DNSSEC

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This presentation is not…

- A DNSSEC introductory course
  - But ask any question you like
- A DNSSEC tutorial
- An HSM showcase or sales pitch

This presentation IS

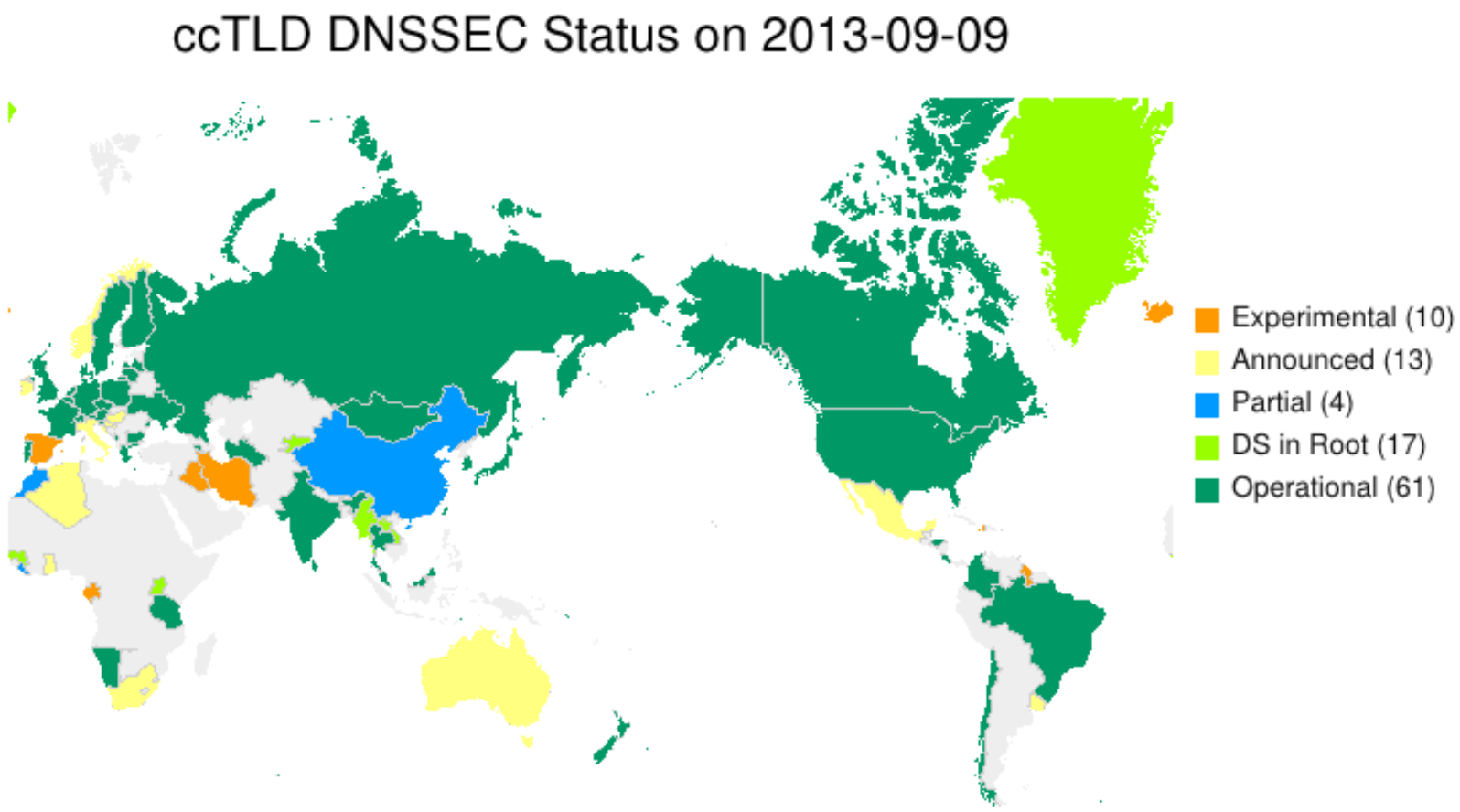
- A snapshot of current status of deployment
- A review of NZRS DNSSEC architecture
  - Technical components
  - Policy components
  - Procedures
- A review of DNSSEC potential
  - DANE, for example

A short “detour”

- DNSSEC
  - Authentication and integrity to DNS data by adding cryptographic signatures
  - Requires cryptographic keys
  - Makes DNS errors more visible
  - New set of potential errors: bogus data due to missing keys, missing sigs, etc.

