ICANN

2017 DNSSEC KSK Rollover

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What is the purpose of this talk?

1. To publicize the new Root Zone DNSSEC KSK

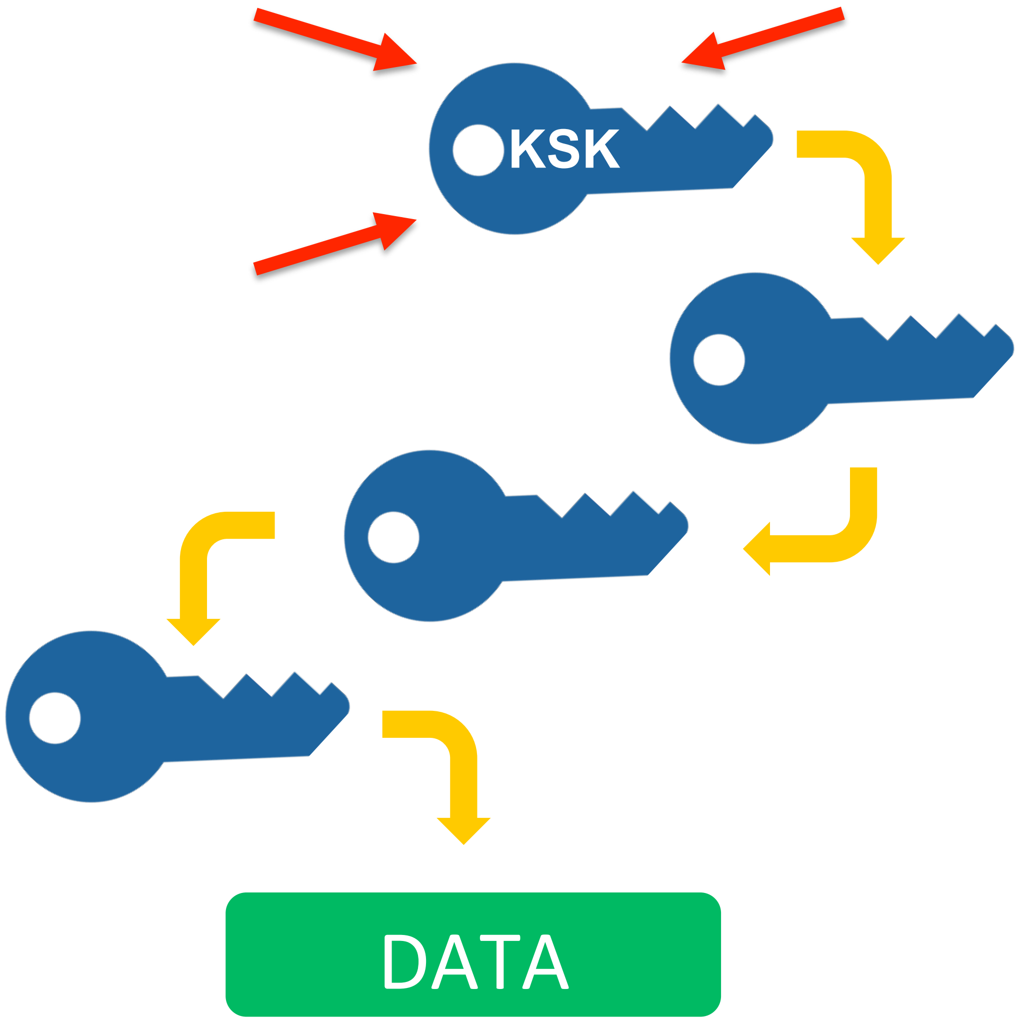
2. Provide status, upcoming events, and contact information

3. Provide helpful resources on the KSK roll

What is the Root Zone DNSSEC KSK?

- The Root Zone DNSSEC Key Signing Key “**KSK**” is the top most cryptographic key in the DNSSEC hierarchy

- Public portion of the KSK is configuration parameter in DNS validating revolvers



What does it mean to rollover the Root Zone DNSSEC KSK?

- **There has been one functional, operational Root Zone DNSSEC KSK**
  - Called "KSK-2010"
  - Since 2010, nothing before that

- **A new KSK will be put into production later this year**
  - Call it "KSK-2017"
  - An orderly succession for continued smooth operations

- **Operators of DNSSEC recursive servers may have some work**
  - As little as review configurations
  - As much as install KSK-2017

What are the rollover’s milestones?

