

DNSSEC Key Ceremony Script Friday, September 25, 2015

Sign In to Facility

POT

Step	Activity	Initial	Time (PST)
1	FO has all participants sign in on Facility Sign-In Sheet before entering the Key Management Facility.	1/	9:49
2	FO reviews emergency evacuation procedures and other relevant information with participants.	ly	9:49 An
3	FO collects cell phones, laptops, etc.	11	,
	Cameras are permitted in the Key Management Facility.	1	9:50
	SC is allowed to use his laptop.		A
4	FO verifies the functioning of audio and video recording.	1/	9:50A

Enter the Key Management Facility

PA

Step	Activity	Initial	Time (P3Γ)
F in F	As the participants enter the Key Management Facility, the EW verifies the identity of each by examining a government-issued photo identification, notes the type and number of each piece of identification, and the participant's entry time on the Participant Signature Sheet. Note that participants do not sign the sheet until the end of the ceremony. As the participants are identified, the identification placards are distributed.	1)	9:51/f

Ground Rules

P	0	+

Step	Activity	Initial	Time (PST)
6	CA previews ground rules and break procedures with participants.		
	- We follow the script step by step.		
	- Each step is read aloud by CA prior to it being performed.	11	and)
	- When a step is complete, it is announced that it is complete plus the time.		7:30
	- If a participant disagree, it is important to speak up, so everyone agrees that things are done properly.		
	- Questions and suggestions for improvement are welcome.		

Verify Time and Date



Step	Activity	Initial	Time (PST)
1	EW reads aloud and records the date (month/day/year) and time (UTC) using an NTP-synchronized clock visible to all. Participants verify that the time is correct. Date: 9/25/20/5 Time: 16.'58 This and all subsequent entries into this script and	1	9.'59
	any associated logs should follow this common source of time.		

Verify UPS

Step	Activity	Initial	Time (UTC)
8	If there is a UPS (uninterruptible power supply), then	,	
	- CA makes sure the UPS is connected to the electric grid and that it is charged.	\mathcal{N}	1700
	- CA also makes sure that the audio recorder is plugged into the UPS.	7	

Remove Equipment from Safe

Step	Activity	Initial	Time (UTC)
9	SC opens safe and makes entry in log sheet indicating opening of safe.	1/	17:02
10	SC collects the following items from the safe:	- /	
	- KSK-HSM-01B-SJC HSM		
	- boot-DVD	, 1	
	- laptop	0	17:47
	and any other items that may be scheduled for removal indicating removal of each with corresponding TEB number in the safe log. SC also provides any necessary power supplies and cables. Equipment is placed on table visible to all partipants.	1	,
	If the key ceremony prior to this one was in this facility, the HSMFD is also collected from the safe. If the key ceremony prior to this one was not performed in this facility, any HSMFD from the previous key ceremony is then produced in it's TEB, having been brought in by one of the participants.		
11	CA reads out KSK-HSM-01B-SJC HSM TEB and serial number while EW checks that it matches the TEB # recorded in the script from the previous key ceremony. TEB# A3112578 Serial# K1011066	#	17:46
12	CA similarly reads out boot-DVD, laptop, and HSMFD TEB numbers while EW checks that they match the TEB # in the script from the previous key ceremony. DVD TEB# A28410793	1/	17:46
	Laptop TEB# A3112579	/	
	HSMFD TEB# A28410771		

Collect OP Cards

Step	Activity	Initial	Time (UTC)
	CA collects OP cards from COs, reading out and comparing TEB numbers with those recorded in the prior ceremony, reproduced for convenience in the appendices of this document. Different COs may appear on different pages. Note any discrepancies. CA places the OP cards in plain view on the table, removing cards from TEBs, discarding used TEBs but saving warning slips for reuse.		17,55

Set Up Laptop

Step	Activity	Initial	Time (UTC)
14	CA takes boot-DVD and laptop out of their TEBs.		
	CA places the boot-DVD and the laptop on the table, connects laptop power to the UPS, external monitor power can be plugged to grid power or the UPS (if the UPS is considered big enough).	,1	18:04
	When these items are powered on, boot the laptop using the DVD.	1	10 4
	During the boot process, make sure the output on the laptop screen is also sent to the external monitor/projector.	7	
	Booting from CD may generate warnings of kernel crash, which can be ignored if it keeps on booting.		
15	CA logs in as root.		18:04
16	CA opens a terminal window.	"4/	18:05

17	CA verifies the time zone, date, and time on the laptop and synchronizes it if necessary.		
	Display the current time and timezone:		
	date		
	If the timezone is not set to UTC:		
	cd /etc/		
	rm localtime	A	
	ln -s /usr/share/zoneinfo/UTC localtime		16120
	Set time to match the wall clock:		18,08
	date mmddHHMMYYYY		
	Verify:		
	date		
18	CA disables screen saver by typing		
	xset s off		
	(while sleep 1800;do xset -dpms;done&)		
	Then closes the window by typing		
	exit	11	18:10
	Now, using the GUI menu, in		1811
	"System" -> "Preferences" -> "Screensaver"	' /	
	uncheck "activate screen saver when computer is idle"		
	Click "Close". In		
	"System" -> "Preferences" -> "More Preferences" -> "Power Management"		
	Ensure both sliders in "Running on AC" are set to "never".		
	Click "Close".		
19	CA opens a terminal window, which we will refer to as the "checksum window". In this window CA starts the calculation of the sha256 checksum of the boot-DVD. This takes about 9 minutes to complete. This step is complete after issuing this command.	H	18:10
l	sha256sum /dev/cdrom		
		. 1	

	CA removes HSMFD from the TEB, connects it to the laptop, and waits for O/S to recognize the FD. CA lets participants view contents of HSMFD then closes FD window.	1	18:13
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Start Logging Terminal Session

Step	Activity	Initial	Time (UTC)
22	CA opens a new terminal window, which we will refer to as the "command window". In this new window CA will change the default directory to the HSMFD and starts capture of terminal output to a file: cd /media/HSMFD script script—20150925.log		18:14

Start Logging HSM Output

Step	Activity	Initial	Time (UTC)
23	CA inspects the HSM TEB for tamper evidence and removes it from TEB; discards TEB and plugs ttyUSB0 null modem serial adaptor and cable to the back.	1/	18:15
24	CA connects the HSM to the laptop using the USB serial adapter.	1/	18:16
25	CA opens a new terminal window, which we will refer to as the "ttyaudit window". In this window the CA will start logging HSM serial port output by executing	11,	18:17
	cd /media/HSMFD	6/	10.
	ttyaudit /dev/ttyUSB0	/	
	Note: DO not unplug USB serial port adaptor from laptop as this causes logging to stop.		

