



Internet Corporation for Assigned Names and Numbers

Root DNSSEC KSK Ceremony 19

Thursday November 20, 2014

ICANN KSK Facility@Terremark NCR
18155 Technology Drive, Culpeper, VA 22701-3805

**This ceremony is executed under the
DNSSEC Practices Statement for the Root Zone KSK Operator Version A Revision 1358**



Abbreviations

- TEB = Tamper Evident Bag (AMPAC, item #GCS1013 small or #GCS1216 large or MMF Industries, item #2362010N20 small or #2362011N20 large)
- HSM = Hardware Security Module
- IW = Internal Witness
- SSC = Safe Security Controller
- KSR = Key Signing Request
- AUD = Third Party Auditor
- SO = Security Officer
- FD = Flash Drive
- CO = Crypto Officer
- MC = Master of Ceremony
- SKR = Signed Key Response
- EW = External Witness
- OP = Operator
- CA = Ceremony Administrator
- SA = System Administrator
- IKOS = ICANN KSK Operations Security
- RZM = Root Zone Maintainer

Participants

Instructions: At the end of the ceremony, participants sign on IW1's copy. IW1 records time upon completion.

Title	Printed Name	Signature	Date	Time
CA	Kim Davies / ICANN		20 November 2014	
IW1	Gustavo Lozano / ICANN			
SSC1	Julie Hedlund / ICANN			
SSC2	Kimberly Alston / ICANN			
CO1	Frederico Neves / BR			
CO2	Anne-Marie Eklund Lowinder / SE			
CO3	Olaf Kolkman / NL			
CO4	Robert Seastrom / US			
RZM	Alejandro Bolivar / Verisign			
RZM	Jose Barreros / Verisign			
AUD	Kyle McQuighan / PricewaterhouseCoopers			
AUD	Ken Harrer / PricewaterhouseCoopers			
SA1	Connor Barthold / ICANN			
SA2	Reed Quinn / ICANN			
EW1 / ICANN	Richard Lamb / ICANN	_____		
EW2	Bevil Wooding / TT			
IW2 / IKOS	Alberto Duero / ICANN			
IW3 / IKOS	Andres Pavez / ICANN			
IW4	Patrick Jones / ICANN			
EW3	_____ / ICANN	_____		
EW4	_____ / ICANN	_____		

Note: By signing this script, you are declaring that this is a true and accurate record of the Root DNSSEC KSK ceremony to the best of your knowledge.

Note: Dual Occupancy enforced. CA leads ceremony. Only CAs, IWs, or SAs can enter ceremony room and/or escort other participants. Only CA+IW can enter safe room and/or escort other participants. CAs, SAs or IWs may let individuals out of the ceremony room but only when CA+IW remain in the ceremony room. No one may leave when CA+IW are in safe room. Participants must sign in and out of ceremony room and leave any credentials assigned to them (keys, cards) in the ceremony room if leaving before completion of the ceremony. The SA starts filming before the participants enter the room.

Some steps during the ceremony require the participants to tell and/or confirm identifiers composed of numbers and letters. When spelling identifiers, the phonetic alphabet shown below will be used:

A	Alfa	AL-FAH
B	Bravo	BRAH-VOH
C	Charlie	CHAR-LEE
D	Delta	DELL-TAH
E	Echo	ECK-OH
F	Foxtrot	FOKS-TROT
G	Golf	GOLF
H	Hotel	HOH-TEL
I	India	IN-DEE-AH
J	Juliet	JEW-LEE-ETT
K	Kilo	KEY-LOH
L	Lima	LEE-MAH
M	Mike	MIKE
N	November	NO-VEM-BER
O	Oscar	OSS-CAH
P	Papa	PAH-PAH
Q	Quebec	KEH-BECK
R	Romeo	ROW-ME-OH
S	Sierra	SEE-AIR-RAH
T	Tango	TANG-GO
U	Uniform	YOU-NEE-FORM
V	Victor	VIK-TAH
W	Whiskey	WISS-KEY
X	Xray	ECKS-RAY
Y	Yankee	YANG-KEY
Z	Zulu	ZOO-LOO
1	One	WUN
2	Two	TOO
3	Three	TREE
4	Four	FOW-ER
5	Five	FIFE
6	Six	SIX
7	Seven	SEV-EN
8	Eight	AIT
9	Nine	NIN-ER
0	Zero	ZEE-RO

Act 1. Initiate Ceremony and Retrieve Equipments

Participants Arrive and Sign into Key Ceremony Room

Step	Activity	Initials	Time
1.	SA confirms that all audit cameras are recording and online streaming is live.	GL	18:04
2.	IW1 confirms that all participants are signed into the Ceremony Room.	GL	18:05

Emergency Evacuation Procedures

Step	Activity	Initials	Time
3.	CA or IW1 reviews emergency evacuation procedures with participants.	GL	18:05

Verify Time and Date

Step	Activity	Initials	Time
4.	<p>IW1 enters UTC date (day/month/year) and time using a reasonably accurate wall clock visible to all in the Ceremony Room:</p> <p>Date and time: <u>20/11/2014 18:06</u></p> <p>All entries into this script or any logs should follow this common source of time.</p>	GL	18:06

Open Credential Safe #2

Step	Activity	Initials	Time
5.	CA and IW1 escorts SSC2, COs into the safe room together. CA brings a flashlight when entering the safe room.	GL	18:07
6.	SSC2, while shielding combination from camera, opens Safe #2.	GL	18:08
7.	<p>SSC2 takes out the existing safe log and shows the most current page to the camera.</p> <p>IW1 provides a blank pre-printed safe log to the SSC2.</p> <p>SSC2 appends the new safe log then prints name, date, time, signature, and reason (i.e. "open safe") in safe log. IW1 initials this entry.</p> <p>Note: If log entry is pre-printed, verify the entry, record time of completion and sign.</p>	GL	18:10

COs Extract Credentials From the Safe Deposit Boxes

Step	Activity	Initials	Time
8.	<p>One by one, the selected COs retrieves required OP cards and SO cards (if applicable) following the steps shown below.</p> <ul style="list-style-type: none"> a) With the assistance of CA (and his/her common key), opens her/his safe deposit box. # Common Key is bottom lock and CO Key is top lock b) Verifies integrity of contents by reading out box number and TEB # for OP and SO cards which should match below. c) Retains OP TEB and SO TEB (if SO TEB is old and the credentials are not boxed) and locks box. d) Makes an entry in safe log indicating OP TEB and SO TEB removal (if applicable) with box #, printed name, date, time and signature. <p>Note: If log entry is pre-printed, verify the entry, record time of completion and sign.</p> <p>Repeat these steps until all required cards are removed. IW1 initials this entry when all COs have finished.</p> <p>CO 1: Frederico Neves ✓ Box # 1238 ✓ OP TEB # BB21820442 (Retain) ✓ SO TEB # BB21820443 (Check and return) ✓</p> <p>CO 2: Anne-Marie Eklund Lowinder Box # 1259 ✓ OP TEB # BB21820444 (Retain) ✓ SO TEB # BB21820445 (Check and return) ✓</p> <p>CO 3: Olaf Kolkman Box # 1239 ✓ OP TEB # BB21368993 (Retain) ✓ SO TEB # A14377121 (Retain) ✓</p> <p>CO 4: Robert Seastrom Box # 1260 ✓ OP TEB # BB21820419 (Retain) ✓ SO TEB # BB21820447 (Check and return) ✓</p>	<p>GL</p>	<p>18:18</p>

Close Credential Safe #2

Step	Activity	Initials	Time
9.	Once all safe deposit boxes are closed and locked, SSC2 makes an entry that includes printed name, date, time and signature into the safe log indicating closing of the safe. IW1 initials this entry. Note: If log entry is pre-printed, verify the entry, record time of completion and sign.	GL	18:19
10.	SSC2 puts log back in safe and locks Safe #2 (spin dial at least two full revolutions each way, counter clock wise then clock wise). CA and IW1 verify that the safe is locked and card reader indicator is green.	GL	18:20
11.	IW1, CA, SSC2, and COs leave safe room, with OP cards and SO cards (if applicable) in TEBs, closing the door behind them.	GL	18:20

Open Equipment Safe #1

Step	Activity	Initials	Time
12.	After a one (1) minute delay, CA, IW1 and SSC1 enter the safe room with an empty equipment cart.	GL	18:22
13.	SSC1, while shielding combination from camera, opens Safe #1.	GL	18:24
14.	SSC1 takes out the existing safe log and shows the most current page to the camera. IW1 provides a blank pre-printed safe log to the SSC1. SSC1 appends the new safe log then prints name, date, time, signature, and reason (i.e. "open safe") in safe log. IW1 initials this entry. Note: If log entry is pre-printed, verify the entry, record time of completion and sign.	GL	18:24

