DNSSEC for the Root Zone

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This design is the result of a cooperation between ICANN & VeriSign with support from the U.S. DoC NTIA

Roles and Responsibilities

ICANN

IANA Functions Operator

- Manages the Key Signing Key (KSK)
- Accepts DS records from TLD operators
- Verifies and processes request
- Sends update requests to DoC for authorization and to VeriSign for implementation

DoC NTIA

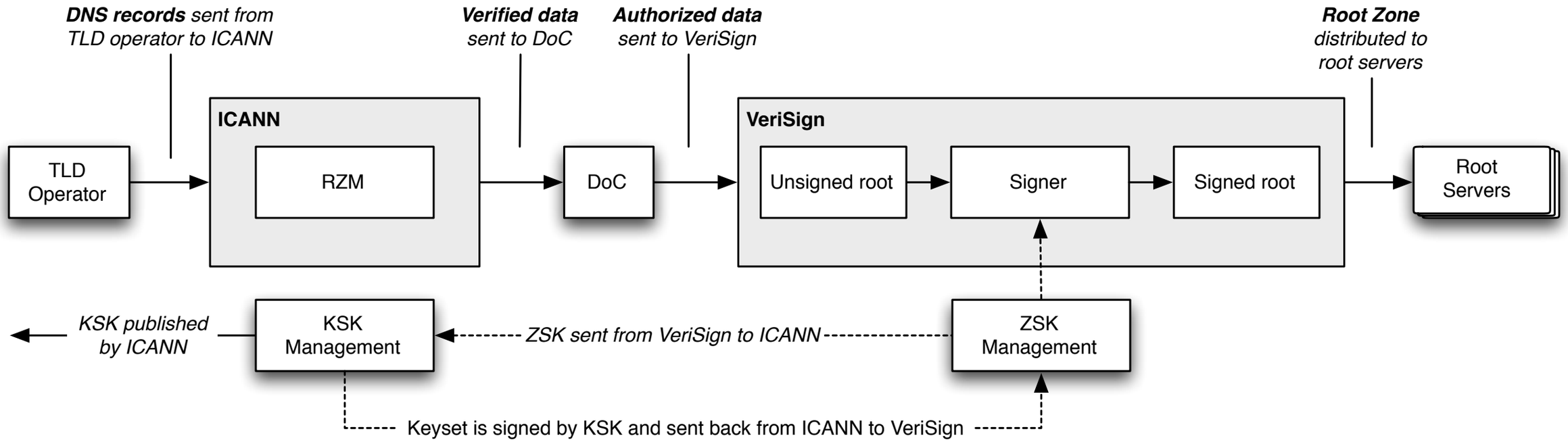
U.S. Department of Commerce
National Telecommunications and Information Administration

- Authorizes changes to the root zone
  - DS records
  - Key Signing Keys
  - DNSSEC update requests follow the same process as other changes
- Checks that ICANN has followed their agreed upon verification/processing policies and procedures

VeriSign

Root Zone Maintainer

- Manages the Zone Signing Key (ZSK)
- Incorporates NTIA-authorized changes
- Signs the root zone with the ZSK
- Distributes the signed zone to the root server operators


DNS records *sent from TLD operator to ICANN*
Verified data *sent to DoC*
Authorized data *sent to VeriSign*
Root Zone *distributed to root servers*
TLD Operator
ICANN
RZM
DoC
VeriSign
Unsigned root
Signer
Signed root
Root Servers
KSK published by ICANN
KSK Management
ZSK sent from VeriSign to ICANN
ZSK Management
Keyset is signed by KSK and sent back from ICANN to VeriSign

Deployment

Goals

- Deploy a signed root zone
  - Transparent processes
  - Audited procedures
  - DNSSEC deployment
    - validators, registries, registrars, name server operators
- Communicate early and often!