Verify DVD checksum

Step	Activity	Initial	Time (UTC)
26	In the "checksum window" CA uses the "hexread" program to have the sha256 checksum of the boot-DVD read aloud by the laptop.		
	hexread		
	CA will copy/paste the checksum into the "hexread" program at the appropriate prompt.		
	If the use of the "hexread" program does not sound properly, CA will read aloud himself, four digits at a time.		18.21
	EW verifies that the checksum of the boot-DVD is the following:		
	7DE4 31F9 C33D DFEF		
	9089 AB56 13A3 8126		
	708A 3AC1 A784 38A7		
	B9C9 2A4F 52A1 F87C		
	Other participants may compare this with the boot- DVD checksum calculated during Key Ceremony 6, reproduced for convenience in the appendices of this document.		
	CA then closes the terminal window by typing		
	exit		

Connecting offline HSM (KSK-HSM-01B-SJC)

Step	Activity	Initial	Time (UTC)
27	CA connects power to HSM. Status information will appear on the serial logging screen in the "ttyaudit window" and the "Ready" LED on the will HSM blink. After the self test the HSM display will have the text "Set Online" indicating that the HSM is in the initialized state. The "Ready" LED is off.	1)	18:24

Activate HSM

Step	Activity	Initial	Time (UTC)
28	CA sets HSM online using the "Set Online" menu item and three (3) OP cards. The "Ready" LED should illuminate. Use OP cards 1, 4 and 5, and PIN 11223344. The HSM will always refer to cards 1, 2 and 3, regardless of our numbering (possibly) being different.	1)	[8:28
29	CA connects Ethernet cable between laptop and HSM and tests network connectivity between laptop and HSM by entering ping 192.168.0.2 in the "command window" and looking for responses. Press Ctrl-C to stop the ping program.	1	8,'29
30	CA inserts flash drive labeled "SCRIPTS" into a free USB slot and waits for O/S to recognize the FD. When the new window for the mounted media appears, close that window.	1	18:30
31	CA copies the compressed scripts from the drive labeled "SCRIPTS" and calculates the checksum of the tar-file. ls /media/SCRIPTS cp -p /media/SCRIPTS/scripts- 20150925.tar.gz . sha256sum scripts-20150925.tar.gz	1	18:31
	5.1425054m 5011pts-20150925.tar.g2		

Start generating Keys and Keybundles

Step	Activity	Initial	Time (UTC)
32	CA copies shell scripts that will be used to generate new keys and bundles by executing:		
	tar -xzvof scripts-20150925.tar.gz		
	cp -p makeallhsmfiles /opt/dccom		
	cp -p exkey /opt/dccom	al	1>
	cp -p keybundle-generate.20141212 /opt/dccom		8:33
	mkdir /tmp/pch	1	
	cp -p 20150925.kc_script_gen.out /tmp/pch		
	cp -p /opt/dnssec/aep.hsmconfig /tmp/pch		
33	CA copies encrypted backups of the ZSKs by executing:	1	14177
	cd /tmp/pch		18,55
	makeallhsmfiles		
34	CA starts key and signature generation by executing:		
	keybundle-generate.20141212 < 20150925.kc_script_gen.out	//	
	The data file contains a line for each zone for which ZSKs will be rolled or a new zone will be generated. This will take a long time generating ZSKs and KSKs as necessary and creating keybundles (KSK signed DNSKEY RRsets). KSKs and ZSKs will automatically be backed up in encrypted form and deleted from HSM as each zone is completed. The backed up keys are stored in /tmp, which is a memory based file system.	4/	18,36
	This step is complete when the CA has issued the command above.		

Re-Package OP Cards

Step	Activity	Initial	Time (UTC)
35	CA places each OP card with pre-printed warning slip in its own new TEB and records the TEB # in the EW's copy of the smart card sign out sheet below, reading it aloud for verification and giving the TEB tear-off strip to the EW.	W	19:14

Re-Distribution of Cards

Step	Activity	Initial	Time (UTC)
36	CA calls each CO to retrieve their smartcards. As each CO receives and inspects their cards, they verify, date and sign the EW's copy of the sign out sheet below and EW initials their entry.	11	19:20

Smart Card Sign Out Sheet

CO#	Card Type	TEB#	Printed Name	Signature	Date	Time	EW
CO1	OP 1 of 7	A28410724	Steve FELDMAN		9/25/15	1915	1/
CO4	OP 4 of 7	A28410725	Eric ALLMAN	En Polh	9/25/15	19:16	-//
CO5	OP 5 of 7	A28410726	Stephan SOMOGYI	SGN	9/25/15	19:16	1

Optionally leave facility

		Time (UTC)
Optionally, all participants can now leave the room if the room is closed and sealed until everyone's return.	1	PD:314

Pack and store Keys and Keybundles

Step	Activity	Initial	Time (UTC)
38	CA waits for key generation script to complete.	1/	20:31
39	CA generates the archive destined for the signers by executing:	lf	
	<pre>tar -cvzf /media/HSMFD/20150925.kb.tar.gz zsk*.hsm *.keybundle.tar.gz *.keybundle.tar.gz.sha256 2> errors</pre>	n /	- 112(1
	The redirection of stderr to the "errors" file is to make possible error messages from the command execution easily noticable. This file should be empty:	1/	10:34
	cat errors		
9	rm errors		
40	CA archives all results including encrypted KSKs for future use by executing:	//	
	<pre>tar -cvzf /media/HSMFD/20150925.session.tar.gz . 2> errors</pre>		20,'34
	cat errors	, ,	
	rm errors		
41	CA creates a snapshot of any changes to DB files by executing:	11	
	cd /media/HSMFD		20,35
	tar -czf 20150925.KSK-HSM-01B- SJC.db.tar.gz *.db	'/	20,33
42	CA calculates checksums of all files on the HSMFD:		
	findtype f -print0 xargs -0 -n 50 sha256sum	1/	20/36
	If that command fails, the following will suffice instead:		20130
	sha256sum *		
	Finally, to keep an eye on available space, execute:		
	df -h		

	CA deletes the files on the SCRIPTS FD and unmounts by executing:		
ı	rm —rf /media/SCRIPTS/*	01	2
v	umount /media/SCRIPTS	7/	10:40
a	and removes the SCRIPTS FD for reuse.		