Remove Equipment from Safe #1

Step	Activity	Initials	Time
15.	<p>CA CAREFULLY removes HSM1 (in TEB) from the safe and completes the entry in the safe log indicating HSM Removal, TEB # and serial number, printed name, date, time, and signature. CA places the item on the equipment cart. IW1 initials this entry.</p> <p>Note: If log entry is pre-printed, verify the entry, record time of completion and sign.</p> <p>HSM1: TEB# BB24706814 ✓ serial # K6002016 ✓</p> <p>Verify the integrity of the other HSM that will not be used this time and return it to the safe.</p> <p>HSM2: TEB# BB24706800 ✓ serial # K6002013 (last used) ✓</p>	GL	18:26
16.	<p>CA takes out the items listed below from the safe and completes the entry in the safe log indicating each item, TEB#, serial number if available. Printed name, date, time and signature. CA places the item on the equipment cart. IW1 initials this entry.</p> <p>Note: If log entry is pre-printed, verify the entry, record time of completion and sign.</p> <p>Laptop2 (Dell ATG6400): TEB# BB24706815 ✓ serial # 35063364997 ✓</p> <p>O/S DVD (Rev600) + HSMFD: TEB# BB21820423 ✓</p> <p>Verify the integrity of the other Laptop that will not be used this time and return it to the safe.</p> <p>Laptop1: TEB# BB24706801 ✓ serial # 41593712005 ✓</p>	GL	18:30

Close Equipment Safe #1 and exit safe room

Step	Activity	Initials	Time
17.	<p>SSC1 makes an entry including printed name, date, time and signature into the safe log indicating, "Close safe". IW1 initials this entry.</p> <p>Note: If log entry is pre-printed, verify the entry, record time of completion and sign.</p>	GL	18:30
18.	<p>SSC1 puts log back in safe and locks Safe #1 (spin dial at least two full revolutions each way, counter clock wise then clock wise).</p> <p>CA and IW1 verify that the safe is locked and door indicator light is green.</p>	GL	18:31
19.	<p>CA, SSC1 and IW1 leave the safe room with the equipment cart, closing the door to the safe room securely behind them.</p>	GL	18:31



Act 2. Confirm and Sign the Key Signing Request

Set Up Laptop

Step	Activity	Initials	Time
1.	CA inspects the laptop TEB for tamper evidence; reads out TEB # and serial # while IW1 observes and matches it to the prior entry in most recent key ceremony or acceptance script for this site. IW1 confirms the TEB # and serial # below. Laptop2 (Dell ATG6400): TEB# BB24706815 ✓ serial # 35063364997 ✓	GL	18:33
2.	CA inspects the O/S DVD + HSMFD TEB for tamper evidence; reads out TEB # while IW1 observes and matches it to the prior entry in most recent key ceremony script for this site. IW1 confirms the TEB # below. O/S DVD (Rev600) + HSMFD: TEB# BB21820423 ✓	GL	18:34
3.	CA takes the laptop, HSMFD and O/S DVD out of TEB placing it on key ceremony table; discards TEBs; connects laptop power, external display, printer and boots laptop from O/S DVD.	GL	18:42
4.	CA sets up the laptop by following the steps below. a) CA presses "CTRL+ALT+F2" to get a console prompt and logs in as root. b) CA executes <code>system-config-display --noui</code> c) CA executes <code>killall Xorg</code> d) CA confirms that external display works. e) CA logs in as root	GL	18:44
5.	CA confirms that the printer is connected then configures printer as default and prints test page by going to System > Administration > Printing And follow the steps below: a) Click the New Printer icon (left side), leave everything default and then click the button Forward b) Under "Select Connection" choose the <u>first device</u> "HP Laserjet xxxx " and then click the button Forward (Note: The xxxx is the Printer Model) c) Select HP and click the button Forward d) Under "Models" scroll down and select "Laserjet", and then click the button Forward e) To finish click the button Apply f) Under "Local Printers" from the left menu, select "printer" g) Click the button " Make Default Printer " and " Print Test Page "	GL	18:46
6.	CA opens a terminal window and maximizes its size for visibility by going to Applications > Accessories > Terminal Follow the additional steps to maximize the terminal window: a) Click the <u>V</u> iew menu and select Zoom In b) Repeat the step above as necessary	GL	18:47

Exception
Initials Time
GL 19:55

GL 19:56

GL 19:57

GL 19:58



Step	Activity	Initials	Time
7.	CA checks and fixes date and time on laptop based on wall clock ensuring UTC time zone has been chosen by going to System > Administration > Date & Time CA executes <code>date</code> using the Terminal window to confirm the date is properly configured.	GL	18:50
8.	CA inserts USB port expander into laptop.	GL	18:50

GL 19:59

GL 19:59

Format and label blank FD

Step	Activity	Initials	Time
9.	CA plugs a new FD into the laptop, then waits for it to be recognized by the O/S, closes the file system popup window and formats the drive by executing <code>dmesg grep -A 5 usb-storage</code> to confirm the drive letter that is assigned to the blank USB drive (e.g. sda, sdb, sdc), - <code>umount /dev/sda</code> to unmounts the drive (change drive letter and partition if necessary), <code>mkfs.vfat -n HSMFD -I /dev/sda</code> to execute a FAT32 format and label it as HSMFD. CA unplugs the FD.	GL	18:52.
10.	CA repeats step 9 for the 2 nd blank FD	GL	18:53
11.	CA repeats step 9 for the 3 rd blank FD	GL	18:53
12.	CA repeats step 9 for the 4 th blank FD	GL	18:54
13.	CA repeats step 9 for the 5 th blank FD	GL	18:54

Connect HSMFD

Step	Activity	Initials	Time
14.	CA plugs the previous HSMFD used in the ceremony 17 into free USB slot on the laptop - NOT EXPANDER - and waits for O/S to recognize the FD. CA lets participants view file names in the HSMFD then closes the file system window.	GL	18:56
15.	Calculate the sha256 hash of the contents on the copied HSMFD. <code>find -P /media/HSMFD -type f -print0 sort -z xargs -0 cat sha256sum</code> IW confirms that the result matches the sha256 hash of the HSMFD that is on the annotated script from the Ceremony 17 . Previous hash should read as below (image from Ceremony 17 annotated script). <code>d951e9581a0c81ae933c5a4e8415982fe2cbfd602ebf36927161a90adac05bad</code> Note: The CA should assign some attendees to confirm the hash displayed on the TV screen and the rest will confirm the hash written on the ceremony script.	GL	18:57

GL 20:01

GL 20:03

Start Logging Terminal Session

Step	Activity	Initials	Time
16.	CA changes the default directory to the HSMFD by executing <code>cd /media/HSMFD</code>	GL	18:57
17.	CA executes <code>script script-20141120.log</code> to start a capture of terminal output.	GL	18:58

GL 20:03
GL 20:03

Start Logging HSM Output

Step	Activity	Initials	Time
18.	CA connects a serial to USB null modem cable to laptop.	GL	18:58
19.	CA opens a second terminal window and maximizes its size for visibility by going to Applications > Accessories > Terminal . Follow the additional steps to maximize the terminal window: a) Click the View menu and select Zoom In b) Repeat the step above as necessary and executes <code>cd /media/HSMFD</code> and executes <code>ttyaudit /dev/ttyUSB0</code> to start logging HSM serial port outputs. Note: DO NOT unplug USB serial port from laptop as this causes logging to stop.	GL	18:59

GL 20:04
GL 20:04

Power Up HSM

Step	Activity	Initials	Time
20.	CA inspects the HSM TEB for tamper evidence; reads out TEB # and serial # while IW1 observes and matches it to the prior script entry. IW1 confirms TEB # and serial # below. HSM1: TEB# BB24706814 / serial # K6002016	GL	19:00
21.	CA removes HSM from TEB; discards TEB and plugs ttyUSB0 null modem serial cable to the back.	GL	19:01
22.	CA switches to the ttyaudit terminal window and connects power to HSM. Status information should appear on the serial logging screen. IW1 matches displayed HSM serial number with above. (Time and date in the HSM may not match the time used for the ceremony logs, but there is no need to change it because the laptop does the script logging and timestamp.) Note: The HSM date and time was set from the factory.	GL	19:03

GL 20:05
GL 20:06
GL 20:07



Enable/Activate HSM

Step	Activity	Initials	Time
23.	<p>One by one, CA calls each COs listed below to inspect the TEB for tamper evidence, opens the TEB and hands the OP card to the CA who places the card in cardholder visible to all.</p> <p>CO 1: Frederico Neves OP TEB # BB21820442 ✓</p> <p>CO 2: Anne-Marie Eklund Lowinder OP TEB # BB21820444 ✓</p> <p>CO 3: Olaf Kolkman OP TEB # BB21368993 ✓</p> <p>CO 4: Robert Seastrom OP TEB # BB21820419 ✓</p>	GL	19:07
24.	<p>CA will perform the following steps to activate the HSM:</p> <ol style="list-style-type: none"> Utilize the HSM's keyboard and scroll through menu using <> key Select "1.Set Online" hit ENT When "Set Online?" is displayed, hit ENT to confirm When "Insert OP Card?" is displayed, insert OP card from the cardholder When "PIN?" is displayed, enter "11223344" hit ENT. When "Remove Card?" is displayed, remove card <p>Repeat steps d) to f) for the 2nd and 3rd OP cards Confirm the "READY" led on the HSM is ON IW1 records the used cards below. Each card is returned to cardholder after use.</p> <p>1st OP card <u>4</u> of 7 2nd OP card <u>2</u> of 7 3rd OP card <u>3</u> of 7</p>	GL	19:09 GL 20:10

Check Network between Laptop and HSM

Step	Activity	Initials	Time
25.	CA connects HSM to laptop using Ethernet cable.	GL	19:10 GL 20:10
26.	CA tests network connectivity between laptop and HSM by entering ping 192.168.0.2 on the laptop terminal window and looking for responses. Ctrl-C to exit program.	GL	19:10 GL 20:10



VERISIGN™

20 November 2014

The SHA256 hash of the 2015 Q1 KSR file is:

29cad3cfff124bf107a58f54a962a91bf59966565db5d864b5440a09f450dc02

The PGP wordlist for the hash above is:

breakup revenue stapler Saturday Zulu backwater dragnet vacancy ahead
paperweight payday equation revenge gadgetry revenge bravado vapor
nebula framework escapade exceed positive stormy getaway scorecard
designing allow applicant upshot embezzle sweatband aftermath

Attested on behalf of Verisign by:

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November 13th, 2014

To Whom It May Concern:

This is a letter of Verification of Employment for Alejandro A. Bolivar. Verisign, Inc. has employed Alejandro A. Bolivar full-time since September 8th, 1997 as a Sr. Manager - CBO in our Operations Department

Verisign is the trusted provider of Internet infrastructure services for the networked world. Billions of times each day our identity protection and registry services allow companies and consumers all over the world to engage in trusted communications and commerce.