Anticipated Issues

DO=1

- A significant proportion of DNS clients send queries with EDNS0 and DO=1
- Some (largely unquantified, but potentially significant) population of such clients are unable to receive large responses
- Serving signed responses might break those clients

Rollback

- If we sign the root, there will be some early validator deployment
- There is the potential for some clients to break, perhaps badly enough that we need to un-sign the root (e.g., see previous slide)
- Un-signing the root will break the DNS for validators

Staged Deployment

Deploy Incrementally

- The goal is to leave the client population with some root servers not offering large responses until the impact of those large responses is better understood
- Relies upon resolvers not always choosing a single server

DURZ

- Deploy conservatively
  - It is the root zone, after all
- Prevent a community of validators from forming
  - This allows us to unsign the root zone during the deployment phase (if we have) to without collateral damage

DURZ

- "Deliberately Unvalidatable Root Zone"
- Sign RRSets with keys that are not published in the zone (but with matching keytag…)
- Publish keys in the zone which are not used, and which additionally contain advice for operators (see next slide)
- Swap in actual signing keys (which enables validation) at the end of the deployment process

DURZ

```
.       3600    IN      DNSKEY  257  3  5 (
                        AwEAAa++++++++++++++++++++++++++++++++
                        ++THIS/KEY/AN/INVALID/KEY/AND/SHOULD
                        /NOT/BE/USED/CONTACT/ROOTSIGN/AT/ICA
                        NN/DOT/ORG/FOR/MORE/INFORMATION+++++
                        ++++++++++++++++++++++++++++++++++++
                        ++++++++++++++++++++++++++++++++++++
                        ++++++++++++++++++++++++++++++++++++
                        ++++++++++++++++++++++++++++++++++++
                        ++++++++++++++++++++++++++++++++++++
                        ++++++++++++++++++++++/=
                        ) ; Key ID = 6477
```

Deploy Incrementally

L	Completed on 27 January
A	Completed on 10 February
M, I	Completed on 3 March
D, K, E	Completed March 22nd
B, H, C, G, F	Being Completed this week. “April 14th”
J	May 5th

Measurement

- For those root servers that are instrumented, full packet captures and subsequent analysis around signing events
- Ongoing dialogue with operator communities to assess real-world impact of changes

Testing

- A prerequisite for this proposal is a captive test of the deployment
  - Test widely-deployed resolvers, with validation enabled and disabled, against the DURZ
  - Test with clients behind broken networks that drop large responses

Interaction with TLDs

DS Change Requests

- Approach likely to be based on existing methods for TLD managers to request changes in root zone
- Anticipate being able to accept DS requests 1-2 months before the validatable signed root zone is in production
- Current topic of discussion within Root DNSSEC Design Team

Communication

Project Web Page

- http://www.root-dnssec.org
  - Status updates
  - Documents
  - Presentation Archive
  - Small collection of links to relevant tools
  - Contact information
  - RSS

Communication

with non-technical audiences

- Will reach the non-technical and semi-technical audiences with press releases and other means.
- PR departments with people who know how to do this will be engaged.

Communication

with technical audiences

- Reaching the technical audiences via mailing lists and other means
  - IETF DNS lists (e.g. DNSOP)
  - non-IETF DNS lists (e.g. DNS-OARC)
  - General operator lists (e.g. MENOG)
  - …

Draft Timeline

- December 1, 2009
  - **Root zone signed**
    - Initially signed zone stays internal to ICANN and VeriSign
  - ICANN and VeriSign begin KSR processing
    - ZSK and KSK rolls
- January - July 2010
  - Incremental roll out of signed root
- July 1, 2010
  - KSK rolled and trust anchor published
  - **Signed root fully deployed**

Deployment Status

13 April 2010

Documentation

- Requirements document posted
- High-Level Architecture, Policy and Practice Statements, Trust Anchor Publication, Deployment documents posted in draft form
- Ceremony, KSK Facility Requirements, Testing documents expected to be posted soon

http://www.root-dnssec.org

Testing

- Data collection testing by Root Server Operators complete - have now done this for real
- Several KSR/SKR exchanges complete
- DURZ vs. Resolver testing complete

DURZ Roll-Out

- L, A, M, I, D, K, and E root servers are running the DURZ
- B C G F and H will complete the transition this week.
- J will have DURZ on 5 May 2010

Other zones

ARPA is now signed

Work on how to sign IN-ADDR.ARPA, IP6.ARPA is happening and reasonable progress is expected.

Thoughts?

- Feedback is extremely welcome
  - Email to rootsign@icann.org

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