Event	Date
Creation of KSK-2017	~~October 27, 2016~~
Production Qualified	~~February 2, 2017~~
Out-of-DNS-band Publication	Now, onwards
In-band (*Automated Updates*) Publication	July 11, 2017 onwards
Sign (Production Use)	October 11, 2017 onwards
Revoke KSK-2010	January 11, 2018
Remove KSK-2010 from systems	Dates TBD, 2018

How can the new key be recognized?

- **The KSK-2017’s Key Tag is**

  20326

- **The Delegation Signer (DS) resource record for KSK-2017 is**

```
.      IN   DS      20326 8 2
                   E06D44B80B8F1D39A95C0B0D7C65D084
                   58E880409BBC683457104237C7F8EC8D
```

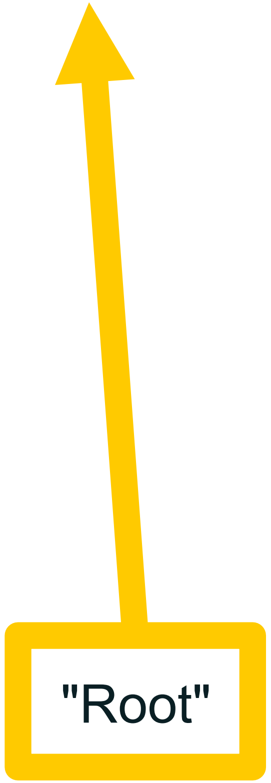
"Root"

Note: liberties taken with formatting for presentation purposes

What does the new DNSKEY Resource Record look like?

- **For KSK-2017, the DNSKEY resource record is**

```
. IN DNSKEY  257 3 8
      AwEAAaz/tAm8yTn4Mfeh5eyI96WSVexTBAvkMgJzkKTOiW1vkIbzxeF3
      +/4RgWOq7HrxRixHlFlExOLAJr5emLvN7SWXgnLh4+B5xQlNVz8Og8kv
      ArMtNROxVQuCaSnIDdD5LKyWbRd2n9WGe2R8PzgCmr3EgVLrjyBxWezF
      0jLHwVN8efS3rCj/EWgvIWgb9tarpVUDK/b58Da+sqqls3eNbuv7pr+e
      oZG+SrDK6nWeL3c6H5Apxz7LjVc1uTIdsIXxuOLYA4/ilBmSVIzuDWfd
      RUfhHdY6+cn8HFRm+2hM8AnXGXws9555KrUB5qihylGa8subX2Nn6UwN
      R1AkUTV74bU=
```



Note: liberties taken with formatting for presentation purposes

Why are there DS and DNSKEY forms of KSK-2017?

- **Tools that you will use to manage DNSSEC trust anchor configurations work on either the DS form, the DNSKEY form or both**
  - Per tool, historical reasons
  - The DS record contains a hash of KSK-2017
  - The DNSKEY record contains the public key of KSK-2017

- **Consult your tool's documentation to know which is appropriate**

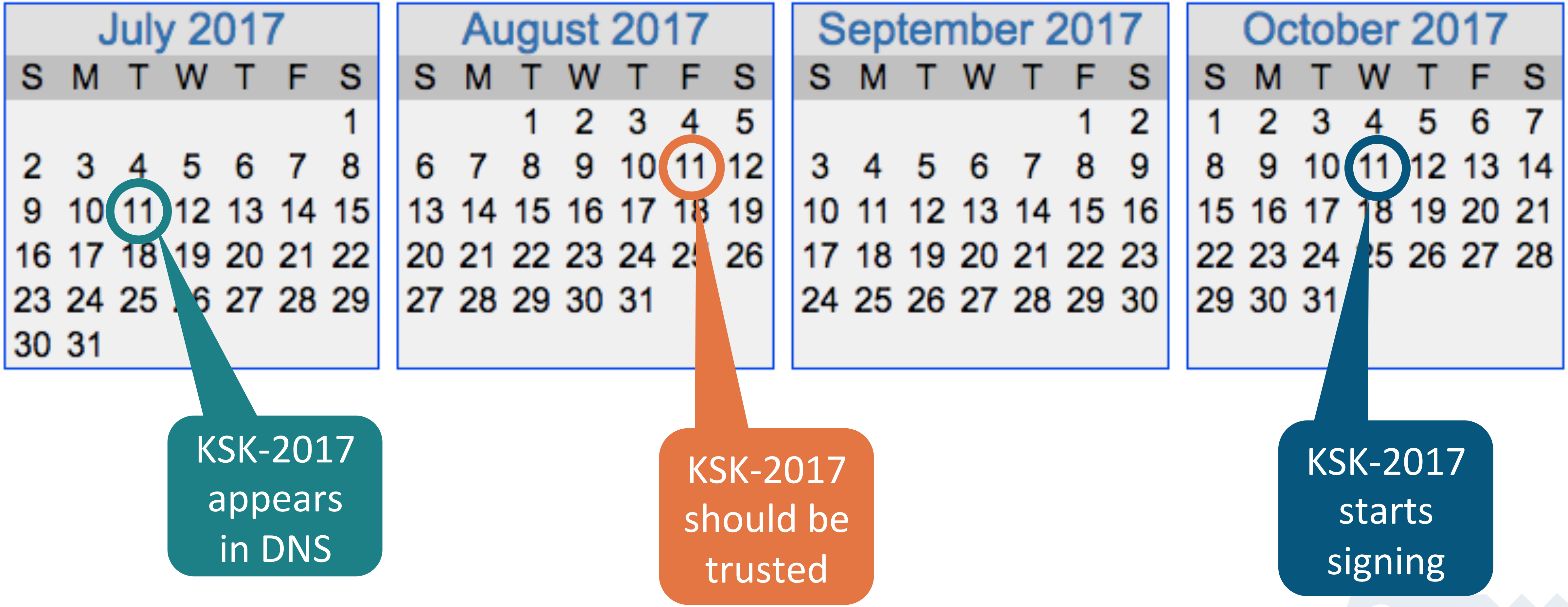
What is the state of the system?

