The Business Case for DNSSEC

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DNS Basics

- DNS converts names (www.zenithbank.com) to numbers (208.112.30.18)
- ..to identify services such as www and e-mail
- ..that identify and link customers to business and visa versa

Where DNSSEC fits in

- ..but CPU and bandwidth advances make legacy DNS vulnerable to MITM attacks
- DNS Security Extensions (DNSSEC) introduces digital signatures into DNS to cryptographically protect contents
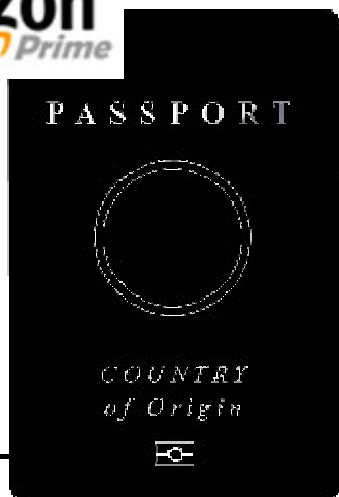- With DNSSEC fully deployed a business can be sure a customer gets un-modified data (and visa versa)

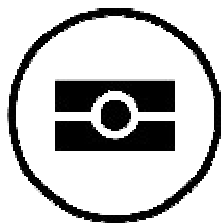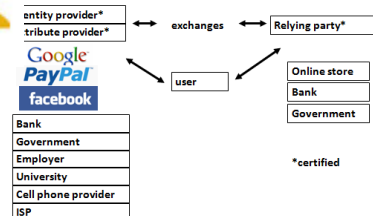# DNS is a part of all IT ecosystems

+1-202-709-5262
VoIP

US-NSTIC effort

OECS ID effort

Smart Electrical Grid
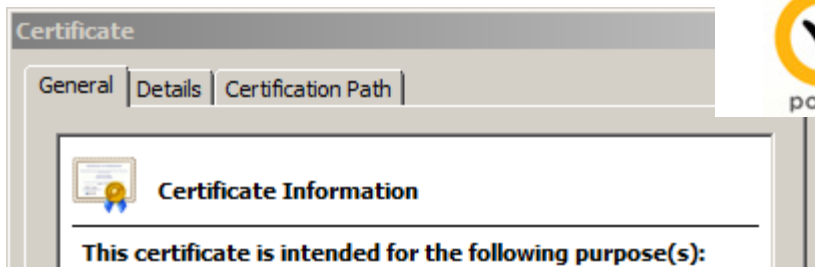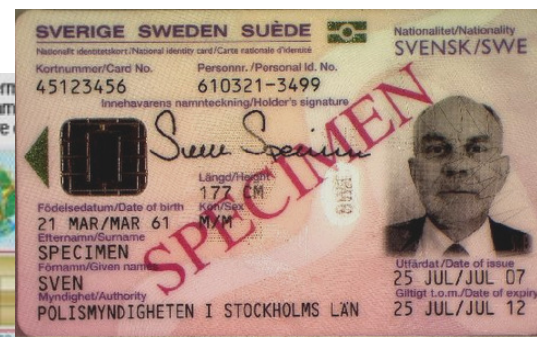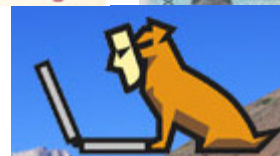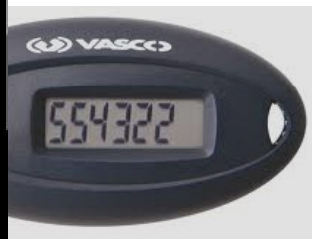
Trust frameworks are not new

e-Passport symbol
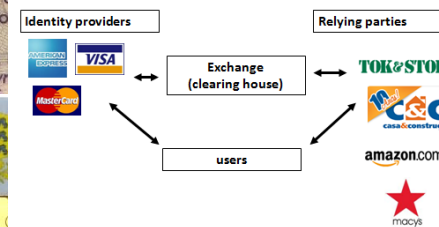
lamb@xtcn.com

mydomainname.com

The Original Problem:
DNS Cache Poisoning Attack

www.majorbank.se=?

