Shared ccTLD DNSSEC Signing Platform

Bill Woodcock and Rick Lamb

ICANN San Francisco

March 2011

ICANN - PCH Common Goals

ICANN Goals:

- Accelerate DNSSEC deployment
- Maintain the highest standards of security and trust

PCH Goals:

- Support critical Internet infrastructure operators
- Increase global network stability and availability
- Conduct knowledge-transfer and improve self-sufficiency

Packet Clearing House

Approach

Shared secure signing platform with knowledge transfer

Leverages existing operational expertise within ICANN and PCH

Best-practice implementation, held to the highest standards

No cost, no restrictions: free-as-in-beer and free-as-in-speech

Packet Clearing House

Modularity

Designed as a system of flexible building-blocks for your convenience: use the system in part or in its entirety

Clear transition path from shared platform to ccTLD owned-and-operated platform in a single step, or in a gradual process

Benefits

Immediate realization of DNSSEC advantages

Security on-par with the root zone

Offload cost of expensive components and services

Build experience in a best-practices environment

Claim operational responsibility as you gain confidence

Bidirectional Transition Path

From ccTLD to PCH:

- Under control and guidance of ccTLD
- Clear checklist of transition steps
- KSK and ZSK generated in PCH's HSMs

From PCH to ccTLD:

- Under stepwise control and guidance of ccTLD
- Clear checklist of transition steps
- KSK and ZSK generated by the ccTLD
- Exchange public key and signature info only
- Transfer of all relevant information

DNSSEC Signer Platform

Built on ICANN DNSSEC root-signing design

Conservatively using BIND signing tools

KSKs and ZSKs in FIPS 140-2 Level 4 HSMs

Fully-redundant offline KSK facilities in San Jose and Singapore

Fully-redundant online ZSK facilities in San Jose and Zurich

Bump-in-the-Wire operational model

Clear TLD Transition Plan

- Knowledge-transfer workshops
- Clear checklists for transitioning on and off the platform
- Complete solution including DPS, key management, etc.

PCH
Packet Clearing House

Diverse Locations

Americas
San Jose, USA
Equinix Datacenter
Commercial

Europe
Zurich, Switzerland
SWITCH Facility
Research & Education

Asia-Pacific
Singapore

PCH
Packet Clearing House

...With Integrated Global Anycast

Packet Clearing House

PCH Inbound Master

FIPS 140-2 Level 4 Hardware Security Module

Online Zone Signing Server

GSA Class-5 IPS Security Container

DCI 6/9 Sensitive Compartmented Information Facility (SCIF)

TIA 942 Tier-4 Datacenter

Zurich

PCH Outbound Master

Other Authoritative Slave

ccTLD Hidden Master

PCH Inbound Master

FIPS 140-2 Level 4 Hardware Security Module

Online Zone Signing Server

GSA Class-5 IPS Security Container

FIPS 140-2 Level 4 Hardware Signing Module

Offline Key Signing Key Master

GSA Class-5 IPS Security Container

DCI 6/9 Sensitive Compartmented Information Facility (SCIF)