Return HSM to a Tamper Evident Bag

Step	Activity	Initial	Time (UTC)
44	CA presses RESTART button on the HSM and waits for self test to complete. CA then disconnects HSM from power and laptop (serial and Ethernet), placing HSM into a new TEB and seals.	1/	20,42
	CA reads out TEB # and HSM serial #, shows item to participants while EW records TEB # and HSM serial # here. TEB# <u>A 412845</u> 7 HSM Serial#: <u>K1011066</u>		20:44

Stop Recording Serial Port Activity

Step	Activity	Initial	Time (UTC)
	CA terminates HSM serial output capture by disconnecting the USB serial adaptor from the laptop. CA then exits out of the "ttyaudit window".	1	20;44

Backup HSM Flash Drive Contents

Step	Activity	Initial	Time (UTC)
47	CA displays contents of HSMFD by executing	11	22/15
	ls -ltr		20,45

48	CA plugs a blank FD labeled "HSMFD" into the laptop waits for it to be recognized by the O/S as HSMFD_ and copies the contents of the HSMFD to the blank drive by executing cp -Rp * /media/HSMFD_ CA then unmounts new FD using umount /media/HSMFD_ CA then removes HSMFD_ from the laptop and places it a new TEB and seals; reads out TEB # and shows item to participants while EW records TEB # here. TEB# A284/D7/9 This copy will later be stored in the on-site audit bundle.		20:57
49	CA repeats this activity a second time to create a second copy. TEB# A284107 20 This copy will later be stored in the off-site audit bundle.	1	20,59
50	CA repeats this activity a third time to create a third copy. TEB# A284/0721 This copy will later be stored in the EW audit bundle.	11	21:01
51	CA repeats this activity a fourth time to create a fourth copy. TEB# 1284/0722 This copy will later be placed in the safe.	11	21:02
52	CA repeats this activity a fifth time to create a fifth copy. TEB# A284/072 3 This copy will later be sent to the other KSK generating country.		21:04

Stop Logging Terminal Output

Step	Activity	Initial	Time (UTC)
53	CA stops logging terminal output by entering "exit" in "command window".	1	20,48
54	CA calculates sha256 checksum of the logfile by executing. sha256sum script-20150925.log CA may choose to use the "hexread" program, and copy/paste, to read the hash of the checksum. EW records the sixty-four digit hash 666E 17D1 EB47 68B 9 2BSB SD44 2AFF 979D A620 01EF 0100 FS1D 01CF 3126 A3BC 71BA 04EE		20:53

Return HSMFD to a Tamper Evident Bag

Step	Activity	Initial	Time (UTC)
55	CA unmounts HSMFD by executing		
	cd /tmp	1,	
	then		21:05
	umount /media/HSMFD		
56	CA removes HSMFD and places it in new TEB and seals; reads out TEB # and shows item to participants.		21:07
	EW records TEB # here. TEB# № 28410718	(/	

Return Boot-DVD to a Tamper Evident Bag

Step	Activity	Initial	Time (UTC)
57	CA executes:	11	
	shutdown —h now	-1/	7/29
	removes DVD and turns off laptop.		21.07
58	CA places boot-DVD in new TEB and seals; reads out TEB # and shows item to participants.	//	- · · · 1 - 2
	EW records TEB # here.	1/	21:09
	TEB# <u>A 284107/</u> 7		

Return Laptop to a Tamper Evident Bag

Step	Activity	Initial	Time (UTC)
	CA disconnects power, and any other connections from laptop and puts laptop in new TEB and seals; reads out TEB #; shows item to participants. EW records TEB # here. TEB# A 4 / 2 8 4 5 8	1	21:11

Return Power Supplies, USB Hub, and Cables

Step	Activity	Initial	Time (UTC)
60	CA places HSM power supply and laptop power supply, USB hub, USB serial adapter, power and networking cables in a bag. This need not be a TEB as it is only used for convenient packaging.	1	21:15

61	SC returns items to the safe. SC records return of each item on the safe log with TEB #, printed name, date, time, and signature with a second participant initialing each entry.		
	- KSK-HSM-01B-SJC HSM		
	- laptop		0.440
	- original HSMFD above		21.78
	- fourth HSMFD backup		
	- DVD		
	Power supplies and cables need not go in the safe, but can be stored separately.		
62	SC closes safe. EW verifies it is locked.	1/	21:19

Sign-Out on Participant Signature Sheet

Step	Activity	Initial	Time (UTC)
63	All participants leave the Key Management Facility, sign the Participant Signature Sheet, and note their exit time.	1	2122
64	CA reviews EWs script and signs it. CA Signature	1/	21,'26

Sign Out of Facility

Step	Activity	Initial	Time (PST)
65	FO returns phones, laptops, and other items to participants and logs their exit times. Participants return identification vests to the FO. Participants are now free to depart.	1)	2,26 pm

Stop Audio-Visual Recording

Step	Activity	Initial	Time (PST)
66	FO stops audio and video recording.	9/	2:26 pm

Copy and Store the Script

P 10 10 10 10 10 10 10 10 10 10 10 10 10		(A) because the constitution of the constituti	
Step	Activity	Initial	Time (PST)
67	EW makes at least 2 colour copies of his or her script: one for off-site audit bundle, one for on-site audit bundle, copies for other participants as requested, and retaining the original.		
	The two audit bundles each contain:		
	- output of signer system - HSMFD		
	- copy of EWs key ceremony script		
	- audio-visual recording		
	- logs from the Facility Physical Access Control	\	
	- SC attestation (A.2 below)		
	- the EW attestation (A.1 below)		
	all in a TEB labeled "Key Ceremony 09/25/2015", dated and signed by EW and CA. One bundle will be stored by the SC along with equipment. The second bundle will be kept securely offsite.		
	The "fifth copy" of the HSMFD will be sent to the other key signing facility.		
	CA keeps any remaining materials (e.g. extra HSMFD) for next key ceremony preparation and analysis.		