5.6.7.8

DNS Resolver

www.majorbank.se = 1.2.3.4

DNS Server

ENTERPRISE

Attacker
www.majorbank.se = 5.6.7.8

Get page
Login page

Username / Password
Error

Attacker webserver www @ 5.6.7.8

ISP / ENTERPRISE / END NODE

Password database
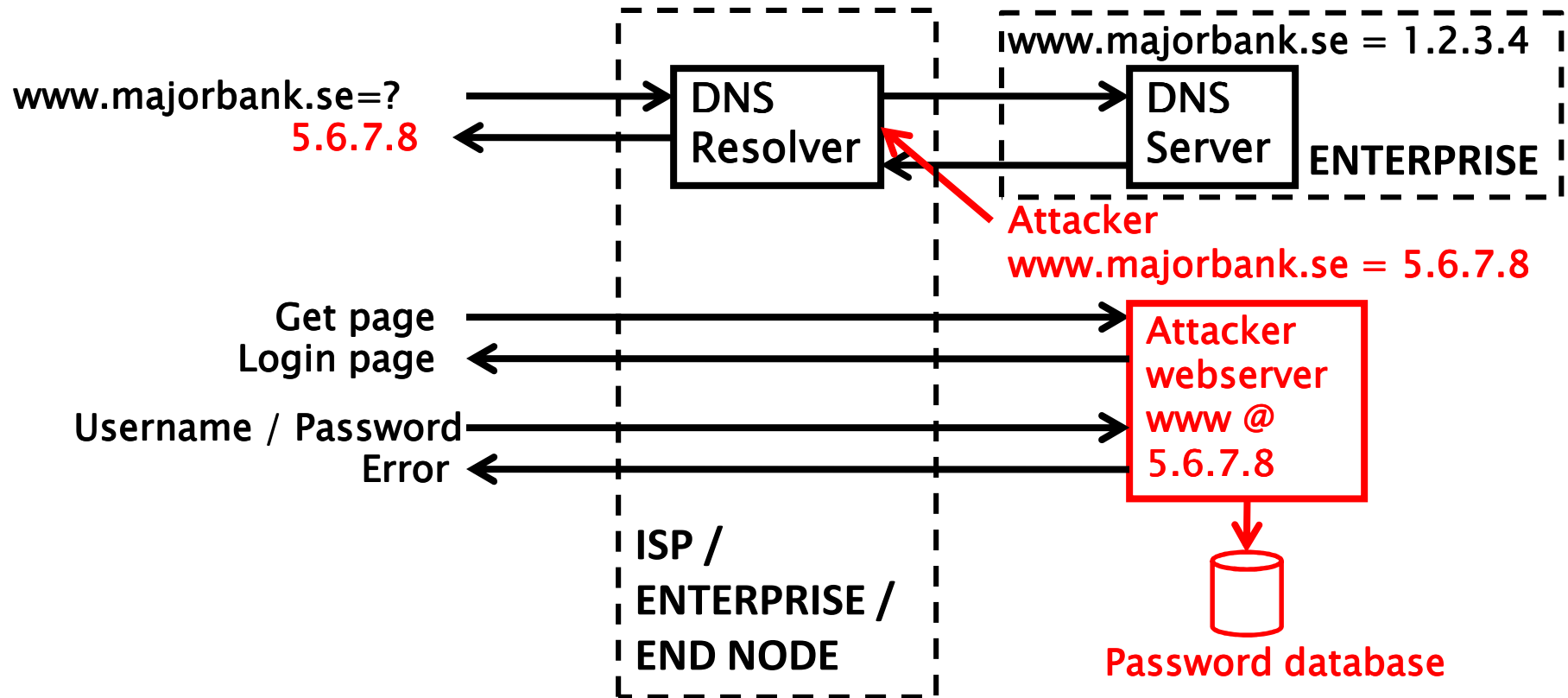
Animated slide

detailed description at: http://unixwiz.net/techtips/iguide-kaminsky-dns-vuln.html