For over 10 years, Verisign Internet infrastructure has been at the very heart of the Internet, enabling key transactions and protecting valuable data. Verisign facilitates as many as 31 billion authoritative Domain Name System (DNS) queries a day, and has been providing this service since 1998 with 100% availability. Over the years the Verisign Internet infrastructure has scaled quickly and dramatically, and has the capacity to scale just as dramatically in the coming years, as the world moves to Internet-based transactions. Verisign's Network Intelligence and Availability team helps protect against distributed denial of service or DDoS attacks through an in-the-cloud monitoring and mitigation services. Verisign's iDefense Security Intelligence Services help identify and track vulnerabilities, malicious code, threats, and helps provide comprehensive intelligence to enable customers to proactively manage risk.

Should you have further questions, please contact me at the number below.

Sincerely,

David Carney
HR Specialist | Verisign, Inc. | 703-948-4143 | dcarney@verisign.com

Insert Copy of KSR to be signed

Step	Activity	Initials	Time
27.	The KSR is downloaded to the KSRFD and transferred to the facility by the IKOS. CA plugs FD labeled "KSR" with KSR to be signed into the laptop and waits for the O/S to recognize the FD. CA points out the KSR file to be signed then closes the file system window.	GL	19:12

GL 20:11

Execute KSR signer

Step	Activity	Initials	Time
28.	CA identifies the KSR to be signed and runs, in the terminal window <code>ksrsigner Kjqmt7v /media/KSR/ksr-root-2015-q1-0.xml</code>	GL	19:13
29.	The KSR signer will ask whether the HSM is activated or not as below. Activate HSM prior to accepting in the affirmative!! (y/N) : CA confirms that the HSM is online and then enters "y" to proceed to verification. Note: DO NOT enter "y" for the "Is this correct y/n?" yet.	GL	19:13

GL 20:12

GL 20:12

Final Verification of the Hash (validity) of the KSR

Step	Activity	Initials	Time
30.	When the program requests verification of the KSR hash, CA asks the Root Zone Maintainer (RZM) representative to identify him/herself, present identification document for IW1 to retain and read out the SHA256 hash in PGP wordlist format for the KSR previously sent to ICANN. IW1 enters RZM representative's name here: <u>Alexandro Bolivar</u>	GL	19:15
31.	Participants match the hash read out with that displayed on the terminal. CA asks, "are there any objections?"	GL	19:15
32.	CA then enters "y" in response to "Is this correct y/n?" to complete KSR signing operation. Sample output should look like Figure 1. The signed KSR (SKR) will be found in <code>/media/KSR/skr-root-2015-q1-0.xml</code>	GL	19:15

GL 20:13

GL 20:14

GL 20:14



ICANN Root DNSSEC KSK Ceremony 19

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$ ksrsigner Kjqmt7v ksr-root-2010-q4-1.xml

Starting: ksrsigner Kjqmt7v /media/KSR/ksr-root-2010-q4-1.xml (at Mon Jul 12 22:44:26 2010 UTC)
Use HSM /opt/dnssec/aep.hsmconfig?
Activate HSM prior to accepting in the affirmative!! (y/N): y

HSM /opt/dnssec/aep.hsmconfig activated.
[debug] setenv KEYPER_LIBRARY_PATH=/opt/dnssec
[debug] setenv PKCS11_LIBRARY_PATH=/opt/Keyper/PKCS11Provider/pkcs11.GCC4.0.2.so.4.07
Found 1 slots on HSM /opt/Keyper/PKCS11Provider/pkcs11.GCC4.0.2.so.4.07
HSM slot 0 included
Loaded /opt/Keyper/PKCS11Provider/pkcs11.GCC4.0.2.so.4.07 Slot=0
HSM Information:
  Label:          ICANNKSK
  ManufacturerID: AEP Networks
  Model:         Keyper Pro 0405
  Serial:        K6002018

Validating last SKR with HSM...
# Inception      Expiration      ZSK Tags      KSK Tag(CKA_LABEL)
1 2010-07-01T00:00:00 2010-07-15T23:59:59 55138,41248 19036
2 2010-07-11T00:00:00 2010-07-25T23:59:59 41248      19036
3 2010-07-21T00:00:00 2010-08-04T23:59:59 41248      19036
4 2010-07-31T00:00:00 2010-08-14T23:59:59 41248      19036
5 2010-08-10T00:00:00 2010-08-24T23:59:59 41248      19036
6 2010-08-20T00:00:00 2010-09-03T23:59:59 41248      19036
7 2010-08-30T00:00:00 2010-09-13T23:59:59 41248      19036
8 2010-09-09T00:00:00 2010-09-24T00:00:00 41248      19036
9 2010-09-20T00:00:00 2010-10-05T23:59:59 40288,41248 19036
...VALIDATED.

Validate and Process KSR /media/KSR/ksr-root-2010-q4-1.xml...
# Inception      Expiration      ZSK Tags      KSK Tag(CKA_LABEL)
1 2010-10-01T00:00:00 2010-10-15T23:59:59 40288,41248
2 2010-10-11T00:00:00 2010-10-25T23:59:59 40288
3 2010-10-21T00:00:00 2010-11-04T23:59:59 40288
4 2010-10-31T00:00:00 2010-11-14T23:59:59 40288
5 2010-11-10T00:00:00 2010-11-24T23:59:59 40288
6 2010-11-20T00:00:00 2010-12-04T23:59:59 40288
7 2010-11-30T00:00:00 2010-12-14T23:59:59 40288
8 2010-12-10T00:00:00 2010-12-25T00:00:00 40288
9 2010-12-21T00:00:00 2011-01-05T23:59:59 21639,40288
...PASSED.

SHA256 hash of KSR:
A17E539793B261112C4F591A06AF4FBC2221DDDD71794BC72D5AEE910C72543
>> ratchet insurgent dwelling mosquito playhouse pioneer fallout Babylon atlas reproduce vapor miracle
ragtime hamburger upshot Wichita snapshot candidate Belfast tambourine stopwatch bookseller Pluto
pyramid highchair specialist robust ultimate assume retraction bombast decimal <<
Is this correct (y/N)? y

Generated new SKR in /media/KSR/skr-root-2010-q4-1.xml
# Inception      Expiration      ZSK Tags      KSK Tag(CKA_LABEL)
1 2010-10-01T00:00:00 2010-10-15T23:59:59 40288,41248 19036
2 2010-10-11T00:00:00 2010-10-25T23:59:59 40288      19036
3 2010-10-21T00:00:00 2010-11-04T23:59:59 40288      19036
4 2010-10-31T00:00:00 2010-11-14T23:59:59 40288      19036
5 2010-11-10T00:00:00 2010-11-24T23:59:59 40288      19036
6 2010-11-20T00:00:00 2010-12-04T23:59:59 40288      19036
7 2010-11-30T00:00:00 2010-12-14T23:59:59 40288      19036
8 2010-12-10T00:00:00 2010-12-25T00:00:00 40288      19036
9 2010-12-21T00:00:00 2011-01-05T23:59:59 40288,21639 19036

SHA256 hash of SKR:
00CC341B7B3BAEE2E62B1AA6A58DEF07F02E4950E959E6A6ACBD7CEFF2741257
>> aardvark revolver choking bravado kickoff councilman robust tomorrow tracker Cherokee beehive
paragon reindeer microscope uncut amusement unearh coherence deckhand embezzle treadmill examine
tracker paragon ribcage quantity kiwi unravel uproot hydraulic atlas Eskimo <<
Unloaded /opt/Keyper/PKCS11Provider/pkcs11.GCC4.0.2.so.4.07 Slot=0