Appendix A:

Key Ceremony Script Attestation

(by EW)

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

Printed Name:

Signature:

Date:

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

CIVIL CODE § 1189

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document. State of California County of San Mateo On 9/25/2015 before me, Larry W. Jordan

Date Here Insert Name and Title of the Officer personally appeared William & Wood Cock who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument. I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct. LARRY W. JORDAN WITNESS my hand and official seal. Commission # 2024037 Notary Public - California San Mateo County My Comm. Expires Jun 7, 2017 Place Notary Seal Above OPTIONAL ' Though this section is optional, completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document. **Description of Attached Document** Title or Type of Document: Document Date: Number of Pages: _____ Signer(s) Other Than Named Above: ____ Capacity(ies) Claimed by Signer(s) Signer's Name: Signer's Name: □ Corporate Officer — Title(s): ____ □ Corporate Officer — Title(s): __ ☐ Partner — ☐ Limited ☐ General ☐ Partner — ☐ Limited ☐ General ☐ Individual ☐ Attorney in Fact ☐ Individual ☐ Attorney in Fact ☐ Trustee ☐ Guardian or Conservator ☐ Trustee ☐ Guardian or Conservator ☐ Other: ☐ Other: Signer Is Representing: Signer Is Representing:

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Appendix B:

Access Control System Attestation

(by SC)

I have reviewed the physical access control system and not found any discrepancies or anything else out of the ordinary.

Attached is the audited physical access log.

Printed Name:

Signature:

Date:

APT 25 2015



1600 Shattuck Avenue Facilities Sign-In Sheet

PDT

Role	Name	Signature	Date	Entry Time	Exit Time
FO	Peter ROWLAND	P. Jul	9/25/15	9:45	
CA	Robert MARTIN- LEGÈNE	Rimil	9/25/15	9:46	
EW	Larry JORDAN	71	9/25/15	9,145	
CO1	Steve FELDMAN		9/25/15	9:45	
CO4	Eric ALLMAN	5 mg / Ch	9/25/15	9:45	
CO5	Stephan SOMOGY	2001	9/25/15	9:48	(
SC1	Bill WOODCOCK	my	9/25/15	9:49	
R	Ashley JONES	M	9/25/15	9.4P	

Appendix C:

Abbreviations Used in This Document

Roles

CA Ceremony Administrator

EW External Witness

SC Security Controller

CO Crypto Officers

FO Facilities Officer

R Registry Representative

Other Abbreviation

TEB Tamper Evident Bag

(MMF Industries, item #2362010N20 small or #2362011N20 large)

HSM Hardware Security Module

FD Flash Drive

AAK Adapter Authorization Key

SMK Storage Master Key

OP Operator

SO Security Operator

Appendix D:

Letter and Number Pronunciation

Character	Call Sign	Pronunciation
A	Alfa	AL-FAH
В	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
ī	India	IN-DEE-AH
J	Juliet	JEW-LEE-ETT
K	Kilo	KEY-LOH
L	Lima	LEE-MAH
M	Mike	MIKE
N		NO-VEM-BER
	er	
0	Oscar	OSS-CAH
Р	Papa	PAH-PAH
Q	Quebec	KEH-BECK
R	Romeo	ROW-ME-OH
S	Sierra	SEE-AIR-RAH
Т	Tango	TANG-GO
U	Uniform	YOU-NEE-FORM
V	Victor	VIK-TAH
W	-	WISS-KEY
X	Xray	ECKS-RAY
Υ	Yankee	YANG-KEY
Z	Zulu	Z00-L00
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

Appendix: E

Card Distribution from Key Ceremony 1

final holders. Each group of cards shall be placed in another TEB whose numbers are recorded below on the EW's script. 104 SMK1, SD1, OP1 TEB# A 2 1 0 9 4 9 8 6 go to CO1, Steve FELDMAN. 105 SMK5, SO5, OP5 TEB# A 2 1 0 9 4 9 8 3 are entrusted to CO1, Steve FELDMAN, for conveyance to CO5, Stephan SOMOGYI. 108 SMK2, SO2, OP2 TEB# A 2 1 0 9 4 9 8 5 go to CO2, Michael SINATRA. 107 SMK3, SO3, OP3 TEB# A 2 1 0 9 4 9 8 4 go to CO3, Kim DAVIES.	DNSS	EC Key Ceremony Script	Tuesd	ay, April 26, 201
Due to limited number of personnel at this key ceremony, cards will be distributed in groups that maintain multi-person control requirements. A subsequent key ceremony will redistribute cards to their final holders. Each group of cards shall be piaced in another TEB whose numbers are recorded below on the EW's script. 104 SMK1, SO1, OP1 TEB#_A2/094986 go to CO1, Steve FELDMAN. 105 SMK5, SO5, OP5 TEB#_A2/094983 are entrusted to CO1, Steve FELDMAN, for conveyance to CO5, Stephan SOMOGY! 106 SMK2, SO2, OP2 TEB#_A2/094985 go to CO2, Michael SINATRA. 107 SMK3, SO3, OP3 TEB#_A2/094987 TEB#_A2/094980 108 SMK6, SO6, OP6 TEB#_A2/094980 109 SMK4, SO4, OP4 TEB#_A2/094980	Dist	ribute Cards		
Ceremony, cards will be distributed in groups that maintain multi-person control requirements. A subsequent key ceremony will redistribute cards to their final holders. Each group of cards shall be placed in another TEB whose numbers are recorded below on the EW's script. 104 SMK1, SO1, DP1	Step	Activity	Initial	Time
TEB# A 2 / 0 9 4 9 8 9 TEB# A 2 / 0 9 4 9 8 3 TEB# A 2 / 0 9 4 9 8 3 TEB# A 2 / 0 9 4 9 8 5 TEB# A 2 / 0 9 4 9 8 5 TEB# A 2 / 0 9 4 9 8 5 TEB# A 2 / 0 9 4 9 8 9 TEB# A 2 / 0 9 4 9 8 9 TEB# A 2 / 0 9 4 9 8 9 TEB# A 2 / 0 9 4 9 8 9 TEB# A 2 / 0 9 4 9 8 9 TEB# A 2 / 0 9 4 9 8 9 TEB# A 2 / 0 9 4 9 8 9 TEB# A 2 / 0 9 4 9 8 9 TEB# A 2 / 0 9 4 9 8 9 TEB# A 2 / 0 9 4 9 8 9 TEB# A 2 / 0 9 4 9 8 9 TEB# A 2 / 0 9 4 9 8 0 TEB# A 2 / 0 9 4 9 8 0 TEB# A 2 / 0 9 4 9 8 0 TEB# A 2 / 0 9 4 9 8 0 TEB# A 2 / 0 9 4 9 8 0 TEB# A 2 / 0 9 4 9 8 0 TEB# A 2 / 0 9 4 9 8 0 TEB# A 2 / 0 9 4 9 8 0	103	ceremony, cards will be distributed in groups that maintain multi-person control requirements. A subsequent key ceremony will redistribute cards to their final holders. Each group of cards shall be placed in another TEB whose numbers are recorded below on	11	8:370
TEB# A 2/094983 are entrusted to CO1, Steve FELDMAN, for conveyance to CO6, Stephan SOMOGY1 106 SMK2, SO2, OP2 TEB# A 2/094985 go to CO2, Michael SINATRA. 107 SMK3, SO3, OP3 TEB# A 2/094984 go to CO3, Kim DAVIES. 108 SMK6, SO6, OP6 TEB# A 2/094980 109 SMK4, SO4, OP4 TEB# A 2/094980 109 SMK4, SO4, OP4 TEB# A 2/094980	104	TEB# A21094986	11	8:390
TEB# A 21094985 go to CO2, Michael SINATRA. 107 SMK3, SO3, OP3 TEB# A 21094984 go to CO3, Kim DAVIES. 108 SMK6, SO6, OP6 TEB# A 21094982 are entrusted to CO3, Kim DAVIES, for conveyance to CO6, LEONG Keng Thail 109 SMK 4, SO4, OP4 TEB# A 2/094980 T 849/m	105	TEB# A 2/094 983 are entrusted to CO1, Steve FELDMAN, for	1/	8:43/m
TEB# A 2109 4984 go to CO3, Kim DAVIES. 108 SMK6, SO6, OP6 TEB# A 210 94982 are entrusted to CO3, Kim DAVIES, for conveyance to CO6, LEONG Keng Thai 109 SMK 4, SO4, OP4 TEB# A 210 94980 TEB# A 210 94980	106	TEB. A 21094985	1/	8:45pu
TEB# A 2 1 0 9 4 9 8 2 are entrusted to CO3, Kim DAVIES, for conveyance to CO6, LEONG Keng Thai 109 SMK 4, SO4, OP4 TEB# A 2 1 0 9 4 9 8 0 TEB# A 2 1 0 9 4 9 8 0	107	TEB# A 2109 4984	11	8:46 19
TEBN A 21094980 7/ 849/m	108	TEB# A 2 / D 9 4 9 8 2 are entrusted to CO3, Kim DAVIES, for conveyance to	1/	8:48pr
	109	TEB# \$21094980	4	849pm