Argghh! Now all ISP customers get sent to attacker.

www.majorbank.se = 1.2.3.4

www.majorbank.se=?   →   DNS Resolver   DNS Server
5.6.7.8   ←

Get page   →   Attacker webserver www @ 5.6.7.8
Login page   ←

Username / Password   →
Error   ←

Password database

Animated slide
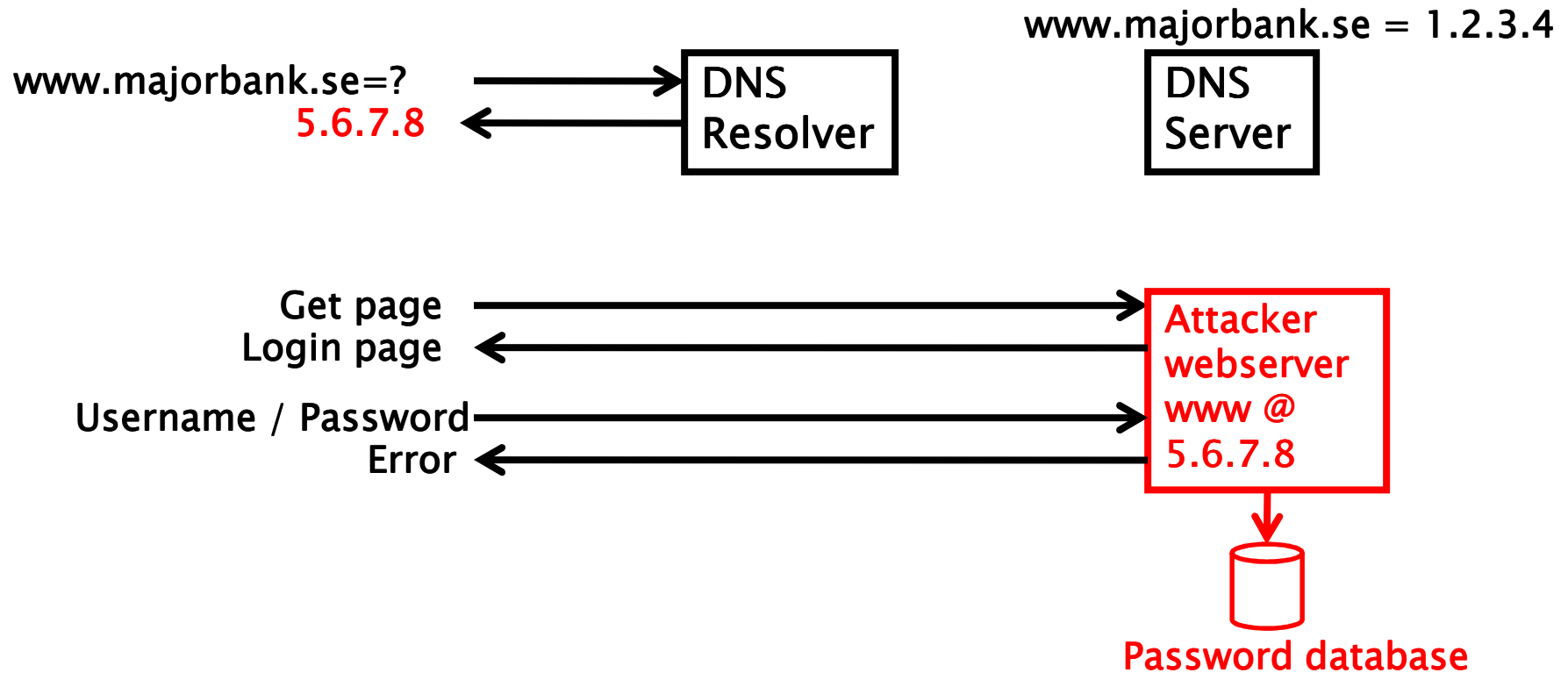
The Bad: DNSChanger - 'Biggest Cybercriminal Takedown in History' – 4M machines, 100 countries, $14M

DNS Malware: Is Your Computer Infected?