- **Sunny, as in "sunny day scenario"**
  - We are changing the KSK under good conditions
  - Leverage trust in KSK-2010 to distribute KSK-2017
  - Recommended course of action – rely on RFC 5011's *Automated Updates of DNSSEC Trust Anchors* protocol
- **Why mention this?**
  - Alternative to *Automated Updates* is bootstrapping (or establishing an initial state of trust in) a trust anchor
  - That would be necessary in stormy (emergency) conditions

What is *Automated Updates of DNSSEC Trust Anchors?*

- ***Automated Updates of DNSSEC Trust Anchors* (RFC 5011)**
  - Use the current trust anchor(s) to learn new
  - To allow for unattended DNSSEC validator operations
  - Based on "time" – if a new one appears and no one complains for some specified time, it can be trusted
  - Defined "add hold" time is 30 days

How does this look on a calendar?



July 2017

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

August 2017

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

September 2017

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

October 2017

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

KSK-2017 appears in DNS

KSK-2017 should be trusted

KSK-2017 starts signing

What does it mean if you rely on *Automated Updates*?

- **On 11 July 2017**
  - KSK-2017's DNSKEY record will appear in the DNS root key set
  - Tools following RFC 5011 will start counting days

- **After 11 August 2017 (give or take a day)**
  - Your tool should see KSK-2017 in its trust anchor database
  - If not, debugging is needed, you have a few weeks to fix
  - (Don't panic if it it's not immediate, remember time zone, etc.)

- **On 11 October 2017**
  - KSK-2017 goes "live," validation ought to be confirmed

What is favorable about *Automatic Updates*?

- **Many DNSSEC validation tools have RFC 5011 support built-in**
  - The support needs to be configured properly, consult your administrator guide
  - All in all, nothing an operator can't handle
- **You can choose to "do it the hard way"**
  - You do have options
  - We are providing the keys in different ways to help

Is *Automated Updates* or a manual approach preferred?

- **Mindful that the choice is a matter of local policy**
  - DNSSEC validation is for the benefit of the receiver
  - Not all operational environments are the same, not all validating tools implement *Automated Updates*
  - We are doing out or best to accommodate different approaches
- ***Automated Updates* is likely the preferred approach**
  - Relies only on what has been trusted before
  - It's the most reliable/stable approach, simplest basis for trust

How can the new key be obtained and verified automatically?

- **If you are DNSSEC validating with KSK-2010**
  - You can simply follow *Automated Updates of DNSSEC Trust Anchors* by configuring your tool of choice to do so

How can the new key be obtained and verified manually?

- **Via the official IANA trust anchor XML file at https://data.iana.org/root-anchors/root-anchors.xml**
  - Contains the same information as a DS record for KSK-2017
  - Validate root-anchors.xml with the detached signature at https://data.iana.org/root-anchors/root-anchors.p7s
- **Via DNS (i.e., ask a root server for “./IN/DNSKEY”)**
  - Validate the KSK-2017 by comparison with other trusted copies
- **Via “Other means” ...**

What “other means” for a manual approach?