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110 SMK7, SO7, OP7

to CO7, Gaurab UPADHAYA

are entrusted to CO4, Jonny MARTIN, for conveyance

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Appendix: F Smart Card Sign Out Sheet from Key Ceremony 1

	DNS	BEC Key C	eremony Script			Tuesda	y. April 26, 2011
	Sm	art Ca	rd Sign Out S	Sheet			
	ÇO#	Cant Type	TEB #	Printed Name	Signature	Date	Tiron EW
	001	OP tol7	A21095013	Steve FELCHAN	CA-	475/11	108011
-1	001	90 1 of 7	A21095012	Shows FELDMAN	ML	45571	20.56 7/
-	CO1	SMK 1 of 7	A21095011	Sheve FELEMAN	10-	405/11	20.56 7
	000	OP 2 of 7	A21095010	Michael SINATRA	IND ACT	405/11	201557
Strange	COS	502 at 7	A21095009	Michael SMATRA	MARSH	495/11	20:55/1
المتعلقسان	002	SMK 2 of 7	A21095008	Michael SPIATRA	Mary B. Sh	4/25/11	20153-7/
	cos	DP 3 6/7	A21095007	Kan DAVIES		405/11	852 4
1	COS	80307	A 21 0950 DG	Ken DAVIES	W/-	4/25/11	852 #
-	.003	SMK 3 of 7	A21095004	Kam DAVIES	HU-	425/11	882 1/
	CD4	OP4el7	A21095005	Johny MARTIN	J.M.	4/25/11	8.58 4
1	CO4	90 4 64 7	A21095003		JUL	425/11	8:58 B
-	CO4	BMK 4 of 7	W 71012000		John.	405/11	8:58 4
	COS	Q#5d#7	A21095001		Epal	4/25/11	W:50 7
1	COS	SO 5 of 7	A210 95000		Au .	425/11	2056 TL
-	COS	SMK 5 of 7	A 210 94999		1	405/11	20:34
	COS		A21094998	KOM DAVIES		425/11	8:53
		SO 6 of 7	A21094997	Kim DAVIES	#A	4/25/11	5:53 1/
-	(management)	OPTHT	A 210 94 996			405/11	853 1
ŧ	007	50 T of T	121094995	Johny MARTIN	J.M.	495/11	8:58 4
l.	007		A21094994	Joney MARTIN	diff.	4/2/5/11	8:58 7
(manage)		mentance is the c	A 21094 193	encery mount and	JIW.	4/25/11	8:58 7
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Appendix: G Smart Card Sign Out Sheet from Key Ceremony 2

	DNSSEC Key Ceremony Script		Monday, May 30, 2011				
	Smart Card Sign Out	Chast	and the second				
		Printed Verse Signature	Dide Time EN				
A1920-444	CON OFTET A19204935	**************************************	1000 DOWN 16				
30/	COI SOINT A1920493		100011 0047 1				
4	CO1 (BMX 1 ±17	Store FELDMAN	505m				
A19204942	COS 00301 A1920443	WILLIAM SHETER ADCUMPEN	1 sam 0049 7/				
0/92	202 50207 A1420493	Marian SALOWA LOCARS	Le roam coan				
au W	COL TANK 2 (M. 7	Michael SSATRA	500391				
A19204947	CON OPENT A19204932	DOWN MASTIN FIND	1000 OSO 1				
V.	000 SOLUT A1920493	D STORY MASTER & THE	100011 Cos> 7				
ul -	CO4 SMK 4 of 7	Jamey MARTHI	5/36/11				
A19204941	005 005 MT A19204929		100m COSI				
VIA	A/920 4928	Bald Boycon C. S.	\$80/11 GOST 7				
	COS SAN S ct 7	Bald BOWDON	\$50011				
	CD7 OF Test	Jamy MARTH	5-20/11				
	CO7 5MK 7 H 7	STORY MARTIN	5/56/271				
2000	(30) 3MM 1011	JOSSEY MART DA	5/08/271				
A19204944 - COX A19204943 - COX A19204942 - COZ A1920494/ COS							
ŧ	Packet Clearing House		Page 25 of 32				