DNS—Domain Name System—is an Internet service that converts user-friendly domain names, such as www.fbi.gov, into numerical addresses that allow computers to talk to each other. Without DNS and the DNS servers operated by Internet service providers, computer users would not be able to browse web sites, send e-mail, or connect to any Internet services.

Criminals have infected millions of computers around the world with malware called DNSChanger which allows them to control DNS servers. As a result, the cyber thieves have forced unsuspecting users to fraudulent websites, interfered with their web browsing, and made their computers vulnerable to other kinds of malicious software.

The Bad: Brazilian ISP fall victim to a series of DNS attacks
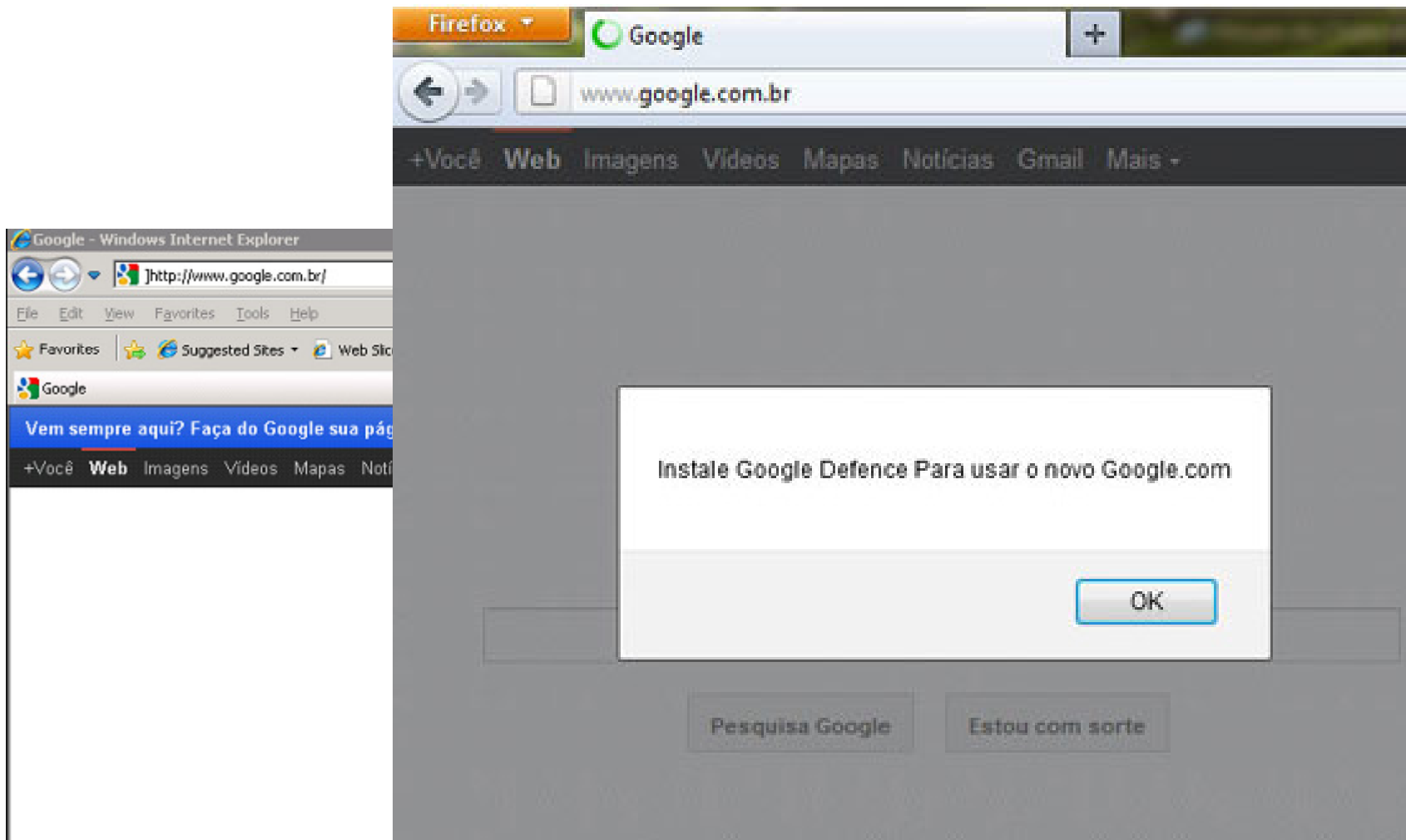
End-2-end DNSSEC validation would have avoided the problems
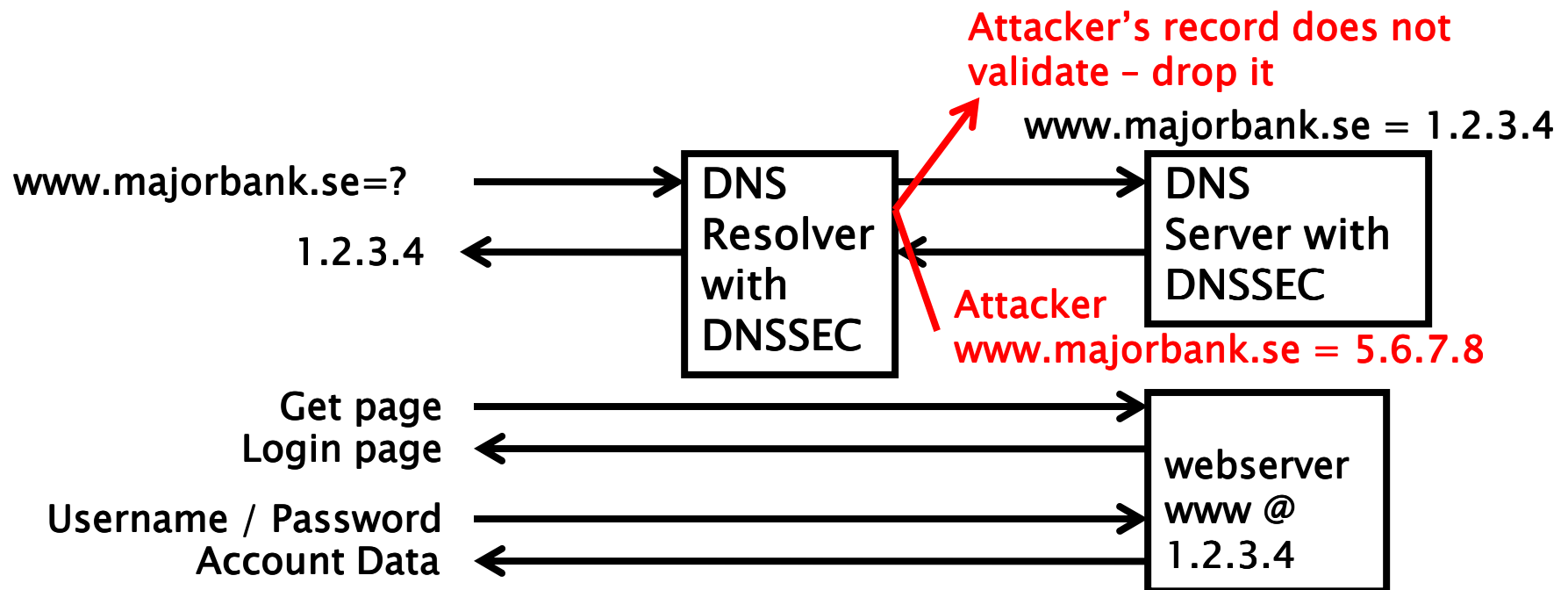
The Bad: Other DNS hijacks*

