CONTRACTOR'S QUARTERLY PROGRESS, STATUS AND MANAGEMENT REPORT

1 September - 31 December 2011

DOMAIN NAME SYSTEM SECURITY (DNSSEC) DEPLOYMENT COORDINATION

Contract No: FA 8750-10-C-0020

Data Item A001, CLIN 0002

Submitted by:

Shinkuro, Inc.
Bethesda, MD

Stephen D. Crocker
Principal Investigator

Jeffrey Dewhurst
Financial and Contract Administration

January 2012

Progress Against Planned Objectives (3.1.1)

- Began Preparations for FOSE 2012 Conference and Exposition April 3-5, 2012
- Steve Crocker continued work as Chairman of an FCC Working Group on DNSSEC Deployment
    - Meetings were held September 23, October 18, Steve Crocker and Jeffrey Dewhurst attended a meeting at the FCC on December 16th.
- Continued work on new Roadmap
- Updated maps on the deployment of DNSSEC in ccTLDs, began update and revision of database system.
- Olafur Gudmundsson Attended the Global IPv6 Global Summit meeting in Taipei, Taiwan, and gave a presentation "DNSSEC in the Modern World"
- Olafur Gudmundsson also attended the IETF meeting in Taipei, Taiwan, and convinced the DANE Working Group to adopt the policy of only using DNSSEC validated input.
- Olafur Gudmundsson assisted the FCC in preparing regulations for ISPs using DNSSEC.

Technical Accomplishments This Period (3.1.2)

- Completed initial version of NSEC3 Zone Size Probe program
    - Uses the information in the NSEC chain to derive the number of signed delegations in the zone. This allows us to measure the uptake of DNSSEC.

Improvements to Prototypes This Period (3.1.3)

None this period

Deliverables This Period (3.1.5)

- Initial version of NSEC3 Zone Size Probe program tarball (92mb)

Publications This Period (3.1.7)

- "DNSSEC in the Modern World", presented at the Global IPv6 Summit

Meetings and Presentations This Period (3.1.8)

- Meeting to work on new Roadmap September 6
- Steve Crocker chaired meetings of the FCC Working Group on DNSSEC Deployment, meetings were held September 23, October 18. Steve Crocker and Jeffrey Dewhurst attended a meeting at the FCC on December 16th.
- DNSSEC Deployment Coordination Meetings were held at Shinkuro's offices on October 7, and November 8, and December 6.
- Steve Crocker attended the ICANN Meeting in Dakar, Senegal, October 23 – 28.
- Olafur Gudmundsson attended the IETF Meeting in Taipei, Taiwan, November 13 - 18.
- Olafur Gudmundsson attended the Global IPv6 Summit in Taipei, Taiwan, November 15 – 17.

Issues or Concerns (3.1.9)

None at this time.

Planned Activities (3.2.1), Information Covering the Next Three Months

- Coordination meetings are scheduled for January 3, January 31, and February 28 at Shinkuro.
- ICANN Meeting in San Jose, Costa Rica, March 11 – 16
- FCC Working Group presentations, March 22
- IETF Paris, France, March 25 - 30.

Attachments (1)