Appendix: H

Smart Card Sign Out Sheet from Key Ceremony 3

DNSSEC Key Ceremony Script

Monday, June 20, 2011

Smart Card Sign Out Sheet

CO#	Card Type	TEB#	Printed Name	Signature	Date	Time	EW
CO1	OP 1 of 7	A 19204876	Steve FELDMAN -	An	6/20/11	67.51	1
CO3	OP 3 of 7	A 14204874	Kim DAVIES	WK_	6/20/11	0751	N
CO4	OP 4 of 7	A19204872	Jonny MARTIN	J. Ul.	6/20/11	07:49	M
CO6	OP 6 of 7	A 16204870	LIM Choon Sai	-42.	6/20/11	01.50	N
CO7	OP 7 of 7	A192248 68	Gaurab UPADHAYA	4	6/20/11	07.49	上

ENCLOSING BAGS:

CO1: A 19204875

CO3: A 19204873

CO 4: A19204871

CO 6: A19204869

607: A19204867

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Appendix: I

Smart Card Sign Out Sheet from Key Ceremony 4

DNSSEC Key Ceremony Script

Friday, January 20, 2012

Re-Package OP Cards

Step	Activity	Init	ial	Time (UTC)
60	CA places each OP card with instruction slip in its own new TEB and records the number in the smart card sign out sheet below.	1/		20:43

Re-Distribution of Cards

Step	Activity	Initial	Time (UTC)
61	CA calls each CO to return their smartcards. As each CO receives and inspects their cards, they fill out the sign out sheet below and EW initials their entry. Note new outer bags in sheet below.	1	70:51

Smart Card Sign Out Sheet

CO#	Card Type	TEB#	Printed Name	Signature	Date	Time	EW
CO2	OP 2 of 7	A19204950	Michael SINATRA	WODES. SAL	1/20/12	2051	1
COS	SO 2 of 7	A19204952	Michael SINATRA	moled & Siz	1/20/12	2051	H
CO4	OP 4 of 7	A19204949	Jonny MARTIN	delle	1/20/12	20019	4,
CO4	SO 4 of 7	A19204953	Jonny MARTIN	Jal.	1/20/12	2049	7
CO5	OP 5 of 7	A19204951	Stephan SOMOGYL	Somi	1/20/12	2046	4
	SO 5 of 7	A19204954	Stephan SOMOGYI	SSW	1/20/12	2076	1

OUTSIDE BAG

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Appendix: J Smart Card Sign Out Sheet from Key Ceremony 5

	or nominary determining 5
DNSSEC Key Ceremony Script	Friday, April 27, 2012
Smart Card Sign Out Sheet	
CO# Card Type TEB #	Printed Name Signature Date Time EW
CO1 OP 1 of 7 A 19204955 Steve	FELDMAN 4/27/12 1844 A
CO1501 of 7 3112567 Steve	FELDMAN AL 4/27/12 (RVV)
12112511	POT TOTT
Outer 1911	10.69
CO3 SO3 017 A3/12572 KIM D	AVIES 4/27/12 18/40 9
M3112363	MARTIN J. M. 4/27/12 18:47
CO4 504 of 7 N3/12593 Jonny	MARTIN C 4/27/12 18:47
Sign-Out on Participant Signature	Sheet
60 All participants leave the Key Ma	Initial Time (UTC)
sign the Participant Signature Siexit time.	neet, and note their
61 CA reviews EWs script and sign	s it.
CA Signature	7/ 18.52
A	
Sign Out of Facility	
Step Activity	Initial Time (UTC)
62 FO returns phones, laptops, and participants and logs their exit till now free to depart.	mes. Participants are
now nee to depart.	1/ 19:53
Stop Audio-Visual Recording	
Step Activity	Initial Time (UTC)
63 SA stops audio and video record	
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Appendix: K

Smart Card Sign Out Sheet from Key Ceremony 5-1

DNSSEC Key Ceremony Script Wednesday, May 30, 2012 Re-Distribution of Cards Step CA calls each CO to return their smartcards. As each CO receives and inspects their cards, they fill out the sign out sheet below and EW initials their entry. Note new outer bags in sheet below. Smart Card Sign Out Sheet CO1 OP 1 of 7 19.11 Steve FELDMAN A28410829 5/30/12 outer CO1 SO 1 of 7 Steve FELDMAN 19:11 128410826 5/30/12 CO2 OP 2 at 7 Michael SINATRA 5/30/12 A28410828 CO2 SO 2 017 A28410825 Michael SINATRA 5/30/12 CO4 OP 4 of 7 A28410827 Jonny MARTIN CO4 SO 4 of 7 A 28410823 Jonny MARTIN 5/30/12 Packet Clearing House Page 12 of 27

Appendix: L

Smart Card Sign Out Sheet from Key Ceremony 6

DNSSEC Key Ceremony Script

Friday, July 27, 2012

Re-Distribution of Cards

Step	Activity	Initial	Time (UTC)
	CA calls each CO to return their smartcards. As each CO receives and inspects their cards, they fill out the sign out sheet below and EW initials their entry. Note new outer bags in sheet below.	11	20:20

Smart Card Sign Out Sheet

CO#	Card Type	TEB#	Printed Name	Signature	Date	Time	
CO1	OP 1 of 7	A284/08/6	Steve FELDMAN	Kes	7/27/12	2019	1
CO1	Outer 1 of 7		Steve FELDMAN		7727/12		
CO4	OP 4 of 7	A28410814	Jonny MARTIN	J.Ml.	7/27/12	2019	1
CO4	Outer 4 of 7		Jonny MARTIN		7/27/12		_
CO5	OP 5 of 7	A284/0817	Stephan SOMOGYI	551	7/27/12	2019	1
CO5	Outer 5 of 7		Stephan SOMOGYI	n	7/27/12		

