Rolling the Root Zone DNSSEC Key Signing Key
Motivation for the Talk

- ICANN is about to change an important configuration parameter in DNSSEC
- For a network DNS operator, this may create a need for action
- This discussion is meant to inform: What is happening, when, and what to do if troubleshooting is needed
DNSSEC in the Root Zone

- DNSSEC in the Root Zone is managed by:
  - ICANN, as the IANA Functions Operator
  - Verisign, as the Root Zone Maintainer (RZM)
- Some changes to the naming of the functions may happen in the future
DNSSEC Key Management in the Root Zone

- DNSSEC key management is divided into:
  - Key Signing Key (KSK), self-signs the key set
  - Zone Signing Key (ZSK), signs other zone data

- These roles are meaningful to the operators of signed zones
  - The significance is that the roles are separated
KSK and ZSK

- ICANN, as IANA Functions Operator, manages the KSK
  - Same KSK since operations began in 2010
  - The KSK signs the ZSK quarterly in a ceremony

- Verisign, as Root Zone Maintainer, manages the ZSK
  - ZSK is changed quarterly
Why Change the KSK?

- **Primary reason – operational preparedness**
  - KSK has no expiration date, currently no weakness
  - No key should live forever: bad crypto practice
  - DNSSEC Practice Statement states the key will be rolled
  - Prefer to exercise process in normal conditions
    - As opposed to abnormal, such as key compromise

- **Big challenge**
  - Involves countless/uncountable participants
  - No test environment can cover all possibilities
The KSK Roll Plan Documents

- The plan consists of five documents:
  - 2017 KSK Rollover Operational Implementation Plan
  - 2017 KSK Rollover Systems Test Plan
  - 2017 KSK Rollover Monitoring Plan
  - 2017 KSK Rollover External Test Plan
  - 2017 KSK Rollover Back Out Plan

- The documents are available at: https://www.icann.org/kskroll
Communications Approach

- Target technical audiences performing DNSSEC validation (e.g., Network Operating Groups)
  - How to participate in the KSK rollover

- Broader communication
  - General awareness, resources available

- Integrated communications approach
  - Traditional channel (email, presentations)
  - Social media (#KeyRoll)
  - Leverage ICANN staff and stakeholder groups
Operational Implementation Plan Phases

- **Preparation Phases**
  - System engineering, KSK creation and replication
  - Little to no operational impact on Internet

- **Automated Updates (RFC 5011) Phases**
  - KSK-2017 (new) pre-published, signs DNSKEY set
  - KSK-2010 (current) is revoked

- **Post Rollover Phases**
  - Deletion of KSK-2010 from system
  - Project experiences documented
Operational Implementation Plan Dates

- Plans publicly available from July 22, 2016

- Key signing ceremonies
  - Q4 2016 ceremony (October 27): generate KSK-2017
  - Q1 2017 ceremony (February): KSK-2017 operationally ready

- DNS changes
  - KSK-2017 added to root zone on July 11, 2017 (with KSK-2010 still there)
  - KSK-2017 signs DNSKEY RRset (instead of KSK-2010) beginning October 11, 2017
  - KSK-2010 revoked on January 11, 2018 but is still in the root zone
Operational Implementation Plan Timeline

2016 Q4 | 2017 Q1 | 2017 Q2 | 2017 Q3 | 2017 Q4 | 2018 Q1

Slot 1...9 | Slot 1...9 | Slot 1...9 | Slot 1 | Slot 2...8 | Slot 9 | Slot 1 | Slot 2...8 | Slot 9 | Slot 1 | Slot 2...8 | Slot 9

... normal ZSK publishing ...

ZSK-earlier post-publish
ZSK-q1 ZSK-q1 ZSK-q1
ZSK-q2 pre-publish ZSK-q2 ZSK-q2
ZSK-q2 post-publish ZSK-q3 ZSK-q3
ZSK-q3 pre-publish ZSK-q3
ZSK-q3
ZSK-... pre-publish

... normal KSK-2010 publishing and signing ...

KSK-2010 publish+sign KSK-2010 publish+sign KSK-2010 publish+sign KSK-2010 publish+sign KSK-2010 publish+sign KSK-2010 publish+sign KSK-2010 publish+sign KSK-2010 publish+sign
KSK-2010 publish KSK-2010 publish KSK-2010 publish KSK-2010 publish KSK-2010 publish KSK-2010 publish KSK-2010 publish KSK-2010 publish
KSK-2010 revoke+sign KSK-2010 revoke+sign KSK-2010 revoke+sign KSK-2010 revoke+sign KSK-2010 revoke+sign KSK-2010 revoke+sign KSK-2010 revoke+sign KSK-2010 revoke+sign

KSK-2017 created in 1st KMI
KSK-2017 replicated to 2nd KMI
First SKR with KSK-2017 signed
First packet size increase
Second packet size increase
Rollover
Delayed revocation of KSK-2010
Systems Test Plan

- Testing internal systems for these components
  - Key Management
    - Lifecycle
  - Key Processing
    - Key Signing Request to Signed Key Response
  - Trust Anchor Publication
    - Generation of the trust anchor file as formatted in eXtensible Markup Language (XML)
Monitoring Plan

○ Automated monitoring involving
  ○ ICANN’s L-root server
  ○ Information Science Institute’s B-root server

○ Looking for
  ○ Low-level fragmentation issues, indicating responses are too large
  ○ Elevated query rates for the DNSKEY resource record set, indicating misconfigured trust anchors

○ Plus a means for ad hoc reporting
External Test Plan

- **Resources targeted for software developers**
  - Two third-party “accelerated” RFC 5011 test environments with accelerated clocks
    - [http://toot-servers.net](http://toot-servers.net)
    - [http://keyroll.systems](http://keyroll.systems)

- **Resources more suitable for operators**
  - “Real time” RFC 5011 test environment being developed by ICANN
  - Roll a test zone trust anchor with actual 30-day Add Hold-Down timer
Back Out Plan

- Plan includes back out capability
  - If necessary, can stay in current state or back out at every phase
  - Until KSK-2010 is revoked in Phase F

- Multiple back out DNSKEY Resource Record Sets (RRsets) signed at each ceremony
  - Back out can be immediate
  - No need for extra key ceremony
What You Need to Know

○ Manage Your Trust Anchors
  ○ Be aware of your software tools for managing trust anchors
  ○ Be aware of the new KSK

○ When Events Happen
  ○ Keep an eye on dates
  ○ Be mindful of when changes are scheduled and monitor appropriately
Managing Trust Anchors

- Trust anchors are configured data in DNSSEC validators
  - If Automated Updates of DNSSEC Trust Anchors (RFC 5011) is enabled and working, the rollover is automatic
  - Otherwise manual intervention is required
    - Add the KSK-2017 before October 11, 2017 (assuming all is on track)
    - Remove KSK-2010 at a later date
Planned KSK Rollover Dates

- Plans publicly available from July 22, 2016

- Key signing ceremonies
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Join the ksk-rollover@icann.org mailing list:
  - https://mm.icann.org/listinfo/ksk-rollover

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