"DNSSEC in the Modern World" by Olafur Gudmundsson

DNSSEC IN THE MODERN WORLD

Ólafur Guðumundsson
Shinkuro, Inc.
Ogud@shinkuro.com

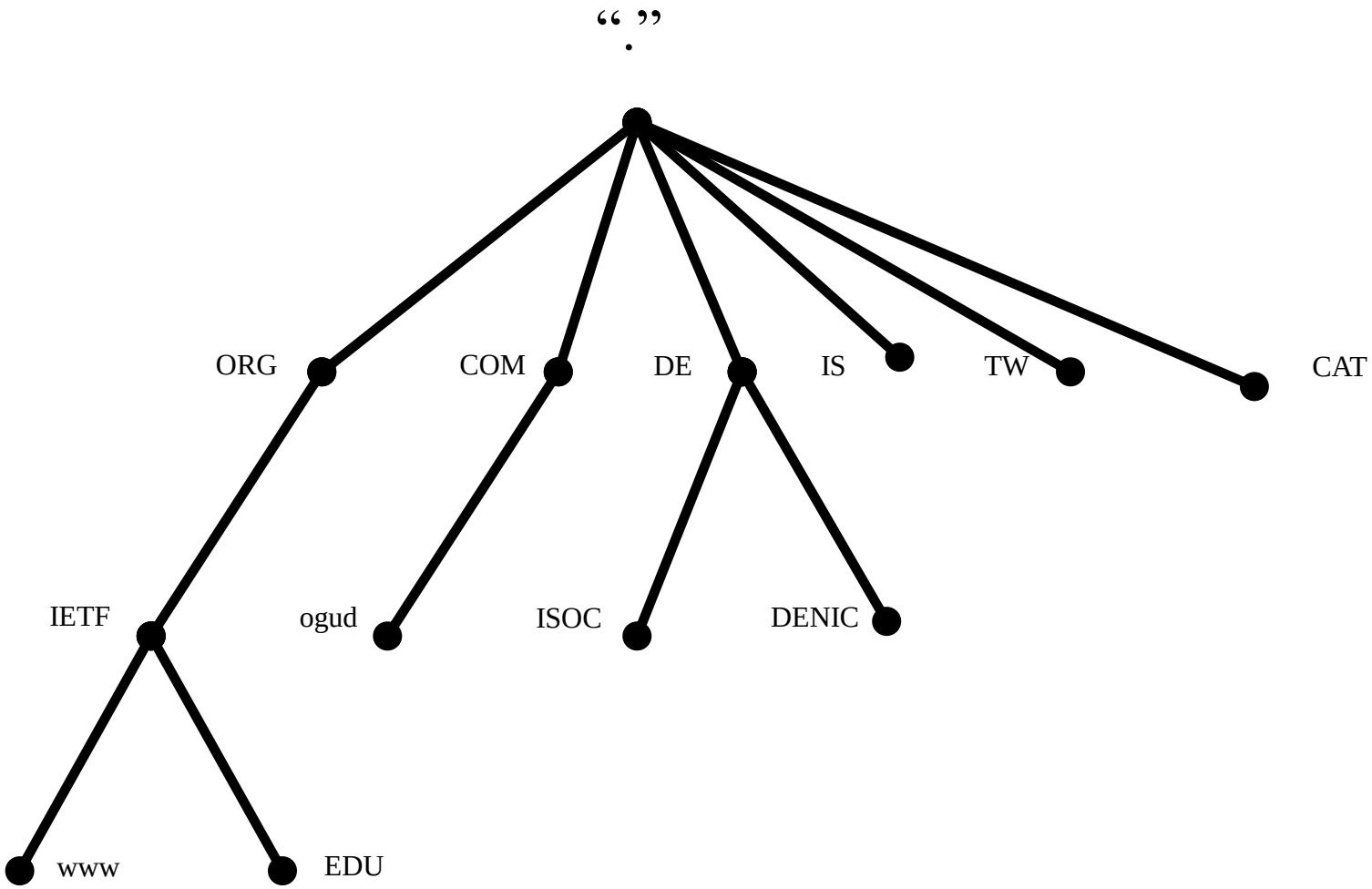
OUTLINE

- DNS and DNSSEC intro
- Status of DNSSEC deployment
- IPv6 and DNSSEC
- Deployment

BASICS OF DNS

- DNS is a hierarchical distributed database
  - Not a general purpose DB only simple lookup no search
- Lookup is by name and type
  - Name broken into parts called labels, labels are separated by a dot “.” in presentation format.
    - www.twnic.net.tw
  - The names form a tree
  - Each label can represent a simple ascii string or a Unicode encoding of non English characters.
    - Xn--<blob>.com.tw
- Answer consists of one or more Resource Record sets (RRset).