***** Log output in ./ksrsigner-20100712-224426.log *****

```

Figure 1



The Internet Corporation for Assigned Names and Numbers

ICANN

SET 1
See exception

Starting: krsigner Kjqmt7v /media/KSR/ksr-root-2015-q1-0.xml (at Thu Nov 20 19:12:37 2014 UTC)

Use HSM /opt/dnssec/aep.hsmconfig?

HSM /opt/dnssec/aep.hsmconfig activated.

setenv KEYPER_LIBRARY_PATH=/opt/dnssec

setenv PKCS11_LIBRARY_PATH=/opt/Keyper/PKCS11Provider/pkcs11.GCC4.0.2.so.4.07

Found 1 slots on HSM /opt/Keyper/PKCS11Provider/pkcs11.GCC4.0.2.so.4.07

HSM slot 0 included

Loaded /opt/Keyper/PKCS11Provider/pkcs11.GCC4.0.2.so.4.07 Slot=0

HSM Information:

Label: ICANNKSK
ManufacturerID: AEP Networks
Model: Keyper Pro 0405
Serial: K6002016

Validating last SKR with HSM...

#	Inception	Expiration	ZSK Tags	KSK Tag(CKA_LABEL)
1	2014-10-01T00:00:00	2014-10-15T23:59:59	08230,22603	19036
2	2014-10-11T00:00:00	2014-10-25T23:59:59	22603	19036
3	2014-10-21T00:00:00	2014-11-04T23:59:59	22603	19036
4	2014-10-31T00:00:00	2014-11-14T23:59:59	22603	19036
5	2014-11-10T00:00:00	2014-11-24T23:59:59	22603	19036
6	2014-11-20T00:00:00	2014-12-04T23:59:59	22603	19036
7	2014-11-30T00:00:00	2014-12-14T23:59:59	22603	19036
8	2014-12-10T00:00:00	2014-12-25T00:00:00	22603	19036
9	2014-12-21T00:00:00	2015-01-05T23:59:59	16665,22603	19036

...VALIDATED.

Validate and Process KSR /media/KSR/ksr-root-2015-q1-0.xml...

#	Inception	Expiration	ZSK Tags	KSK Tag(CKA_LABEL)
1	2015-01-01T00:00:00	2015-01-15T23:59:59	16665,22603	
2	2015-01-11T00:00:00	2015-01-25T23:59:59	16665	
3	2015-01-21T00:00:00	2015-02-04T23:59:59	16665	
4	2015-01-31T00:00:00	2015-02-14T23:59:59	16665	
5	2015-02-10T00:00:00	2015-02-24T23:59:59	16665	
6	2015-02-20T00:00:00	2015-03-06T23:59:59	16665	
7	2015-03-02T00:00:00	2015-03-16T23:59:59	16665	
8	2015-03-12T00:00:00	2015-03-26T23:59:59	16665	
9	2015-03-21T00:00:00	2015-04-05T23:59:59	48613,16665	

...PASSED.

SHA256 hash of KSR:

29CAD3CFFF124BF107A58F54A962A91BF59966565DB5D864B5440A09F450DC02

>> breakup revenue stapler Saturday Zulu backwater dragnet vacancy ahead paperweight pa
yday equation revenge gadgetry revenge bravado vapor nebula framework escapade exceed p
ositive stormy getaway scorecard designing allow applicant upshot embezzle sweatband af
termath <<

Generated new SKR: /media/KSR/ksr-root-2015-q1-0.xml USA
 Washington, DC 101 New York Avenue NW, Suite 930 Washington, DC 20005 T +1 202 570 7240 F +1 202 789 0104
 Brussels # Inception Expiration B-1040 Brussels ZSK Tags BELGIUM KSK+32221347870 LABEL+32 2 234 7848
 Marina del Rey 2015-04-01T00:00:00 2015-01-15T23:59:59 Marina del Rey, CA 90292 2260 USA 19036 310 823 9358 F +1 310 823 8649
 Sydney Level 2, 48 Hunter Street Sydney NSW 2000 AUSTRALIA T +61 2 8236 7900 F +61 2 8236 7913

SET 1

See exception

2	2015-01-11T00:00:00	2015-01-25T23:59:59	16665	19036
3	2015-01-21T00:00:00	2015-02-04T23:59:59	16665	19036
4	2015-01-31T00:00:00	2015-02-14T23:59:59	16665	19036
5	2015-02-10T00:00:00	2015-02-24T23:59:59	16665	19036
6	2015-02-20T00:00:00	2015-03-06T23:59:59	16665	19036
7	2015-03-02T00:00:00	2015-03-16T23:59:59	16665	19036
8	2015-03-12T00:00:00	2015-03-26T23:59:59	16665	19036
9	2015-03-21T00:00:00	2015-04-05T23:59:59	16665,48613	19036

SHA256 hash of SKR:

04671E3AF0E325AD38E7CB760CCE8666136B80EA6DE3C39DDF54DB23B2C0B9B2

>> adrift graduate berserk corrosion unearth torpedo bombast perceptive classic truncat
ed spheroid impetus ammo sardonic necklace gossamer Aztec Hamilton merit undaunted gogg
les torpedo snowcap Ohio talon equation suspense cannonball sawdust recipe sentence pio
neer <<

Unloaded /opt/Keyper/PKCS11Provider/pkcs11.GCC4.0.2.so.4.07 Slot=0

SCF2
see coeption

Starting: ksrsigner Kjqmt7v /media/KSR/ksr-root-2015-q1-0.xml (at Thu Nov 20 20:11:32 2014 UTC)

Use HSM /opt/dnssec/aep.hsmconfig?

HSM /opt/dnssec/aep.hsmconfig activated.

setenv KEYPER_LIBRARY_PATH=/opt/dnssec

setenv PKCS11_LIBRARY_PATH=/opt/Keyper/PKCS11Provider/pkcs11.GCC4.0.2.so.4.07

Found 1 slots on HSM /opt/Keyper/PKCS11Provider/pkcs11.GCC4.0.2.so.4.07

HSM slot 0 included

Loaded /opt/Keyper/PKCS11Provider/pkcs11.GCC4.0.2.so.4.07 Slot=0

HSM Information:

Label: ICANNKSK
ManufacturerID: AEP Networks
Model: Keyper Pro 0405
Serial: K6002016

Validating last SKR with HSM...

#	Inception	Expiration	ZSK Tags	KSK Tag(CKA_LABEL)
1	2014-10-01T00:00:00	2014-10-15T23:59:59	08230,22603	19036
2	2014-10-11T00:00:00	2014-10-25T23:59:59	22603	19036
3	2014-10-21T00:00:00	2014-11-04T23:59:59	22603	19036
4	2014-10-31T00:00:00	2014-11-14T23:59:59	22603	19036
5	2014-11-10T00:00:00	2014-11-24T23:59:59	22603	19036
6	2014-11-20T00:00:00	2014-12-04T23:59:59	22603	19036
7	2014-11-30T00:00:00	2014-12-14T23:59:59	22603	19036
8	2014-12-10T00:00:00	2014-12-25T00:00:00	22603	19036
9	2014-12-21T00:00:00	2015-01-05T23:59:59	16665,22603	19036

...VALIDATED.

Validate and Process KSR /media/KSR/ksr-root-2015-q1-0.xml...

#	Inception	Expiration	ZSK Tags	KSK Tag(CKA_LABEL)
1	2015-01-01T00:00:00	2015-01-15T23:59:59	16665,22603	
2	2015-01-11T00:00:00	2015-01-25T23:59:59	16665	
3	2015-01-21T00:00:00	2015-02-04T23:59:59	16665	
4	2015-01-31T00:00:00	2015-02-14T23:59:59	16665	
5	2015-02-10T00:00:00	2015-02-24T23:59:59	16665	
6	2015-02-20T00:00:00	2015-03-06T23:59:59	16665	
7	2015-03-02T00:00:00	2015-03-16T23:59:59	16665	
8	2015-03-12T00:00:00	2015-03-26T23:59:59	16665	
9	2015-03-21T00:00:00	2015-04-05T23:59:59	48613,16665	

...PASSED.

SHA256 hash of KSR:

29CAD3CFFF124BF107A58F54A962A91BF59966565DB5D864B5440A09F450DC02

>> breakup revenue stapler Saturday Zulu backwater dragnet vacancy ahead paperweight pa
yday equation revenge gadgetry revenge bravado vapor nebula framework escapade exceed p
ositive stormy getaway scorecard designing allow applicant upshot embezzle sweatband af
termath <<

Generated new SKR in /media/KSR/skr-root-2015-q1-0.xml

#	Inception	Expiration	ZSK Tags	KSK Tag(CKA_LABEL)
1	2015-01-01T00:00:00	2015-01-15T23:59:59	16665,22603	19036

SET 2
see caption

2	2015-01-11T00:00:00	2015-01-25T23:59:59	16665	19036
3	2015-01-21T00:00:00	2015-02-04T23:59:59	16665	19036
4	2015-01-31T00:00:00	2015-02-14T23:59:59	16665	19036
5	2015-02-10T00:00:00	2015-02-24T23:59:59	16665	19036
6	2015-02-20T00:00:00	2015-03-06T23:59:59	16665	19036
7	2015-03-02T00:00:00	2015-03-16T23:59:59	16665	19036
8	2015-03-12T00:00:00	2015-03-26T23:59:59	16665	19036
9	2015-03-21T00:00:00	2015-04-05T23:59:59	16665,48613	19036

SHA256 hash of SKR:

04671E3AF0E325AD38E7CB760CCE8666136B80EA6DE3C39DDF54DB23B2C0B9B2

>> adrift graduate berserk corrosion unearth torpedo bombast perceptive classic truncat
ed spheroid impetus ammo sardonic necklace gossamer Aztec Hamilton merit undaunted gogg
les torpedo snowcap Ohio talon equation suspense cannonball sawdust recipe sentence pio
neer <<

Unloaded /opt/Keyper/PKCS11Provider/pkcs11.GCC4.0.2.so.4.07 Slot=0



Print Copies of the Operation for Participants

Step	Activity	Initials	Time
33.	CA prints out a sufficient number of copies for participants using <code>printlog ksrsigner-20141120-*.log N</code> where <code>ksrsigner-20141120-*.log</code> is replaced by log output file displayed by program. (This example generates N copies) and hands copies to participants.	GL	19:20
34.	IW1 attaches a copy to his/her script.	GL	19:20

GL 20:17
GL 20:17

Backup Newly Created SKR

Step	Activity	Initials	Time
35.	CA copies the contents of the KSR FD by running <code>cp -p /media/KSR/* .</code> for posting back to RZM. Confirm overwrite by entering "y" when prompted.	GL	19:21
36.	CA lists contents of KSR FD which should now have an SKR by running <code>ls -ltr /media/KSR</code> and then unmounts the KSR FD using <code>umount /media/KSR</code>	GL	19:21
37.	CA removes KSR FD containing SKR and gives it to the RZM representative.	GL	19:21

GL 20:17
GL 20:18
GL 20:18

Disable/Deactivate HSM

Step	Activity	Initials	Time
38.	CA makes sure to utilize the card(s) that were NOT used to activate the HSM are used to deactivate the HSM. CA will perform the following steps to deactivate the HSM: a) Utilize the HSM's keyboard and scroll through menu using <code><></code> key b) Select "2.Set Offline" hit ENT c) When "Set Offline?" is displayed, hit ENT to confirm d) When "Insert OP Card?" is displayed, insert OP card from the cardholder e) When "PIN?" is displayed, enter "11223344" hit ENT f) When "Remove Card?" is displayed, remove card Repeat steps d) to f) for the 2nd and 3rd OP cards Confirm the "READY" led on the HSM is OFF IW1 records the used cards below. Each card is returned to cardholder after use. 1st OP card <u>1</u> of 7 2nd OP card <u>2</u> of 7 3rd OP card <u>3</u> of 7	GL	19:24

GL 20:23



Act. 3 Secure Hardware and Close the Ceremony

Return HSM to a TEB

Step	Activity	Initials	Time
1.	CA disconnects HSM from power and laptop (serial and Ethernet) if connected.	GL	19:24
2.	CA places the HSM into a new TEB and seals it.	GL	19:26
3.	CA reads out TEB # and HSM serial #, shows item to participants and IW1 confirms TEB # and HSM serial # below. HSM1: TEB# BB246466017 serial # K6002016 IW1 and CA initials the TEB and keep the sealing strips for later inventory. CA places item on equipment cart.	GL	19:27

GL 20:24
 GL 20:25
 GL 20:26

new HSM1: TEB # BB24706804

Stop Recording Serial Port Activity and Logging Terminal Output

Step	Activity	Initials	Time
4.	Closing ttyaudit terminal window CA terminates the HSM serial output capture by disconnecting the USB serial adaptor from laptop. CA then exits out of ttyaudit terminal window by typing "exit".	GL	19:28
5.	Terminating the logging script CA stops logging terminal output by entering "exit" in the other terminal window. This only stops the script logging and will NOT close window.	GL	19:28

GL 20:26
 GL 20:27



Backup HSMFD Contents

Step	Activity	Initials	Time
6.	Set dotglob by executing <code>shopt -s dotglob</code> This allows copying everything in the original HSMFD.	GL	19:29 19:39
7.	Calculate the sha256hash of the contents on the original HSMFD. <code>find -P /media/HSMFD -type f -print0 sort -z xargs -0 cat sha256sum</code>	GL	19:29
8.	Copy and paste the sha256hash and paste it on Text Editor by going to Applications > Accessories > Text Editor	GL	20:30
9.	Print two copies. One for the audit bundle and the other for the HSMFD package.	GL	20:30
10.	CA displays contents of HSMFD by executing <code>ls -ltr</code>	GL	20:31
11.	CA plugs a blank FD labeled HSMFD into the laptop, then waits for it to be recognized by the O/S (as HSMFD_); and copies the contents of the HSMFD to the blank drive for backup by executing <code>cp -Rp * /media/HSMFD_</code>	GL	20:31
12.	CA displays contents of HSMFD_ by executing <code>ls -ltr /media/HSMFD_</code>	GL	20:31
13.	Calculate the sha256hash of the contents on the copied HSMFD. <code>find -P /media/HSMFD_ -type f -print0 sort -z xargs -0 cat sha256sum</code> Confirm that it matches the sha256hash of the original HSMFD	GL	20:32
14.	CA unmounts new FD using <code>umount /media/HSMFD_</code>	GL	20:32
15.	CA removes HSMFD_ and places on table.	GL	20:32
16.	CA repeats step 11 to 15 for the 2 nd copy	GL	20:34
17.	CA repeats step 11 to 15 for the 3 rd copy	GL	20:35
18.	CA repeats step 11 to 15 for the 4 th copy	GL	20:36
19.	CA repeats step 11 to 15 for the 5 th copy	GL	20:36

GL 20:27
see exception

GL 20:21

Print Logging Information

Step	Activity	Initials	Time
20.	CA prints out hard copies of logging information by executing <code>enscript -2Gr -# 2 script-20141120.log</code> <code>enscript -Gr -# 2 --font="Courier8" ttyaudit-ttyUSB*-20141120-*.log</code> for attachment to IW1 and CA scripts. Note: Ignore the error regarding non-printable characters if prompted.	GL	20:38

be4043b2ab9b7bde230cf6abaa92f4fe69237dff8220fce6cb4d42dbeed4fc15 -

11/2014
20:26:25

script-20141120-1.log