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Appendix: M

Smart Card Sign Out Sheet from Key Ceremony 7

DNSSEC Key Ceremony Script Friday, December 14, 2012 Re-Package OP Cards Step Activity Initial Time (UTC) 65 The CA places each OP card with pre-printed warning slip in its own new TEB and seals TEB, hands the EW the tear-off strip from the TEB to 20:44 record. Re-Distribution of Cards Step Activity Initial Time (UTC) The CA calls each CO to return their smartcards. As each CO receives and inspects their cards, they fill out the sign out sheet below and the EW initials their Smart Card Sign Out Sheet CO# Card Type TEB # Printed Name Signature Date Time CO1 OP 1 of 7 284/08 O5 Steve FELDMAN 2045 CO2 OP 2 of 7 Michael SINATRA 42846804 A28410803 CO4 OP 4 of 7 Jonny MARTIN Packet Clearing House Page 13 of 30

Appendix: N

Smart Card Sign Out Sheet from Key Ceremony 8

DNS	SSEC Key Ce	remony Script			Thursday, S	eptember 12, 2013
Re-	Distribution	of Cards				
Ste	Р	Act	tivity	1	Initial	Time (UTC)
63	each CO r	eceives and ins	ve their smartca pects their card W's copy of the Is their entry.	e they	1/	18:20
		n Out Sheet				
CO#	Card Type	TEB#	Printed Name	Sig	nature f	Date Time EW
001	OP 1 of 7 A	28410802	Steve FELDMAN	A	9/1	2113 1912 1
cos	OP 2 of 7 A	28410801	Michael SINATRA	tales	9/1	213 1816 1
CO3	OP3 of7 A	28410800	Km DAVIES	del	L 9/1:	2113 1819 1
Sian	-Out on Pa	rticipant Signa	ture Sheet			
Step		Acti			Initial	Time (UTC)
64	All participa sign the Pa exit time.	ants leave the K rticipant Signati	ey Managemen ure Sheet, and r	t Facility, note their	11	22,53
65	CA reviews	EWs script and	signs it.		-/-	
	CA Signatu	re Re M	7-50	•	71	22:55
Sign	Out of Faci	ility				
Step		Activ	/ity		Initial	Time (PDT)
66	participants	and logs their e fication vests to	, and other item exit times. Partic the FO. Partici	ipants	1/	3:58pm
Stop	Audio-Visu	al Recording				
Step		Activ	rity	1	Initial	Time (PDT)
67	SA stops au	idio and video re	ecording.		11	4:00ph
Packe	et Clearing Ho	use				Page 12 of 29

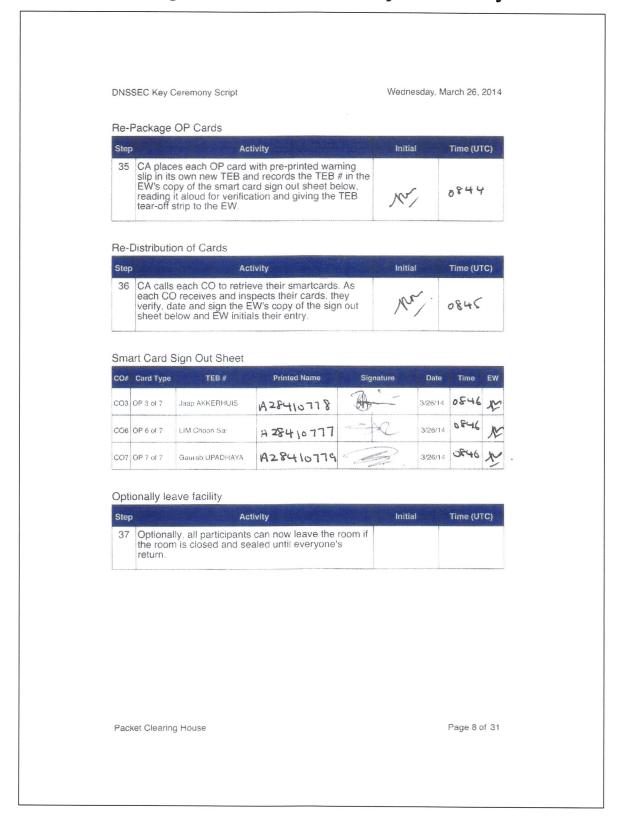
Appendix: O

Smart Card Sign Out Sheet from Key Ceremony 9

Friday, January 10, 2014 **DNSSEC Key Ceremony Script** Re-Package OP Cards Initial Time (UTC) CA places each OP card with pre-printed warning slip in its own new TEB and records the TEB # in the 8:15 EW's copy of the smart card sign out sheet below, reading it aloud for verification and giving the TEB tear-off strip to the EW. Re-Distribution of Cards Time (UTC) Initial Activity CA calls each CO to retrieve their smartcards. As each CO receives and inspects their cards, they verify, date and sign the EW's copy of the sign out sheet below and EW initials their entry. 18:18 Smart Card Sign Out Sheet CO# Card Type Printed Name Signature 18:16 CO1 OP 1 of 7 Steve FELDMAN 1/10/14 A28410774 A28410773 18:17 Michael SINATRA CO2 OP 2 of 7 1/10/14 18:17 A284/0772 CO5 OP 5 of 7 Stephan SOMOGYI 1/10/14 Optionally leave facility Initial Time (UTC) Activity Optionally, all participants can now leave the room if the room is closed and sealed until everyone's Page 8 of 31 Packet Clearing House

Appendix: P

Smart Card Sign Out Sheet from Key Ceremony 10



Appendix: Q

Smart Card Sign Out Sheet from Key Ceremony 11

DNSSEC Key Ceremony Script

Friday, December 12, 2014

Re-Package OP Cards

Step	Activity	Initial	Time (UTC)
	CA places each OP card with pre-printed warning slip in its own new TEB and records the TEB # in the EW's copy of the smart card sign out sheet below, reading it aloud for verification and giving the TEB tear-off strip to the EW.	11	19:17

Re-Distribution of Cards

Step	Activity	Initial	Time (UTC)
	CA calls each CO to retrieve their smartcards. As each CO receives and inspects their cards, they verify, date and sign the EW's copy of the sign out sheet below and EW initials their entry.	1	19:19

Smart Card Sign Out Sheet

CO#	Card Type	TEB#	Printed Name	Signature	Date	Time	EW
CO1	OP 1 of 7	A28410734	Steve FELDMAN	han	12/12/14	19:17	1
CO2	OP 2 of 7	A 284/0735	Michael SINATRA	up as	12/12/14	19:18	1
CO4	OP 4 of 7	A28410736	Eric ALLMAN	Sind M	12/12/14	14:18	1