DNS TREE

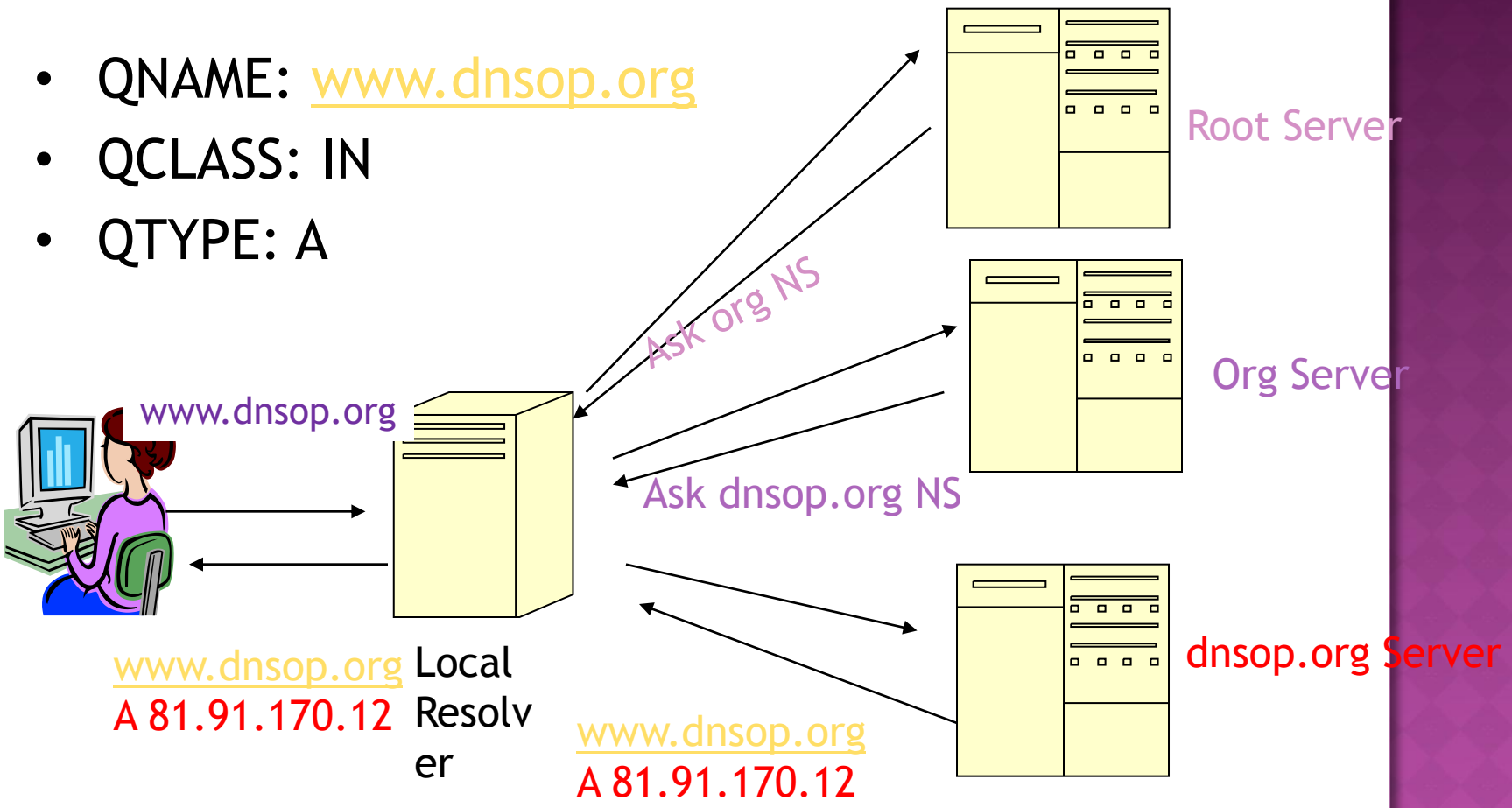


DNS FUNCTIONAL COMPONENTS

- Resolver
  - *stub*: simple, only asks questions
  - *recursive*: takes simple query and makes all necessary steps to assemble the full answer,
  - *caching*: A recursive resolver that stores prior results and reuses them
- Server
  - *authoritative*: the servers that contain the zone file for a zone, one Primary, one or more Secondaries,
- Some implementations perform resolver and server roles.

TRAVERSING THE DNS TREE

- QNAME: www.dnsop.org
- QCLASS: IN
- QTYPE: A



DNSSEC INTRO

- DNSSEC is a recent addition to the protocol to provide integrity to DNS answers.
- Role: Protect DNS
  - How done: view from 10 km.
    - A DNS RRSet is signed by the zone it belongs to.
    - DS RRSet is vouched for by parent zone.
      - Chain of trust DS→ DNSKEY → DS →DNSKEY
- What DNSSEC does not do:
  - Make data in DNS any more correct
- Single Trust Anchor: DNS Root is signed
  - IANA Root

DNSSEC: MORE DETAILS

- Data integrity protection
  - Each DNS RRSet is signed by a digital signature
    - RRSIG containing a signature by the zone private key, for a certain time period
- Existence proof:
  - Chain of NSEC or NSEC3 records lists all names in a zone and their RR types. (authentic proof/denial of existence)
- Parent signs a fingerprint of child's Key Signing DNSKEY (DS RR)
  - allows transition from a secure parent zone to a secure child zone.