- 25 Dec 2010 - Russian e-Payment Giant ChronoPay Hacked
- 18 Dec 2009 – Twitter – "Iranian cyber army"
- 13 Aug 2010 - Chinese gmail phishing attack
- 25 Dec 2010 Tunisia DNS Hijack
- 2009-2012 google.*
  - April 28 2009 Google Puerto Rico sites redirected in DNS attack
  - May 9 2009 Morocco temporarily seize Google domain name
- 9 Sep 2011 - Diginotar certificate compromise for Iranian users
- 7 Jan 2013 – Turktrust / EGO
- SSL / TLS doesn't tell you if you've been sent to the correct site, it only tells you if the DNS matches the name in the certificate. Unfortunately, majority of Web site certificates rely on DNS to validate identity.
- DNS is relied on for unexpected things though insecure.

*A Brief History of DNS Hijacking - Google
http://costarica43.icann.org/meetings/sanjose2012/presentation-dns-hijackings-marquis-boire-12mar12-en.pdf

The Good: Securing DNS with DNSSEC

www.majorbank.se=?

1.2.3.4

DNS Resolver with DNSSEC

Attacker's record does not validate – drop it

www.majorbank.se = 1.2.3.4

DNS Server with DNSSEC

Attacker
www.majorbank.se = 5.6.7.8

Get page
Login page

Username / Password
Account Data

webserver www @ 1.2.3.4

Animated slide

The Good: Resolver only caches validated records

www.majorbank.se=? →
1.2.3.4 ←

DNS Resolver with DNSSEC

www.majorbank.se = 1.2.3.4

DNS Server with DNSSEC

Get page →
Login page ←

Username / Password →
Account Data ←

webserver www @ 1.2.3.4

ISP / ENTERPRISE / END NODE
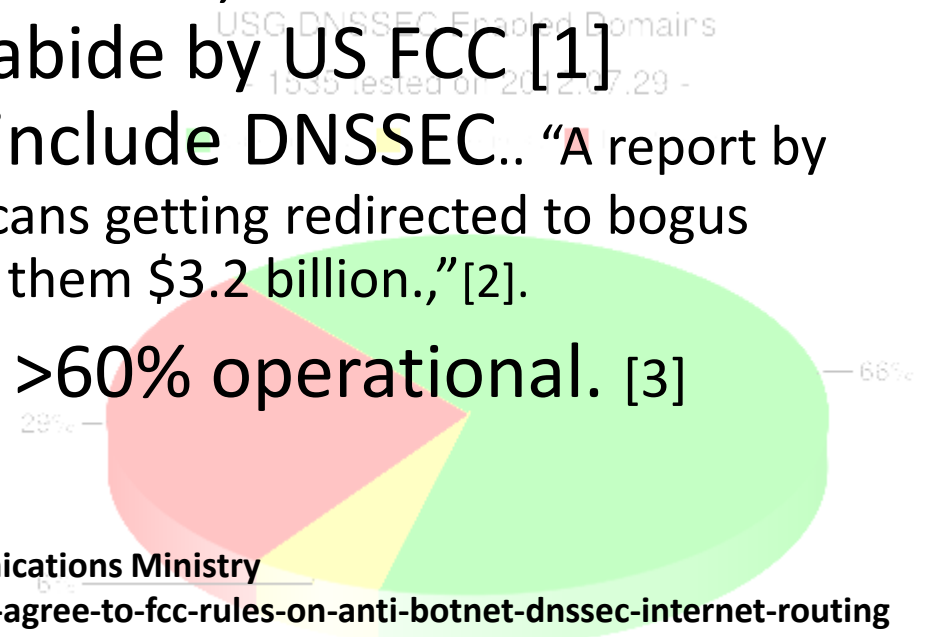
ENTERPRISE

Animated slide
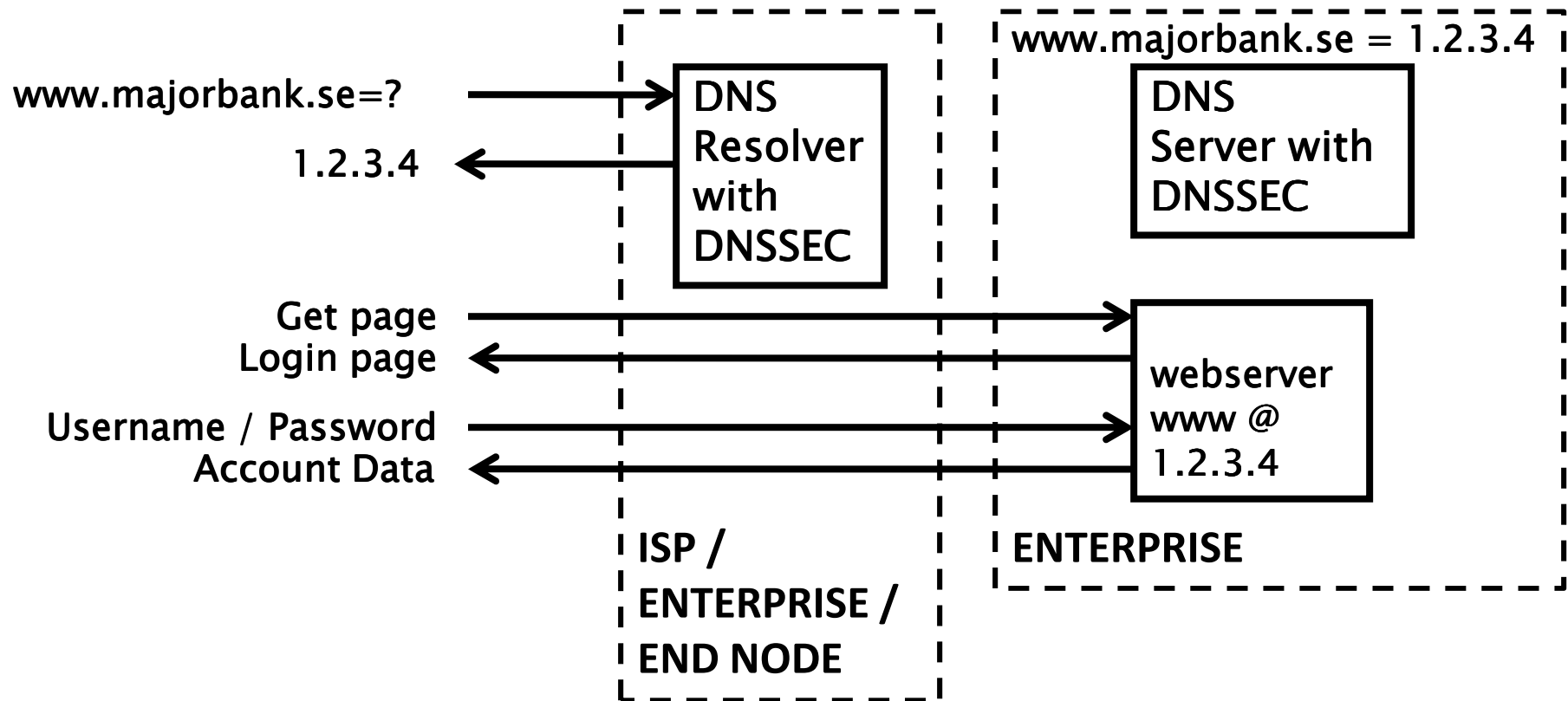
The Business Case for DNSSEC

- Cyber security is becoming a greater concern to enterprises, government, and end users. DNSSEC is a key tool and differentiator.

- DNSSEC is the biggest security upgrade to Internet infrastructure in over 20 years. It is a platform for new security applications (for those that see the opportunity).