- **Most software/OS distributions of DNSSEC**
  - Embed copies of the KSK (now KSK-2010, later KSK-2017)
  - In contact with as many distributors as possible

- **Compare with the key from these slides**
  - If you trust the presentation copy you've seen here

- **Obtain a copy from another operator, or other trusted source**
  - How well do you trust "them"?

- **Perhaps it will be on a trinket too**
  - Not promising one, but...

What is get_trust_anchor.py?

- **Tool that retrieves "https://data.iana.org/root-anchors/root-anchors.xml" and validates all active root KSK records**

  https://github.com/kirei/get_trust_anchor

  - Contains extensive in-code comments/documentation
  - Download & run in python v2.7, v3 or newer

    ```
    $ python get_trust_anchor.py
    ```

  - Writes DS and DNSKEY records to files that can be used to configure DNSSEC validators

What does an operator need to do?

- Be aware whether DNSSEC is enabled in your servers
- Be aware of how trust is evaluated in your operations
- Test/verify your set ups
- Inspect configuration files, are they (also) up to date?
- If DNSSEC validation is enabled or planned in your system
  - Have a plan for participating in the KSK rollover
  - Know the dates, know the symptoms, solutions

What tools are available for DNSSEC validation?

- ISC's BIND
- NLnet Lab's Unbound
- Microsoft Windows
- Nominum Vantio
- CZnic's Knot Resolver
- DNSMASQ
- Secure64 DNS Cache
- PowerDNS Recursor

What is special about BIND?

- **Blog post from ISC**

  https://www.isc.org/blogs/2017-root-key-rollover-what-does-it-mean-for-bind-users/

- **Unique to BIND**
  - Because of BIND's long DNSSEC history, some "named.conf" files may have to be updated despite tech-refresh of BIND versions
  - Notably, the introduction of `managed-keys` in ***February 2010***, (ISC's version 9.7) an update to `trusted-keys`
    - **I.e., Check pre-February 2010 configurations!**

What about Microsoft Server?

- **Extensive Documentation**
  - *DNSSEC and Windows: Get Ready, 'Cause Here It Comes! (2010)*

    https://channel9.msdn.com/Events/TechEd/NorthAmerica/2010/WSV333
  - *DNSSEC in Windows Server 2012* (updated 2014)

    https://technet.microsoft.com/library/dn593694

What about other tools?

- **Unbound**

  https://schd.ws/hosted_files/icann572016/49/Jaap-Akkerhuis-Unbound-KSK-rollover.pdf

- **PowerDNS**

  https://doc.powerdns.com/md/recursor/dnssec/#trust-anchor-management

- **Knot Resolver**

  https://knot-resolver.readthedocs.io/en/latest/daemon.html#enabling-dnssec

- **DNSMASQ**

  http://www.thekelleys.org.uk/dnsmasq/CHANGELOG (see v2.69 notes)

What are signs of a DNSSEC problem related to the rollover?

- **Problems caused by IPv6 fragmentation-related issues**
  - DNSSEC validation fails for everything, resulting from an inability to get the Root Zone DNSKEY set with KSK-2017
  - Look for a large number of queries leaving a recursive server "retrying" the question
- **Problems caused by using the wrong trust anchor**
  - DNSSEC validation fails for everything, resulting from an inability to build a chain of trust
  - Look in logs for check failures, implementation specific

What are the steps to recovery?

1. **Stop the tickets!** It's OK to turn off DNSSEC validation while you fix (but do turn it back on!)

2. **Debug.** If the problem is the trust anchor, find out why it isn't correct

   - Did RFC 5011 fail? Did configuration tools fail to update the key?
   - If the problem is fragmentation related, make sure TCP is enabled and/or make other transport adjustments

3. **Test the recovery.** Make sure your fixes take hold

What educational/informational resources are available?

- **ICANN organizes KSK rollover information here**

  https://www.icann.org/resources/pages/ksk-rollover

  - Link to that page can be found on ICANN's main web page under "Quicklinks"

  - Contains links to what's been covered in this presentation, the get_trust_anchor.py script and information on ICANN's live testbeds

What ICANN's live test bed resources?

- **ICANN is finalizing a test bed to allow operators to test whether configurations follow *Automated Updates***
  - The goal is to use production settings with real-but-test DNS zones, running in real time
    - A full test will need to run more than 30 days
  - Information on the test bed will appear on the ICANN KSK rollover page

    https://www.icann.org/resources/pages/ksk-rollover

How can you engage with ICANN?

ICANN

Thank You and Questions

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