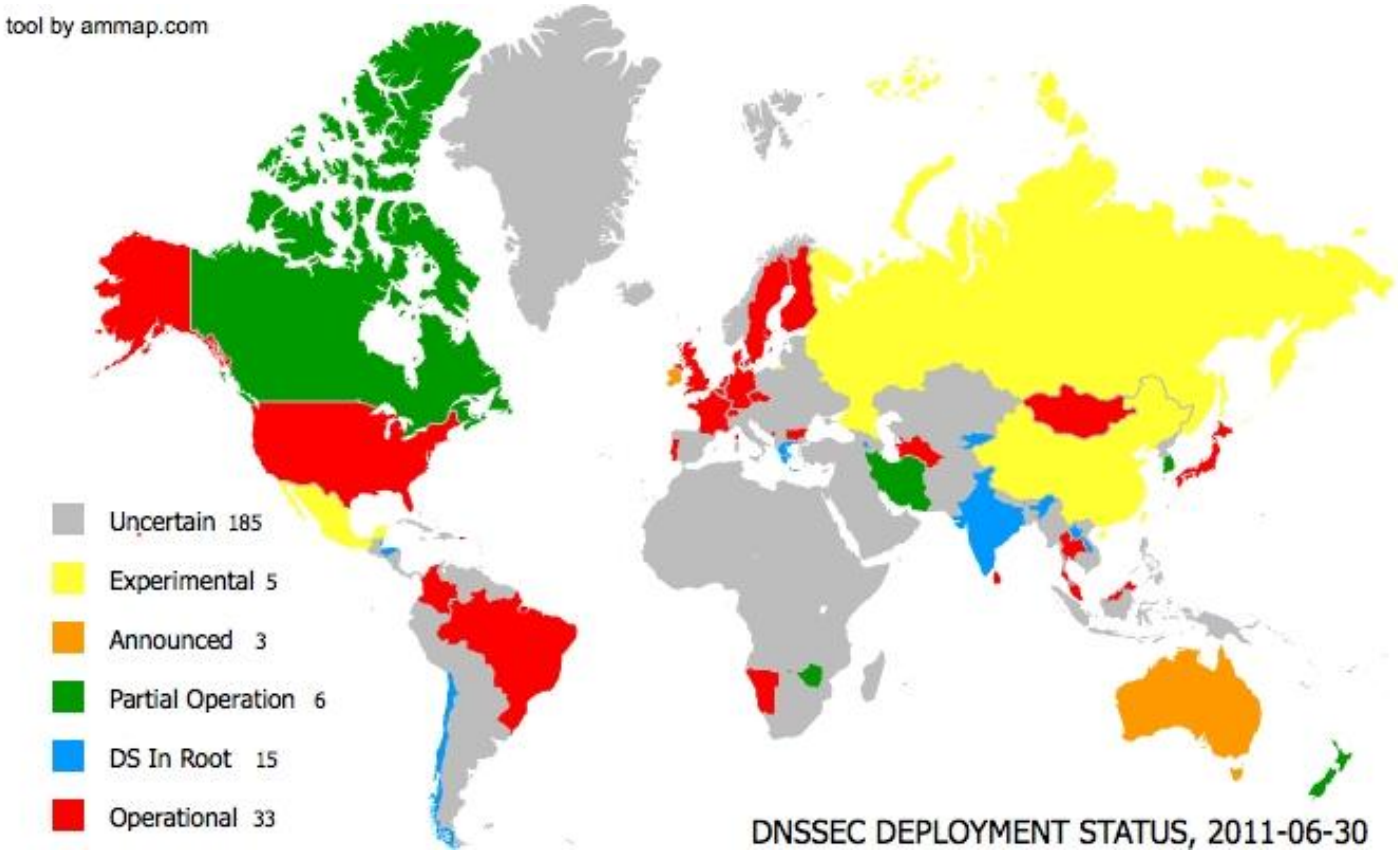
DNSSEC IMPACT ON OPERATIONS

- More things can go wrong
  - "Fire and forget until next change" operation not possible any more
    - DNS zones need to be resigned periodically
      - Really should be handled by tools not humans
  - Key rollovers
    - Timing is important
  - Trust anchor maintenance
    - Order and timing constraints must be respected
      - ➔ domains can become invisible for a while
- Keep up with vendor updates

DNSSEC IN TLD'S 2011/11/16

12 Nov 2011	Total	Signed	DS in Root
ccTLD	247	56	53
IDN ccTLD	30	4	2
gTLD	22	12	11
IDN gTLD	0	0	0
Test IDN	11	11	11
Total	310	81	77

CCTLD'S DNSSEC STATUS



DNSSEC AS ENABLING TECHNOLOGY

- DNSSEC provides allows the insertion of higher value data in the DNS
  - Keys
  - Identites
  - Policies
- This has the potential to become a disruptive force for new applications

DNSSEC ENABLED: DANE

- DNS-based Authentication of Named Entities: is to place TLS keys and CERT's in DNS
  - Augment Certification Authorities
  - Express what CA's are used by a domain
- Goal:
  - Stop TLS MiM attacks
  - Avoid the use of fake Certs
    - Replace CA's for most uses but EV certs
- Later: other protocols in addition to HTTPS/TLS