```

Script started on Thu 20 Nov 2014 08:03:08 PM UTC
\033]0;root@localhost:/media/HSMFD\007[root@localhost HSMFD]# ping 192.168.0.2
PING 192.168.0.2 (192.168.0.2) 56(84) bytes of data:
64 bytes from 192.168.0.2: icmp_seq=1 ttl=255 time=0.955 ms
64 bytes from 192.168.0.2: icmp_seq=2 ttl=255 time=0.257 ms
64 bytes from 192.168.0.2: icmp_seq=3 ttl=255 time=0.255 ms

--- 192.168.0.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1999ms
rtt min/avg/max/mdev = 0.255/0.489/0.955/0.329 ms
\033]0;root@localhost:/media/HSMFD\007[root@localhost HSMFD]# ksrsgn Kjqmt7v /media
/KSR/ksr-root-2015-q1-0.xml
Starting: ksrsgn Kjqmt7v /media/KSR/ksr-root-2015-q1-0.xml (at Thu Nov 20 20:11:32
2014 UTC)
Use HSM /opt/dnssec/aep.hsmconfig?
Activate HSM prior to accepting in the affirmative!! (Y/N): y

```

```

HSM /opt/dnssec/aep.hsmconfig activated.
[debug] setenv KEYPER_LIBRARY_PATH=/opt/dnssec
[debug] setenv PKCS11_LIBRARY_PATH=/opt/Keyper/PKCS11Provider/pkcs11.GCC4.0.2.so.4.07
Found 1 slots on HSM /opt/Keyper/PKCS11Provider/pkcs11.GCC4.0.2.so.4.07
HSM slot 0 included
Loaded /opt/Keyper/PKCS11Provider/pkcs11.GCC4.0.2.so.4.07 slot=0
HSM Information:
Label: ICANNKSK
ManufacturerID: AEP Networks
Model: Keyper Pro 0405
Serial: K6002016

```

```

Validating last SKR with HSM...
# Inception Expiration ZSK Tags KSK Tag(CKA_LABEL)
1 2014-10-01T00:00:00 2014-10-15T23:59:59 08230,22603 19036
2 2014-10-11T00:00:00 2014-10-25T23:59:59 22603 19036
3 2014-10-21T00:00:00 2014-11-04T23:59:59 22603 19036
4 2014-11-01T00:00:00 2014-11-14T23:59:59 22603 19036
5 2014-11-10T00:00:00 2014-11-24T23:59:59 22603 19036
6 2014-11-20T00:00:00 2014-12-04T23:59:59 22603 19036
7 2014-11-30T00:00:00 2014-12-14T23:59:59 22603 19036
8 2014-12-10T00:00:00 2014-12-25T23:59:59 22603 19036
9 2014-12-21T00:00:00 2015-01-05T23:59:59 16665,22603 19036
...VALIDATED.

```

```

Validate and Process KSR /media/KSR/ksr-root-2015-q1-0.xml...
# Inception Expiration ZSK Tags KSK Tag(CKA_LABEL)
1 2015-01-01T00:00:00 2015-01-15T23:59:59 16665,22603
2 2015-01-11T00:00:00 2015-01-25T23:59:59 16665
3 2015-01-21T00:00:00 2015-02-04T23:59:59 16665
4 2015-01-31T00:00:00 2015-02-14T23:59:59 16665
5 2015-02-10T00:00:00 2015-02-24T23:59:59 16665
6 2015-02-20T00:00:00 2015-03-06T23:59:59 16665
7 2015-03-02T00:00:00 2015-03-16T23:59:59 16665
8 2015-03-12T00:00:00 2015-03-26T23:59:59 16665
9 2015-03-21T00:00:00 2015-04-05T23:59:59 48613,16665
...PASSED.

```

```

SHA256 hash of KSR:
29CAD3CFFF124BF107A58F54962A91BF59966565DB5D864B5440A09F450DC02
>> breakup revenue stapler Saturday Zulu backwater dragnet vacancy ahead paperwork p
ayday equation revenge gadgetry revenge bravado vapor nebula framework escapade exceed
positive stormy getaway scorecard designing allow applicant upshot embezzle sweatband
aftermath <<
Is this correct (y/N)? y

```

