps determine the validation status for a DNS record and the reasons for validation failure if any	Cobham	http://www.dnssec-tools.org/wiki/index.php/Validate
dnspktflow	This tool, when combined with tethereal and graphviz, can trace tcpdump/tethereal network packet captures to visually diagram dns packet flows	Cobham	http://www.dnssec-tools.org/wiki/index.php/Dnspktflow
Traffic Monitoring Tool	Tool to capture and analyze DNS traffic to and from a name server	NIST	http://snad.ncsl.nist.gov/dnssec/
dnsdump	Perl script that captures and displays DNS packets seen on the network	The Measurement Factory	http://dns.measurement-factory.com/tools/dnsdump/
dnscap	network capture utility designed specifically for DNS traffic	OARCI	http://public.oarci.net/tools/dnscap
Logwatch	Configuration plugin to have logwatch perform DNSSEc parsing of system logging messages from running BIND name serverq	Plugin provided by Cobham available in the logwatch distribution	http://www2.logwatch.org:81/

DNSSEC Capable Applications

Firefox	patch that enables DNSSEC checking of DNS lookups done with Firefox	Cobham	http://www.dnssec-tools.org/wiki/index.php/Firefox
Firefox Addon	Checks DNSSEC validity of DNS portion of url bar	Cz nic Labs	https://addons.mozilla.org/en-US/firefox/addon/64247
Thunderbird	patch that enables DNSSEC validation in the Thunderbird mail app	Cobham	http://www.dnssec-tools.org/wiki/index.php/Thunderbird
SSH	patch that contains support for local DNSSEC validation for all DNS lookups	Cobham	http://www.dnssec-tools.org/wiki/index.php/Ssh
Sendmail	patch for adding DNSSEC validation support during lookups	Cobham	http://www.dnssec-tools.org/wiki/index.php/Sendmail
Postfix	patch for adding DNSSEC validation support during lookups	Cobham	http://www.dnssec-tools.org/wiki/index.php/Postfix
libsf2	patch for adding DNSSEC validation support during lookups and adding a new field in the mail header based on the results of the checks	Cobham	http://www.dnssec-tools.org/wiki/index.php/LibSPF
wget	patch to enable DNSSEC validation in wget	Cobham	http://www.dnssec-tools.org/wiki/index.php/Wget
ncftp	patch to enable DNSSEC validation during lookups	Cobham	http://www.dnssec-tools.org/wiki/index.php/Ncftp
proftpd	patch to enable DNSSEC validation during lookups	Cobham	http://www.dnssec-tools.org/wiki/index.php/Proftpd

Validation Libraries

libval	A C library that provides interfaces for name lookup with DNSSEC validation support.	Cobham	http://www.dnssec-tools.org/docs/tool-description/libval.html
libval_shim	LD_PRELOAD-based approach for transparently adding DNSSEC capability to existing applications	Cobham	http://www.dnssec-tools.org/docs/tool-description/libval_shim.html
ldns library	A C library that provides validation capability	NLNet Labs	http://www.nlnetlabs.nl/ldns/
libunbound	A C library that can be linked against applications to provide validation capability	NLNet Labs, Verisign, Nominet, Kirei	http://unbound.net/

Perl SDKs

Net::DNS::SEC	Extension to Net::DNS with DNSSEC functionality	RIPE NCC	http://www.net-dns.org/
Net::DNS::SEC::Tools	Tools and modules that provide zone signing and key management configuration utilities.	Cobham	http://www.dnssec-tools.org/
Net::DNS::ZoneFile::Fast	provides the ability to parse zone files that BIND8 and BIND9 use, fast.	Anton Berezin and Cobham	http://search.cpan.org/dist/Net-DNS-ZoneFile-Fast/Fast.pm

Validator API

DNSSEC Validator API	Proposed API between applications and security aware validating stub resolvers	Cobham	http://tools.ietf.org/id/draft-hayatnagarkar-dnsext-validator-api-07.txt
libunbound API	API provided by the libunbound library	NLNet Labs, Verisign, Nominet, Kirei	http://www.unbound.net/documentation/index.html

Testing Resources

maketestzone	useful for generating test data which DNSSEC aware software can be tested against	Cobham	www.dnssec-tools.org
Querysim	A DNS traffic replay tool	NIST	http://snad.ncsl.nist.gov/dnssec/
Packet Server	A tool that helps crafting packets with various settings to test the behavior of validating resolvers	Roy Arends	http://www.nsec3.org/cgi-bin/trac.cgi/browser/dnssec/perltools/

Operator Guidance Documentation

NIST Special Publication 800-81	Recommendations of the National Institute of Science and Technology, Deployment Guide	NIST	http://csrc.nist.gov/publications/nistpubs/
RFC 4641	DNSSEC Operational Practices	IETF	http://www.ietf.org/rfc/rfc4641.txt
Step-by-Step guides	Guides for signed zone operation	Cobham	http://www.dnssec-tools.org/resources/documentation.html
DNSSEC Howto	A tutorial in disguise	NLNet Labs	http://www.nlnetlabs.nl/dnssec_howto/

Summary

- DNSSEC adds to cost and complexity but the availability of good tools can reduce much of this.
- DNS operators have diverse environments, so tools should be modular and extensible
  - Possible to envision tool suites that wrap around existing tools and hand-walk an administrator through the process of deploying DNSSEC
- A number of tools that enable DNSSEC deployment for various environments exist ***today***; the DNSSEC-Tools suite provides many of them.
- A number of DNSSEC-capable applications are also available
  - Complexity of retrofitting DNSSEC in applications depends on the complexity of the application design.
  - API development work is ongoing.

Comments or Questions?

(If time permits)

http://www.dnssec-tools.org
http://www.dnssec-deployment.org

Questions, comments and other feedback can be sent to
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