DNSSEC ENABLED: DKIM

- Domain Keying Internet Mail
  - Mail servers sign outgoing emails
  - Recipients can check signatures that mail came from servers in that domain
    - Prevents spammers from impersonating your mail servers

DNSSEC AND IPV6

- Reverse IPv6 lookup
  - Provision: hard
  - Maintenance: hard
  - Signing: Hard and expensive
- Solutions:
  - Sign on the fly (JPRS demo)
  - Signed wild cards
  - No reverse map

How to deploy DNSSEC

- Slow and steady in phases
  - Update tools and servers
    - You may need to replace firewalls, routers
    - Revisit procedures
  - Sign Zone's
    - Not important ones first
  - Test and Test some more
    - Create a test plan and walk through it
  - Monitor
  - Add Trust anchors to parent zone
- Start adding new services
- Keep up with vendor Updates

DNSSEC TOOLS

- There are all kinds of tools at various levels of maturity: Use them
- DNSSEC is not a simple technology

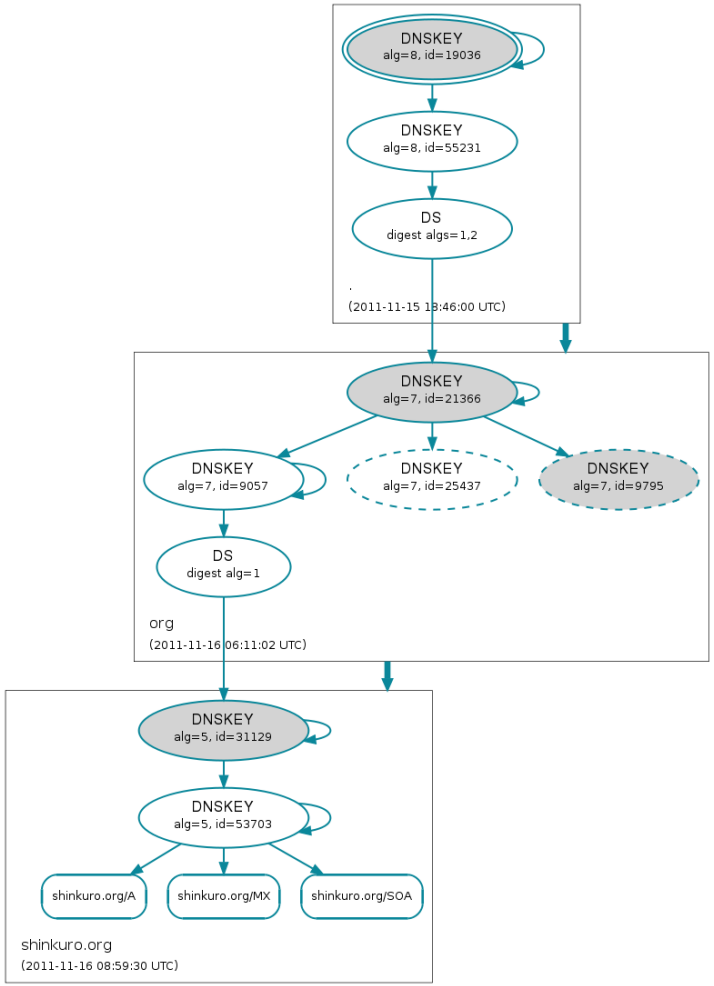
DNSSEC TOOLS: NAME SERVER

- Software:
  - NSD/Unbound full support
  - Bind-9.7,9.8 full support
  - Nominum: full support
  - Microsoft 2008 server: partial Support
  - PowerDNS: full support
- Appliances:
  - Xelerance
  - InfoBlox
  - Secure64
  - InfoWeapons

MORE TOOLS

- Signing and maintainance tools
  - Dnssec-tools.org
  - OpenDNSSEC
- Monitoring tools:
  - DnsViz
  - Dnssecmonitor
  - ZoneCheck v3.0

DNSVIZ: SHINKURO.ORG



DNSSEC IN THE NEAR FUTURE

- Most TLD's will be signed
- Many enterprises will adopt DNSSEC in particular ecommerce
- Many web services will adopt to avoid issues with Rouge Certificates
  - No more Iranian certs for gmail.com

DNSSEC and Embedded Systems

- Any product that has DNS component and does not support DNSSEC has the potential to become a barrier for DNSSEC deployment
  - Firewalls
  - Smart Routers
  - Application Gateways
- DNSSEC support is a market opportunity

QUESTIONS

- Thank you