Optionally leave facility

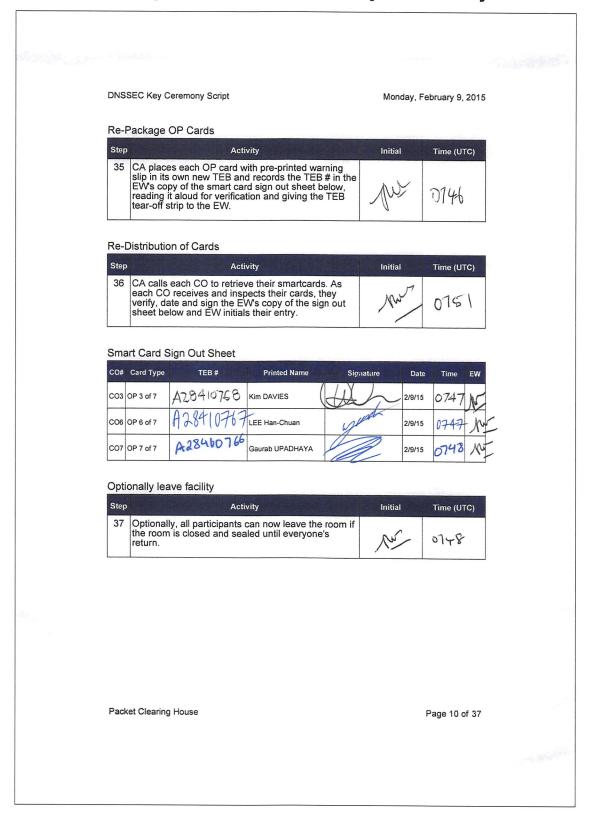
Step	Activity	Initial	Time (UTC)
38	Optionally, all participants can now leave the room if the room is closed and sealed until everyone's return.	1	

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Appendix: R

Smart Card Sign Out Sheet from Key Ceremony 12



Appendix: S

Boot-DVD Checksum from Key Ceremony 6

DNS	SSEC Key Ceremony Script	Frid	ay, July 27, 2012
16	CA opens a terminal window.	11	17:18
17	CA verifies the time zone, date, and time on the laptop and synchronizes it if necessary.	1	
	Display the current time and timezone:	1	
	date	11	17:20
	If the timezone is not set to UTC:		
	cd /etc/		
	rm localtime		
	ln -s /usr/share/zoneinfo/UTC localtime		
	Set time to match the wall clock:		
	date nunddHHMMYYYY		
	Verify:		
	date		
18	CA calculates sha256 checksum of the boot-DVD. CA may proceed with additional steps while this process completes. When the checksum is complete, CA reads it aloud, four digits at a time.	A	[7:34
	sha256sum /dev/cdrom	1/	
19	EW records the sixty-four digit boot-DVD checksum	1	
	7DEY 31F9 C330 OFEF	1	
	9089 ABS6 13A3 8126	1 (1	17:20
	708A 3ALI A784 38A7		17.37
	B9C9 2A4F 52A1 F87C		
Setta Dave 7	Other participants may compare this with the boot- DVD checksum calculated during Key Ceremony 1, reproduced for convenience in the appendices of this document.		
20 A	CA connects USB hub to laptop.	71	17:21
21	CA removes HSMFD KSK-HSM-01B-SJC from TEB and plugs into a free USB slot on the laptop; waits for O/S to recognize the FD. CA lets participants view contents of HSMFD then closes FD window.	11	17:29
21	reproduced for convenience in the appendices of this document. CA connects USB hub to laptop. CA removes HSMFD KSK-HSM-01B-SJC from TEB and plugs into a free USB slot on the laptop; waits for O/S to recognize the FD. CA lets participants	71	

PCH DNSSEC Key Ceremony Script Exception Form

Step	Activity	Initial	Time
1	EW Describes exception and action here: HSMFDTEB# A4128486 K1011066 Boot DVDTEB# A28410729 LAPFOPTEB# A4128487 RSAY	Initial	Time
2	EW notes date and time of key ceremony exception and signs here: Signature:	1	J7:45

^{*} End of DNSSEC Key Ceremony Script Exception *

PCH DNSSEC Key Ceremony Script Exception Form

Step	Activity	Initial	Time
1	EW Describes exception and action here: We going to execute 53-54 before 48-52		70,48
2	EW notes date and time of key ceremony exception and signs here: Signature:	1/	20:48

^{*} End of DNSSEC Key Ceremony Script Exception *

PCH DNSSEC Key Ceremony Script Exception Form

Step	Activity	Initial	Time
1	EW Describes exception and action here: Eric Allman and Stephan Somogyi left the Ceremony without Signing out		2135pm
2	EW notes date and time of key ceremony exception and signs here: Signature:		

^{*} End of DNSSEC Key Ceremony Script Exception *

Participant Signature Sheet

Role	Name	Citizen ship	Signature	Form of Identification	Identification Number	Date	Entry Time UTC	Exit Time UTC
CA1	Robert MARTIN-LEGÈNE	DK	RMISS	DL/ED	24292497	Sept 25, 2015	16:53	ている
ĘW	Larry JORDAN	US	7/	DUCA	N4675802	Sept 25, 2015	16:56	21:22
CO1	Steve FELDMAN	US		DC/CA	N6019042	Sept 25, 2015	16:56	12/2/
CO4	Eric ALLMAN	US		DL/CA	N 7040268	Sept 25, 2015	16.55	
CO5	Stephan SOMOGYI	US		DL/CA	16289747	Sept 25, 2015	16.54	
SC1	Bill WOODCOCK	US	phin at	D44	A100502	Sept 25, 2015	16:53	21:21
R	Ashley JONES	US	cy	DUNU	170 4490775	Sept 25, 2015	1654	19:26

PCH DNSSEC Key Ceremony Entry/Exit Log

Name	Enter	Exit	Initial	Time
ROBERT MARTIN-LEGERA	-	\searrow	-	10.09
_ ,) -	\times	_	B	1039
Eric Allman		V	SA	12:22
Steve Feldman		1/	1328	1223
STEADAN SOMETI			S.	1225
BILL WODEDEK		7	Bu	12:26
ROBERT WAR WHE	E	\nearrow		12:27
Larry Jordan		X		12:28
Robert Martin-Legone	X			1729
Brewonscon	\times		Tow	13:30
J.	X		14	13:30
			-	