TIA 942 Tier-4 Datacenter

San Jose

PCH Outbound Master

PCH Anycast Server

PCH Anycast Server

PCH Anycast Server

PCH Anycast Server

Anycast Locations

FIPS 140-2 Level 4 Hardware Security Module

Offline Key Signing Key Master

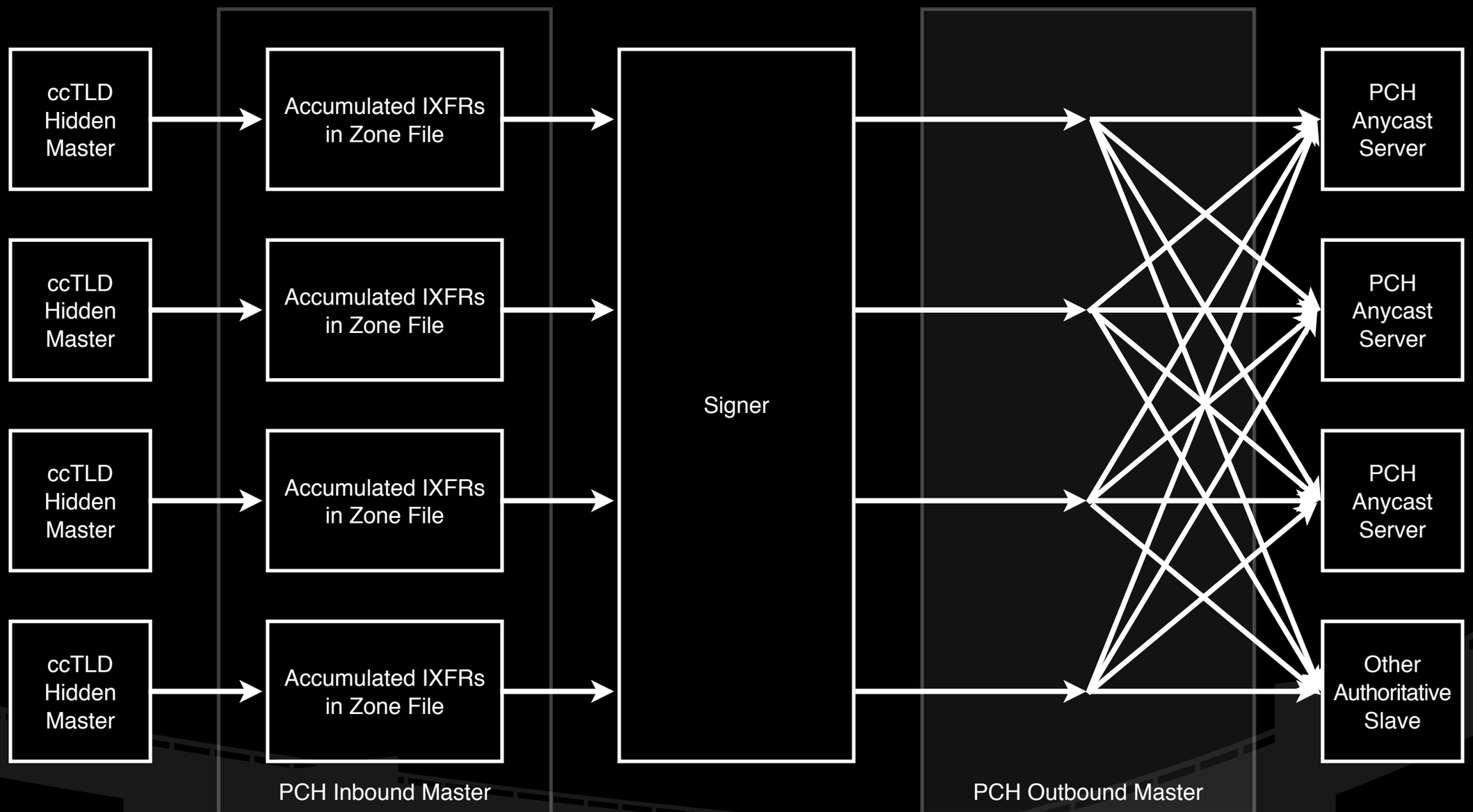
GSA Class-5 IPS Security Container

DCI 6/9 Sensitive Compartmented Information Facility (SCIF)

TIA 942 Tier-4 Datacenter

Singapore

Packet Clearing House



Timeframes

Five years: HSM hardware refresh

One year: Generate 18 months of ZSKs

Six months: Maximum ZSK roll frequency

Key Management

Automated signature updates and ZSK rollovers

Automated integrity checking before publication

Real-time monitoring of signing and publication processes

Configurable email alerts on any warning or error

KSK generation and use at offline key ceremonies

Pre-generated keys and signed DNSKEY RRsets

- KSK: 2048 RSA
- ZSK: 1024 RSA NSEC3

Business Continuity & Maintenance

Backup sites on different continents, under diverse control

Well-documented emergency plans
- KSK compromise and loss
- ZSK rollover

Transition plans

Packet Clearing House

Live Demo!

ccTLD Test Phases

1: Sign zone, verify validity on signing system

2: Sign zone, publish on anycast servers, verify distribution and public visibility

3: Coordinate authoritative slaves to pull signed zone

4: Put DS record in the root, go live

Thanks, and Questions?

Copies of this presentation can be found in PDF format at:

http:// www.pch.net / resources / papers / tld-dnssec-platform

Bill Woodcock
Research Director
Packet Clearing House
woody@pch.net

Rick Lamb
DNSSEC Program Manager
ICANN
richard.lamb@icann.org