```

Generated new SKR in /media/KSR/ksr-root-2015-q1-0.xml
# Inception Expiration ZSK Tags KSK Tag(CKA_LABEL)
1 2015-01-01T00:00:00 2015-01-15T23:59:59 16665,22603 19036
2 2015-01-11T00:00:00 2015-01-25T23:59:59 16665 19036
3 2015-01-21T00:00:00 2015-02-04T23:59:59 16665 19036
4 2015-01-31T00:00:00 2015-02-14T23:59:59 16665 19036
5 2015-02-10T00:00:00 2015-02-24T23:59:59 16665 19036
6 2015-02-20T00:00:00 2015-03-06T23:59:59 16665 19036
7 2015-03-02T00:00:00 2015-03-16T23:59:59 16665 19036
8 2015-03-12T00:00:00 2015-03-26T23:59:59 16665 19036
9 2015-03-21T00:00:00 2015-04-05T23:59:59 16665,48613 19036

```

```

SHA256 hash of SKR:
04671E3AF0E325AD38E7CB760CCE8666136B80EA6DE3C39DDF54DB23B2C0B9B2
>> adrift graduate berserk corrosion unearth torpedo bombast perceptive classic trun
ted spheroid impetus ammo sardonic necklace gossamer Aztec Hamilton merit undaunted
pioneer <<
ggles torpedo snowcap Ohio talon equation suspense cannonball sawdust recipe sentence.
Unloaded /opt/Keyper/PKCS11Provider/pkcs11.GCC4.0.2.so.4.07 slot=0

```

```

***** Log output in ./ksrsgn-20141120-201132.log *****
\033]0;root@localhost:/media/HSMFD\007[root@localhost HSMFD]# printlog ks\007r\007sk
er-20141120-*.log 12
[ 2 pages * 12 copy ] sent to printer
3 lines were wrapped
\033]0;root@localhost:/media/HSMFD\007[root@localhost HSMFD]# cp -p /media/KSR/*
\033]0;root@localhost:/media/HSMFD\007[root@localhost HSMFD]# ls -ltr /media/KSR
-rwxr-xr-x 1 root root 18314 Nov 11 03:20 \033]0;32mskr.xml.20141120201132\033]00m
-rwxr-xr-x 1 root root 15371 Nov 11 03:20 \033]0;32mskr-root-2015-q1-0.xml\033]00m
-rwxr-xr-x 1 root root 18314 Nov 20 20:13 \033]0;32mskr.xml\033]00m
-rwxr-xr-x 1 root root 18314 Nov 20 20:13 \033]0;32mskr-root-2015-q1-0.xml\033]00m
\033]m\033]0;root@localhost:/media/HSMFD\007[root@localhost HSMFD]# amount /media/KSR
\033]0;root@localhost:/media/HSMFD\007[root@localhost HSMFD]# exit
exit

```

```

Script done on Thu 20 Nov 2014 08:26:25 PM UTC

```


11/20/14
20:26:09

ttyaudit-ttyUSB0-20141120-200407.log

