From NSEC to NSEC3

CZ.NIC - http://www.nic.cz
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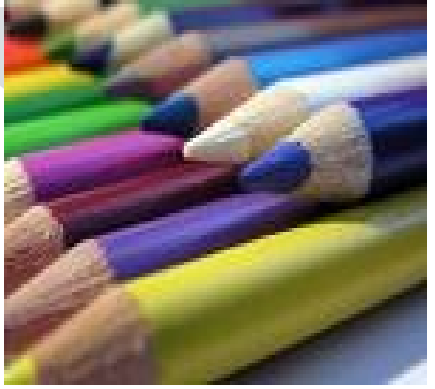
Short history of DNSSEC.CZ

- April 4, 2008 - ENUM (0.2.4.e164.arpa) zone signed – first signed ENUM
- September 2, 2008 – .CZ signed
- September 30, 2008 - .CZ open for end-user public key registration (DS records)
- Started with NSEC – NSEC3 not deployed that time
- Consultation with Personal Data Protection Office
- July 15, 2010 – root zone signed

Reasons for the rollover



- Current key published 2 years ago
- Administrative
  - Zone walking
  - Data mining (whois)
- Technical
  - SHA-1 not recommended any more
    - Known cryptographic attacks
  - SHA-2
    - Recommended by NIST for next years
- Side effect – awareness increase

NSEC3

- About 15% of Czech domains signed
- (105k of 720k)
- We expect more to come
- NSEC3 with OPT-OUT would not reduce zone file size in the future
- “pure” NSEC3 chosen

Key algorithm rollover

- Different from simple key rollover
- Complex process
  - Exact timing (Aug 3 – Aug 24) + preparation phase
  - Exact order of the steps
    - Check RFC4035 2.2 – algorithm downgrade protection
- Thorough testing environment
  - Replicated setup in the lab
- And also first tested on ENUM

Steps for the change

- RFC4641bis
  - http://tools.ietf.org/html/draft-ietf-dnsop-rfc4641bis
  - Section 4.1.5 – Key algorithm rollover
- Signature for every algorithm in zone apex!
- You cannot use key prepublishing
- Key with the algorithm for every algorithm in DS
- Double signed zones

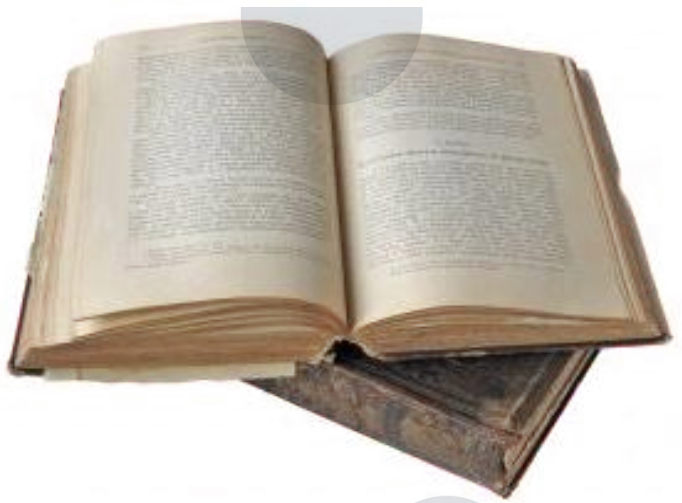
Rollover in detail

1) Generation of new keys + preparation of DNS infrastructure, communication with resolver operators (root, algorithm)
2) Add new RRSIGs (and wait for TTL time)
3) Add new DNSKEY(s) (and wait...)
4) Exchange DS records (and wait...) - 2 days in root zone, removal from ITAR – 14 days, DLV tied with ITAR
5) Remove old DNSKEY(s) (and wait...)
6) Remove old RRSIGs (and you're done)

DNS servers differ

- Bind 9 is more tolerant
  - Can cope if there are keys, but no signatures
  - No AD bit between steps 5 and 6
- Unbound is stricter
  - Adhere to the standards
  - Adding a DNSKEY with new algorithm and without signatures - causes validation failures

Lessons learnt



- Test, test, test... and test...
- Implementation details differ...
  - So test with different implementations and versions
- Timing is crucial
  - Do rehearsals
- Plan you DNS infrastructure properly - sufficient memory
  - More than twice of current consumption

Thank you

Questions?

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http://www.dnssec.cz