Current deployment status

- Globally



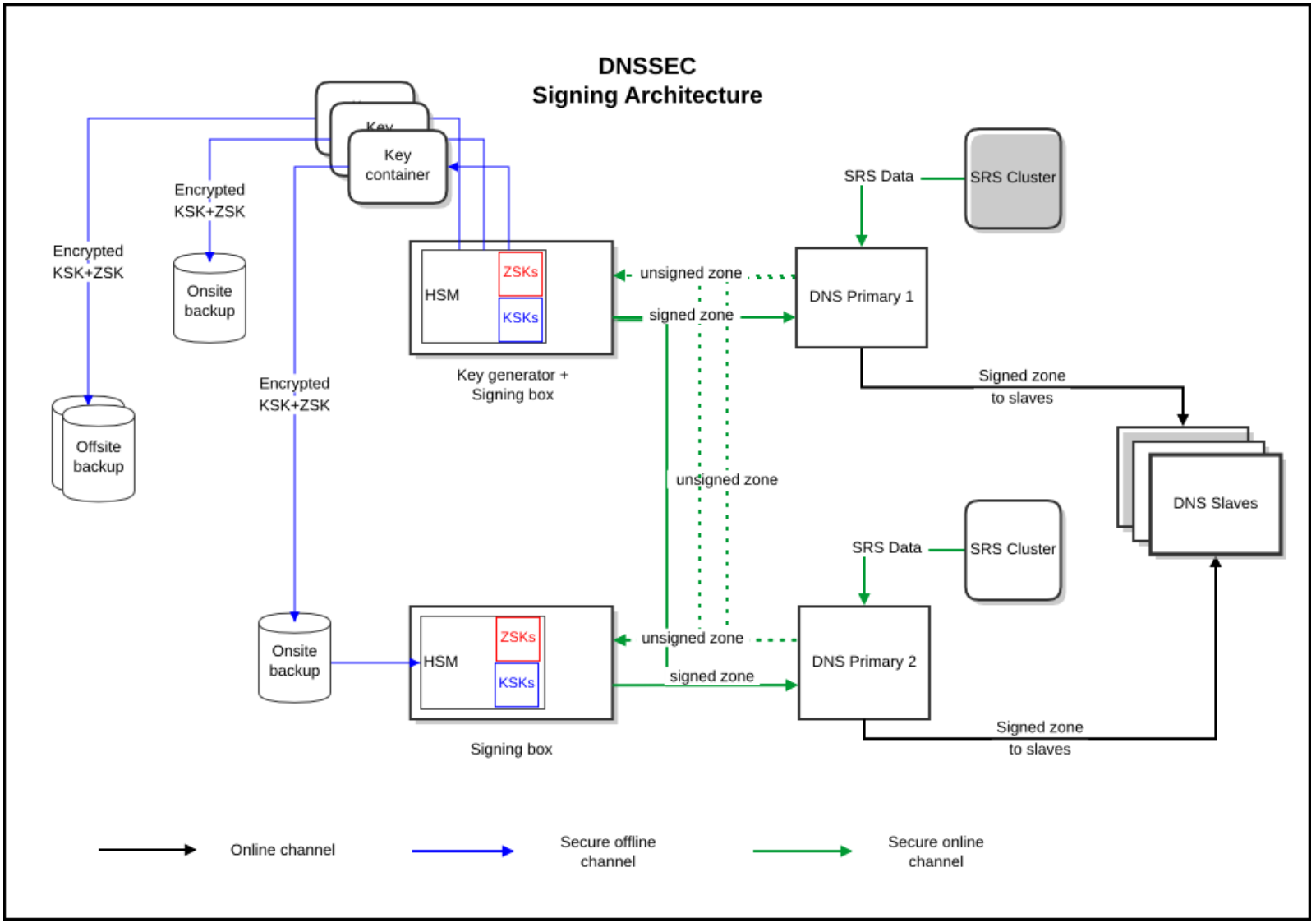
Current deployment status

- Locally
  - 115 domains signed
    - Several from geeks, with some organizations as Unleashed, GodZone, RadioNZ
  - 94 with DS records (includes the second level domains)
  - 2 registrars DNSSEC-friendly

NZRS DNSSEC Architecture

- Main features
  - Resilient: built with BC and DR in mind (in line with company policy)
  - Robust
  - Bump in the wire
  - Separations of roles (operators, security officers)

Overview


DNSSEC
Signing Architecture
Key container
Encrypted KSK+ZSK
Encrypted KSK+ZSK
Onsite backup
Offsite backup
Encrypted KSK+ZSK
HSM
ZSKs
KSKs
Key generator + Signing box
unsigned zone
signed zone
SRS Data
SRS Cluster
DNS Primary 1
Signed zone to slaves
DNS Slaves
unsigned zone
SRS Data
SRS Cluster
Onsite backup
HSM
ZSKs
KSKs
unsigned zone
signed zone
DNS Primary 2
Signing box
Signed zone to slaves
Online channel
Secure offline channel
Secure online channel

Architectural decisions

- KSK/ZSK or CSK?
- Online/Offline KSK
- How to feed the zones for signing? Zone transfers, copying files, database backend
- How to distribute the zones?

Policy Components

- DNSSEC Practice Statement
  - Prepared based on RFC 6841
  - Defines policies around keys, responsabilities, roles, security controls, etc.