```
2014-11-20T20:06:40+0000 ttyUSB0 Application Boot Loader - Feb 25 2010 11:08:16
2014-11-20T20:06:40+0000 ttyUSB0
2014-11-20T20:06:41+0000 ttyUSB0
2014-11-20T20:06:41+0000 ttyUSB0 Battery OK!
2014-11-20T20:06:41+0000 ttyUSB0
2014-11-20T20:06:41+0000 ttyUSB0
2014-11-20T20:06:41+0000 ttyUSB0 No Tamper Counts in BBERAM!
2014-11-20T20:06:41+0000 ttyUSB0 Loading Application (APP)
2014-11-20T20:06:41+0000 ttyUSB0 Starting loaded code.
2014-11-20T20:06:42+0000 ttyUSB0
2014-11-20T20:06:42+0000 ttyUSB0 \000Application - Feb 25 2010 11:08:02
2014-11-20T20:06:43+0000 ttyUSB0
2014-11-20T20:06:43+0000 ttyUSB0 wdog started
2014-11-20T20:06:44+0000 ttyUSB0
2014-11-20T20:06:44+0000 ttyUSB0
2014-11-20T20:06:47+0000 ttyUSB0 Running DES POST Test
2014-11-20T20:06:47+0000 ttyUSB0
2014-11-20T20:06:47+0000 ttyUSB0 DES POST Test Passed
2014-11-20T20:06:47+0000 ttyUSB0 Running Triple DES POST Test
2014-11-20T20:06:47+0000 ttyUSB0
2014-11-20T20:06:47+0000 ttyUSB0 Triple DES POST Test Passed
2014-11-20T20:06:47+0000 ttyUSB0 Running AES POST Test
2014-11-20T20:06:47+0000 ttyUSB0
2014-11-20T20:06:47+0000 ttyUSB0 AES POST Test Passed
2014-11-20T20:06:47+0000 ttyUSB0 Running SHA1 POST Test
2014-11-20T20:06:47+0000 ttyUSB0
2014-11-20T20:06:47+0000 ttyUSB0 SHA1 POST Test Passed
2014-11-20T20:06:47+0000 ttyUSB0 Running SHA2 POST Test
2014-11-20T20:06:47+0000 ttyUSB0
2014-11-20T20:06:47+0000 ttyUSB0 SHA2 POST Test Passed
2014-11-20T20:06:47+0000 ttyUSB0 Running RandomGen SHA1 POST Test
2014-11-20T20:06:47+0000 ttyUSB0 Randomgen SHA1 POST Test Passed
2014-11-20T20:06:47+0000 ttyUSB0 Running RSA POST Test
2014-11-20T20:06:47+0000 ttyUSB0 RSA POST Test Passed
2014-11-20T20:06:47+0000 ttyUSB0 Running DSA POST Test
2014-11-20T20:06:48+0000 ttyUSB0 DSA POST Test Passed
2014-11-20T20:06:48+0000 ttyUSB0 Running RandomGen POST Test
2014-11-20T20:06:48+0000 ttyUSB0 RandomGen POST Test Passed
2014-11-20T20:06:48+0000 ttyUSB0 Additional RandomGen POST Test Passed
2014-11-20T20:06:48+0000
```




Returning HSMFD and O/S DVD to a TEB

Step	Activity	Initials	Time
21.	CA unmounts HSMFD by executing <code>cd /tmp</code> then <code>umount /media/HSMFD</code> CA removes HSMFD.	GL	20:38
22.	After all print jobs are complete, CA a) Turns off the laptop by pressing the power switch b) Turns on the laptop by pressing the power switch c) Remove the O/S DVD from the drive d) Turns off the laptop again by pressing the power switch	GL	20:39
23.	CA places TWO HSMFDs and OS/DVD, paper with printed hash in TEB; writes date, time and "HSMFD" in amount field; and seals; reads out TEB #; shows item to participants and IW1 confirms TEB # below. O/S DVD (Rev600) + HSMFD: TEB# BB21820430 ✓	GL	20:42
24.	CA and IW1 initials the TEB and places it on the equipment cart.	GL	20:42

Distribute HSMFDs

Step	Activity	Initials	Time
25.	Remaining HSMFDs are distributed to IW1 (2 for audit bundles, 2 for IKOS) to post SKR to RZM, and to review, analyze and improve on procedures.	GL	20:43

Returning Laptop to a TEB

Step	Activity	Initials	Time
26.	CA disconnects printer, display, power, and any other connections from laptop and puts laptop in prepared TEB and seals; reads out TEB #, serial # laptop # and shows item to participants and IW1 confirms TEB #, serial # laptop # below. Laptop2 (Dell ATG6400): TEB# BB24646602 / serial # 35063364997 ✓	GL	20:44
27.	CA and IW1 initials the TEB and keeps the sealing strips for later inventory. CA then places the TEB on equipment cart.	GL	20:44

Returning OP Smartcards to TEBs

Step	Activity	Initials	Time
28.	<p>CA calls each COs to the front of the room one at a time and repeats the steps below.</p> <ul style="list-style-type: none"> a) CA takes a TEB prepared for the CO and reads out the number and description while showing the bag to IW1 and CO. Figure 2 below for an example. b) CO places the OP card into the plastic case c) CA places the plastic case into the TEB, seals in front of IW1 and CO then the CA initials TEB and strip. d) IW1 inspects the TEB, confirms description in table below and initials TEB and strip. IW1 keeps sealing strips for later inventory. e) CA hands the TEB containing the OP card to the CO. CO inspects and verifies TEB #s and contents then initials his/her TEB. f) CO enters completion time and signs for each TEB in the table below in IW1's script. IW1 initials table entry. g) CO returns to his/her seat with the TEB, being careful not to poke or puncture TEB. <p>CO 1: Frederico Neves OP TEB # BB21907186 ✓</p> <p>CO 2: Anne-Marie Eklund Lowinder OP TEB # BB21907187 ✓</p> <p>CO 3: Olaf Kolkman OP TEB # BB21907258 ✓</p> <p>CO 4: Robert Seastrom OP TEB # BB21907190 ✓</p>	<p>GL</p>	<p>20:52</p>



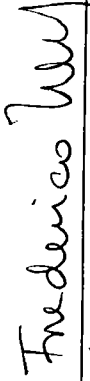
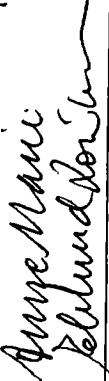



Returning SO Smartcards to TEBs

Step	Activity	Initials	Time
29.	<p>Once the OP cards are packed, CA calls the CO with an SO card to the front of the room and performs the steps below.</p> <ul style="list-style-type: none"> a) CO opens the SO card TEB and confirms the contents b) CO places the SO card into the labeled plastic case c) CA places the plastic case into the TEB, seals in front of IW1 and CO then the CA initials TEB and strip. d) IW1 inspects the TEB, confirms description in table below and initials TEB and strip. IW1 keeps sealing strips for later inventory. e) CA hands the TEB containing the SO card to the CO. CO inspects and verifies TEB #s and contents then initials his/her TEB. f) CO enters completion time and signs for each TEB in the table below in IW1's script. IW1 initials table entry. g) CO returns to his/her seat with the TEB, being careful not to poke or puncture TEB. <p>CO 3: Olaf Kolkman SO TEB # BB21907253 ✓</p>	<p>GL</p>	<p>20:55</p>



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ICANN Root DNSSEC KSK Ceremony 19

CO #	Card Type	TEB #	Printed Name	Signature	Date	Time	IW1 Initials
CO 1	OP 1 of 7	BB21907186	Frederico Neves		20 November 2014	20:47	GL
CO 2	OP 2 of 7	BB21907187	Anne-Marie Eklund Lowinder		20 November 2014	20:49	GL
CO 3	OP 3 of 7	BB21907258	Olaf Kolkman		20 November 2014	20:50	GL
CO 3	SO 3 of 7	BB21907253	Olaf Kolkman		20 November 2014	20:54	GL
CO 4	OP 4 of 7	BB21907190	Robert Seastrom		20 November 2014	20:52	GL

Returning Equipment to Safe #1

Step	Activity	Initials	Time
30.	CA, IW1, SSC1 open safe room and enter with equipment cart.	GL	21:57
31.	SSC1 opens Safe #1 shielding combination from camera.	GL	22:11
32.	SSC1 removes the safe log and fills the next entry with printed name, date, time, and signature indicating the opening of the safe. IW1 initials the entry. Note: If log entry is pre-printed, verify the entry, record time of completion and sign.	GL	22:11
33.	CA records return of HSM in next entry field of safe log with TEB # and HSM serial #, printed name, date, time, and signature. CA CAREFULLY places the HSM into Safe #1 and IW1 initials the entry. HSM1: TEB# BB24646601 / Serial # K6002016 ✓	GL	22:12
34.	CA records return of laptop in next entry field of safe log with TEB #, serial #, laptop #, printed name, date, time, and signature; places the laptop into Safe #1 and IW1 initials the entry. Laptop2 (Dell ATG6400): TEB# BB24646602 / serial # 35063364997 ✓	GL	22:13
35.	CA records return of O/S DVD + HSMFD in next entry field of safe log with TEB #, printed name, date, time, and signature; places the O/S DVD + HSMFD into Safe #1 and IW1 initials the entry. O/S DVD (Rev600) + HSMFD: TEB# BB21820430 ✓	GL	22:13

Close Equipment Safe #1

Step	Activity	Initials	Time
36.	SSC1 makes an entry including printed name, date, time, signature and notes "closing safe" in the safe log. IW1 initials the entry. Note: If log entry is pre-printed, verify the entry, record time of completion and sign.	GL	22:14
37.	SSC1 places log back in safe and locks Safe #1 (spin dial at least two full revolutions each way, counter clock wise then clock wise). IW1 and CA verify safe is locked and door indicator light is green.	GL	22:14
38.	IW1, CA, and SSC1 return to ceremony room with equipment cart closing the door behind them.	GL	22:15

Open Credential Safe #2

Step	Activity	Initials	Time
39.	After a one (1) minute delay, CA, IW1, SSC2, and COs enter the safe room. CA brings a flashlight and the CO brings their OP card TEB with them.	GL	22:17
40.	SSC2 opens Safe #2 while shielding combination from camera.	GL	22:22
41.	SSC2 removes the safe log and fills in the next entry with printed name, date, time, and signature indicating the opening of the safe. IW1 initials the entry. Note: If log entry is pre-printed, verify the entry, record time of completion and sign.	GL	22:25

CO Returns Credentials to Safe #2

Step	Activity	Initials	Time
42.	<p>One by one, each COs along with the CA (using his/her common key):</p> <p>a) Open his/her respective safe deposit box and read out box number inside Safe #2.</p> <p>b) CO makes an entry into the safe log indicating the return of OP card and SO card (if applicable) including Box #, TEB #, card type, printed name, date, time, and signature. IW1 initials the entry after verifying contents and integrity of the TEB and comparing TEB# s and card type to his/her script.</p> <p>Note: If log entry is pre-printed, verify the entry, record time of completion and sign.</p> <p>c) CO shows the bag to the camera and then places his/her TEB into his/her box and locks the safe deposit box with the help of the CA.</p> <p>Repeat the steps above until all cards are returned to the deposit box.</p> <p>CO 1: Frederico Neves Box # 1238 ✓ OP TEB # BB21907186 ✓</p> <p>CO 2: Anne-Marie Eklund Lowinder Box # 1259 ✓ OP TEB # BB21907187 ✓</p> <p>CO 3: Olaf Kolkman Box # 1239 OP TEB # BB21907258 ✓ SO TEB # BB21907253 ✓</p> <p>CO 4: Robert Seastrom Box # 1260 OP TEB # BB21907190 ✓</p>	<p>CL</p>	<p>77:29</p>



Close Credential Safe #2

Step	Activity	Initials	Time
43.	Once all safe deposit boxes are closed, SSC2 makes an entry including printed name, date, time, and signature and notes "Close safe" into the safe log. IW1 initials the entry. <i>Note: If log entry is pre-printed, verify the entry, record time of completion and sign.</i>	GL	22:30
44.	SSC2 puts log back in safe and locks Safe #2 (spin dial at least two full revolutions each way, counter clock wise then clock wise). IW1 and CA verify safe is locked and door indicator light is green.	GL	22:31
45.	CA, IW1, SSC2, and COs leave safe room closing the door behind them making sure it is locked.	GL	22:31

Participant Signing of IW1's Script

Step	Activity	Initials	Time
46.	One by one, all participants come to the front of the room, confirms printed name and date. Then, the participant declares that this script is a true and accurate record of the ceremony by signing on IW1's script coversheet. IW records the completion time once all participants have signed the coversheet. <i>Note: If entry is pre-printed, verify the entry and sign.</i>	GL	22:38
47.	CA reviews IW1's script and signs it.	GL	22:39

Signing Out of Ceremony Room

Step	Activity	Initials	Time
48.	IW2 ensures that all participants sign out of Ceremony Room log and are escorted out of the Ceremony Room. SA, IW1 and CA remain in the Ceremony Room.	GL	22:48

Filming Stops

Step	Activity	Initials	Time
49.	SA stops filming and makes 2 copies of film, one for on-site and one for off-site storage along with IW1 script copies made below.	GL	22:48

Copying and Storing the Script

Step	Activity	Initials	Time
50.	IW1 makes at least 4 copies of his/her script: one for off-site audit bundle, one for IW1, one for IKOS and copies for other participants, as requested. Audit bundles each contain 1) Output of signer system – HSMFD 2) Copy of IW1's key ceremony script 3) Audio-visual recording 4) Logs from the Physical Access Control and Intrusion Detection System (Range is 04/17/2014 – 11/20/2014) 5) The IW attestation (A.1 below) 6) SA attestation (A.2, A.3 below) All in a TEB labeled "Key Ceremony 19", dated and signed by IW1 and CA. Off-site audit bundle is delivered to off-site storage. The CA holds the ultimate responsibility for finalizing the audit bundle.	GC	3:22 + 1 day

All remaining participants sign out of ceremony room log and leave.

Audit Bundle Checklist:

1. Output of Signer System (CA)

One electronic copy (physical flash drive) of the HSMFD in each audit bundle, each placed within a tamper-evident bag, labeled, dated and signed by the CA and the IW1

2. Key Ceremony Scripts (IW1)

Hard copies of the IW1's key ceremony scripts, including the IW's notes and the IW's attestation. See Appendix A.1.

3. Audio-visual recordings from the key ceremony (SA)

One set for the original audit bundle and the other for duplicate.

4. Logs from the Physical Access Control and Intrusion Detection System (SA)

One electronic copy (physical flash drive) of the firewall configuration, the screenshots from the PAC-IDS configuration review, the list of the enrolled users, the event log file and the configuration audit log file in each audit bundle, each placed in a tamper-evident bag, labeled, dated and signed by the SA and the IW.

IW confirms the contents of the logs before placing the logs in the audit bundle.

5. Configuration review of the Physical Access Control and Intrusion Detection System (SA)

SA's attestation and hard copies of the screen shots and configuration audit log from the review process. See Appendix A.2.

6. Configuration review of the Firewall System (SA)

SA's attestation and hard copies of the firewall configuration from the review process. See Appendix A.3. Make sure the scrambled passwords are eliminated from the configuration before publishing it.

7. Other items

If applicable.



A.1 Key Ceremony Script (by IW)

I hereby attest that the Key Ceremony was conducted in accordance with this script and any exceptions that may have occurred were accurately and properly documented.

Gustavo Lozano

A handwritten signature in black ink, appearing to read "Gustavo Lozano", is written over a horizontal line. The signature is somewhat stylized and includes a large loop at the end.

Date: 20 November 2014

A.2 Access Control System Configuration Review (by SA)

I have reviewed the access control system configuration, the configuration audit log and the assigned authorizations from the other KMF and not found any discrepancies or anything else out of the ordinary.

Enclosed are the configuration audit log, the list of assigned authorizations and the screenshots of the roles configurations.

Enclosed is also an electronic copy of the event log from the access control system ranging from the last log extraction on **17 April 2014 00:00 UTC** to now.

Connor Barthold



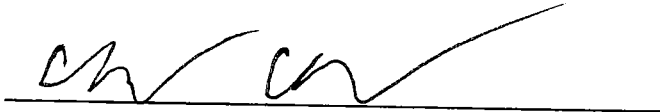
Date: 20 November 2014

A.3 Firewall Configuration Review (by SA)

I have reviewed the firewall configuration from the other KMF and not found any discrepancies or anything else out of the ordinary.

Enclosed is the configuration extract from the firewall unit.

Connor Barthold

A handwritten signature in black ink, appearing to read "CB", is written over a horizontal line.

Date: 20 November 2014



ICANN DNSSEC Script Exception

Abbreviations

- TEB = Tamper Evident Bag
- HSM = Hardware Security Module
- FD = Flash Drive
- CA = Ceremony Administrator
- IW = Internal Witness
- SA = System Administrator
- SSC = Safe Security Controller

Instructions: Initial each step that has been completed below. Note time.

Note Exception Time

Step	Activity	Initials	Time
1.	IW1 notes date and time of key ceremony exception and signs here: <u>20/11/2014 18:37</u>	GL	18:37
2.	IW1 Describes exception and action below.	GL	18:37

ACT 2, STEP 3, PAGE 8
IKOS provided a display port to HDMI adapter to CA

– End of DNSSEC Script Exception –



ICANN DNSSEC Script Exception

Abbreviations

- TEB = Tamper Evident Bag
- HSM = Hardware Security Module
- FD = Flash Drive
- CA = Ceremony Administrator
- IW = Internal Witness
- SA = System Administrator
- SSC = Safe Security Controller

Instructions: Initial each step that has been completed below. Note time.

Note Exception Time

Step	Activity	Initials	Time
1.	IW1 notes date and time of key ceremony exception and signs here: 20/11/2014 18:49	GL	18:49
2.	IW1 Describes exception and action below.	GL	18:49

Timezone changed to UTC. by CA.
ACT 2, STEP 7, PAGE 9

– End of DNSSEC Script Exception –



ICANN DNSSEC Script Exception

Abbreviations

- TEB = Tamper Evident Bag
- HSM = Hardware Security Module
- FD = Flash Drive
- CA = Ceremony Administrator
- IW = Internal Witness
- SA = System Administrator
- SSC = Safe Security Controller

Instructions: Initial each step that has been completed below. Note time.

Note Exception Time

Step	Activity	Initials	Time
1.	IW1 notes date and time of key ceremony exception and signs here: 2011/2014 19:29	GL	19:24
2.	IW1 Describes exception and action below.	GL	19:29

- ACT 3, STEP 7, PAGE 16
- Hash calculation failed for HSM FD,
 - CA removed the HSM FD instead of the KSR FD. in ACT 2, STEP 37, PAGE 14.
 - Participants agreed to use the backup of HSM FD and HSR FD.
 - Ceremony restarted in STEP 3, ACT 2, PAGE 8.
 - original HSM FD and original KSR FD were stored in TEB # BB24706819. by 11205.
 - HSM was stored in new TEB # B1324706804 in ACT 3, STEP 3, PAGE 15

- End of DNSSEC Script Exception -



ICANN DNSSEC Script Exception

Abbreviations

- TEB = Tamper Evident Bag
- HSM = Hardware Security Module
- FD = Flash Drive
- CA = Ceremony Administrator
- IW = Internal Witness
- SA = System Administrator
- SSC = Safe Security Controller

Instructions: Initial each step that has been completed below. Note time.

Note Exception Time

Step	Activity	Initials	Time
1.	IW1 notes date and time of key ceremony exception and signs here: <u>20/11/2014 20:02</u>	GC	20:02
2.	IW1 Describes exception and action below.	GC	20:02

ACT 2, STEP 17, PAGE 10

- CA used a different name for the script log. The new filename is script-20141120-blog

– End of DNSSEC Script Exception –



ICANN DNSSEC Script Exception

Abbreviations

TEB = Tamper Evident Bag
HSM = Hardware Security Module
FD = Flash Drive
CA = Ceremony Administrator
IW = Internal Witness
SA = System Administrator
SSC = Safe Security Controller

Instructions: Initial each step that has been completed below. Note time.

Note Exception Time

Step	Activity	Initials	Time
1.	IW1 notes date and time of key ceremony exception and signs here: <u>20/11/2014 20:56</u>	GC	20:56
2.	IW1 Describes exception and action below.	GC	20:56

AET 3, STEP 30, PAGE 22

- CARD READER WAS DISABLED, BECAUSE OF A FAILING SENSOR. IW SAFE 1.
 - Security guard from the facility opened the door with the manual key, tier 5.
 - Alarm in the sensor was cleared.
 - Security system working properly.
 - Participants call go into tier 3.
 - Participants call go into tier 4.
 - Ceremony continues.
 - At the end of the ceremony, the security guard is escorted to tier 1 with the manual key in a new TEB # BB21369007
- End of DNSSEC Script Exception -



ICANN DNSSEC Script Exception

Abbreviations

- TEB = Tamper Evident Bag
HSM = Hardware Security Module
FD = Flash Drive
CA = Ceremony Administrator
IW = Internal Witness
SA = System Administrator
SSC = Safe Security Controller

Instructions: Initial each step that has been completed below. Note time.

Note Exception Time

Step	Activity	Initials	Time
1.	IW1 notes date and time of key ceremony exception and signs here: 20/11/2014 22:23	GL	22:23
2.	IW1 Describes exception and action below.	GL	22:30

- ACT 3, STEP 41, PAGE 22
- SDCARDS in camera 1, 2, and 3 are full.
 - Empty SDCARDS were installed in camera 1, 2, and 3 by SA1, SA2, and olaf.

– End of DNSSEC Script Exception –