  - Our DPS publicly available at http://www.nzrs.net.nz/dns/dnssec/dps

DPS: a glimpse

- ZSK
  - 1024 bits, RSA
  - Lifetime: 3 months
  - Automatic rollovers
- KSK
  - 2048 bits, RSA
  - Lifetime: 12 months
  - Manual rollovers

DPS (2)

Roles

- System Administrator (SA)
- Keystore Security Officer (KSO)
- Device Security Officer (DSO)
- Key Generation Administrator (KGA)
- Witness (WI)

Zone Signing Params

- Signature validity period: 12 to 16 days
- Refresh time: 3 days
- TTLs
- Authenticated denial of existence

Key Generation Procedure

- Key Generation Procedure
  - Create new keys for the next period
  - Remove used keys
  - Create HSM backup
- Requires a SA, SO, KGA, audit trails, etc
- Material available at http://www.nzrs.net.nz/dns/dnssec
- We've done two so far

HSM

- Hardware Security Modules
  - Provide protection to private component of keys
  - Operate as blackboxes: provide them with data to sign, the id of the key and they will sign
  - Different certifications:
    - FIPS 140-2
    - CC-EAL

HSM (2)

- Many many alternatives:
  - Going form USD$0 to 100K
  - Differentation points: level of certification, speed, algorithm support, key size support
- Do I need an HSM to do DNSSEC?
  - Not necessarily, depends on how much do you value your keys.
  - There are TLDs not using HSM for DNSSEC. Risk management has been done differently

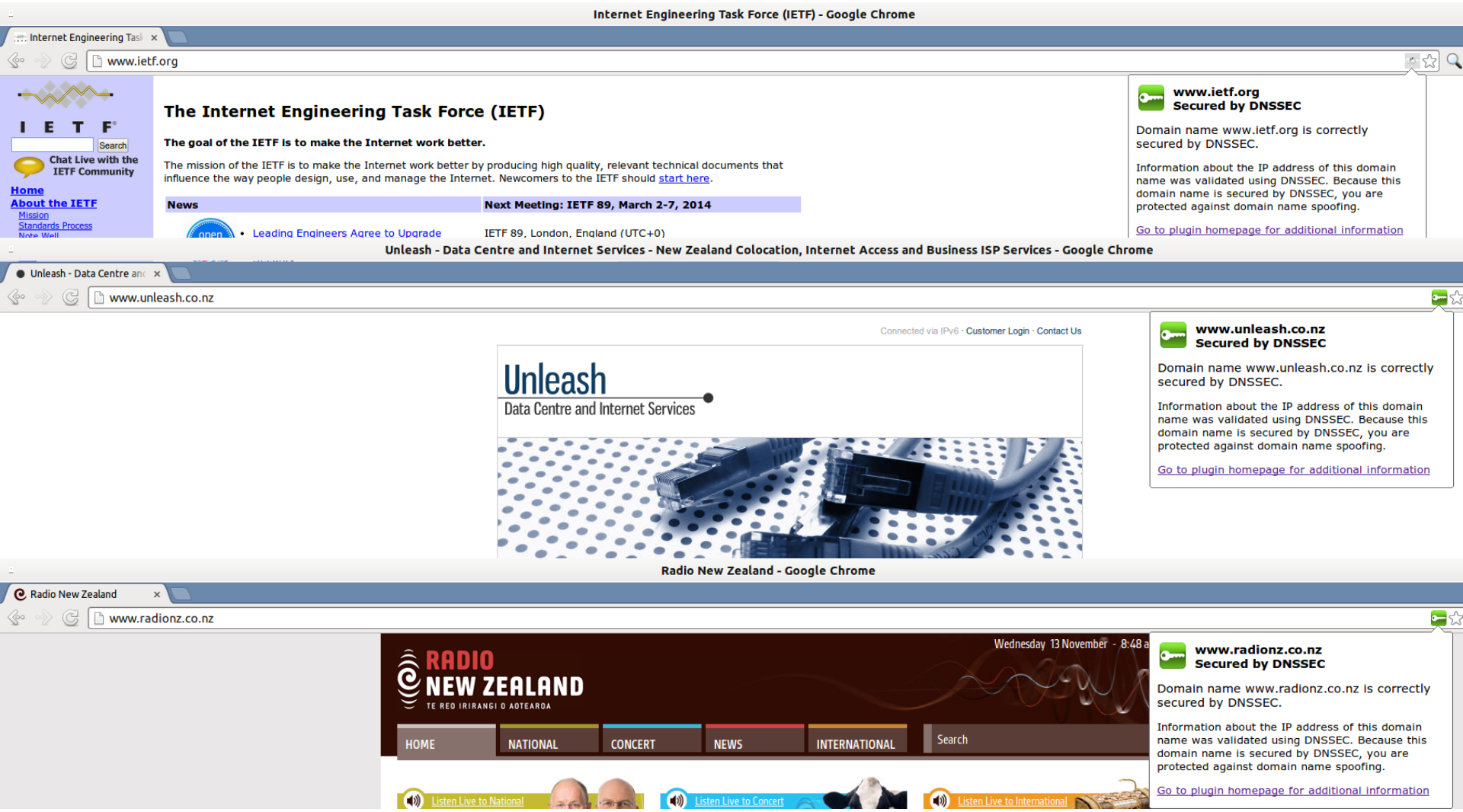
Is there value on DNSSEC?

- The IETF DANE WG is working on standards to publish data that will enable trust
  - TLSA records for SSL Certificates, which will affect Web, Mail, XMPP, SIP, etc.
  - Fingerprint for PGP keys
  - SSH fingerprints for servers (SSHFP)
- During IETF88, the commitment was to bring encryption to all protocols, as much as possible.
- DNS (with DNSSEC) will serve as bootstrap for trust

Status of DNS tools

- For signing: pretty much done. BIND, PowerDNS, OpenDNSSEC do signing. KnotDNS will add it soon
- For validation: done. BIND, Unbound, major DNS vendors support validation
- For applications: getting there.
  - DNSSEC validator for the browser
  - OpenSSH in FreeBSD 10 will silently trust valid signed SSHFP records
  - Postfix support added
  - A DNS API is being discussed that will provide secure signalling to applications.

Some examples



Questions?