```
cbarthold@srx> show configuration | no-more
## Last commit: 2014-04-18 07:15:51 UTC by cbarthold
version 10.1R3.7;
system {
  host-name srx;
  domain-name ksk.cjr.dns.icann.org;
  location {
    country-code US;
    postal-code 22701;
    building Terreremark-Admin;
    floor 1;
    rack 1;
  }
  ports {
    console {
      log-out-on-disconnect;
      type vt100;
    }
  }
  root-authentication {
    encrypted-password XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX; ##
SECRET-DATA
  }
  name-server {
    199.4.29.19;
    199.4.29.29;
  }
  login {
    user cbarthold {
      full-name "Connor A. Barthold";
      uid 2007;
      class super-user;
      authentication {
        encrypted-password
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX; ## SECRET-DATA
      }
    }
    user reed {
      full-name "Reed Quinn";
      uid 2003;
      class super-user;
      authentication {
        encrypted-password
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX; ## SECRET-DATA
      }
    }
    user spowell {
      full-name "Sean P. Powell";
      uid 2008;
```



```

        class super-user;
        authentication {
            encrypted-password
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX; ## SECRET-DATA
        }
    }
}
services;
syslog {
    archive size 100k files 3;
    user * {
        any emergency;
    }
    file messages {
        any critical;
        authorization info;
    }
    file interactive-commands {
        interactive-commands error;
    }
}
max-configurations-on-flash 5;
max-configuration-rollback 20;
license {
    autoupdate {
        url https://ae1.juniper.net/junos/key_retrieval;
    }
}
processes {
    idp-policy disable;
}
ntp {
    server 199.4.29.17;
    server 199.4.29.27;
    source-address 10.4.29.1;
}
}
interfaces {
    interface-range interfaces-trust {
        member ge-0/0/1;
        member fe-0/0/2;
        member fe-0/0/3;
        member fe-0/0/4;
        member fe-0/0/5;
        member fe-0/0/6;
        member ge-0/0/0;
        unit 0 {
            family ethernet-switching {
                vlan {
                    members vlan-trust;
                }
            }
        }
    }
}

```

```

    }
  }
}
fe-0/0/7 {
  speed 100m;
  link-mode full-duplex;
  fastether-options {
    no-auto-negotiation;
  }
  unit 0 {
    family inet {
      address 199.4.29.196/29;
    }
  }
}
vlan {
  unit 0 {
    family inet {
      address 10.4.29.1/32;
    }
  }
}
}
routing-options {
  static {
    route 0.0.0.0/0 next-hop 199.4.29.193;
  }
}
security {
  ssh-known-hosts {
    host 199.4.29.21 {
      rsa-key
AAAAB3NzaC1yc2EAAAABIwAAAQEA4so1gB6EcqjcP7WTbIm4/6Z0qqYfFI3MRl7Hi02C2C
1UML2jyaHAVQq0/5LtbKyPoZ38huGEGgYMqsMDaga+lIiKpu+2sJysG6HHnH
+ZPw0eQ24RnTMxGaZjfCKR+/
GDQDnrpyZG0st8jlbSLPjVnQFzWmBAW2A0rcqDkSINEkb5vyzDeZxQTpBrHRwQDJew9m87
GxalHJo7sqz91blpsC7K2XaE7ypMQnEd0xY2mE4jzF/
0zNaNZVcWiN9YSeAPmRKYbIbHcLX9Gn3K8IPJGLEVMMfwrWxhSj7iFl6Gr6gi
+rQvTVepDKgw0s6JLJY2hTGHRIbFQ2/c/PpxsrqmQ==;
    }
  }
}
nat {
  source {
    rule-set trust-to-untrust {
      from zone trust;
      to zone untrust;
      rule source-nat-rule {
        match {
          source-address 0.0.0.0/0;
        }
      }
    }
  }
}

```