- DNSSEC infrastructure deployment has been brisk but requires expertise. Getting ahead of the curve is a competitive advantage.
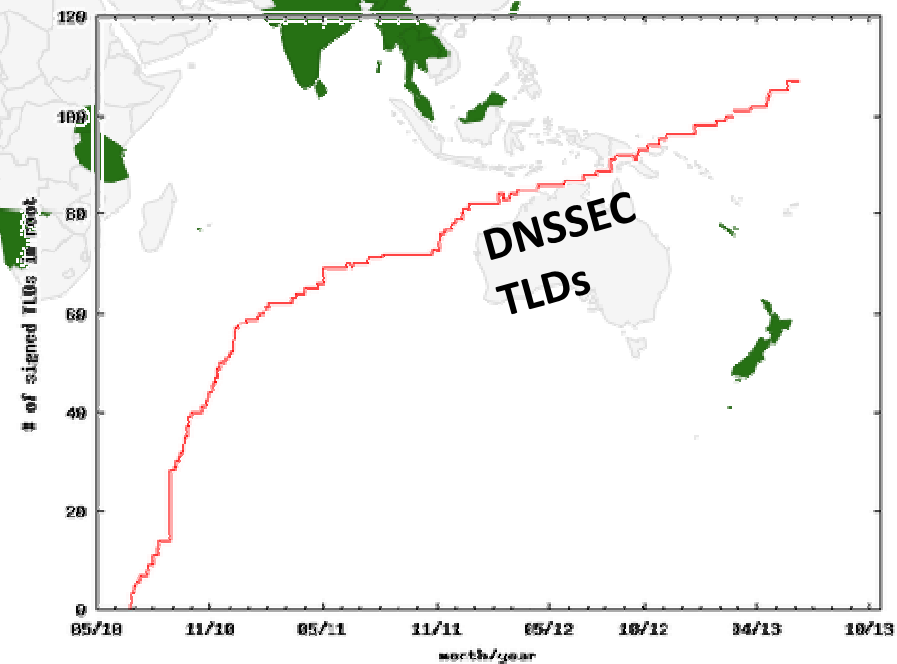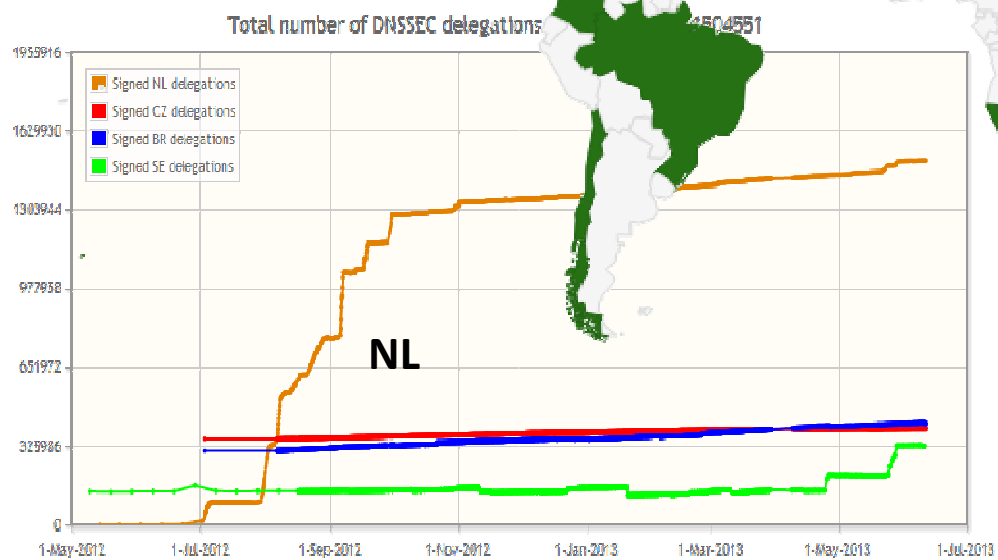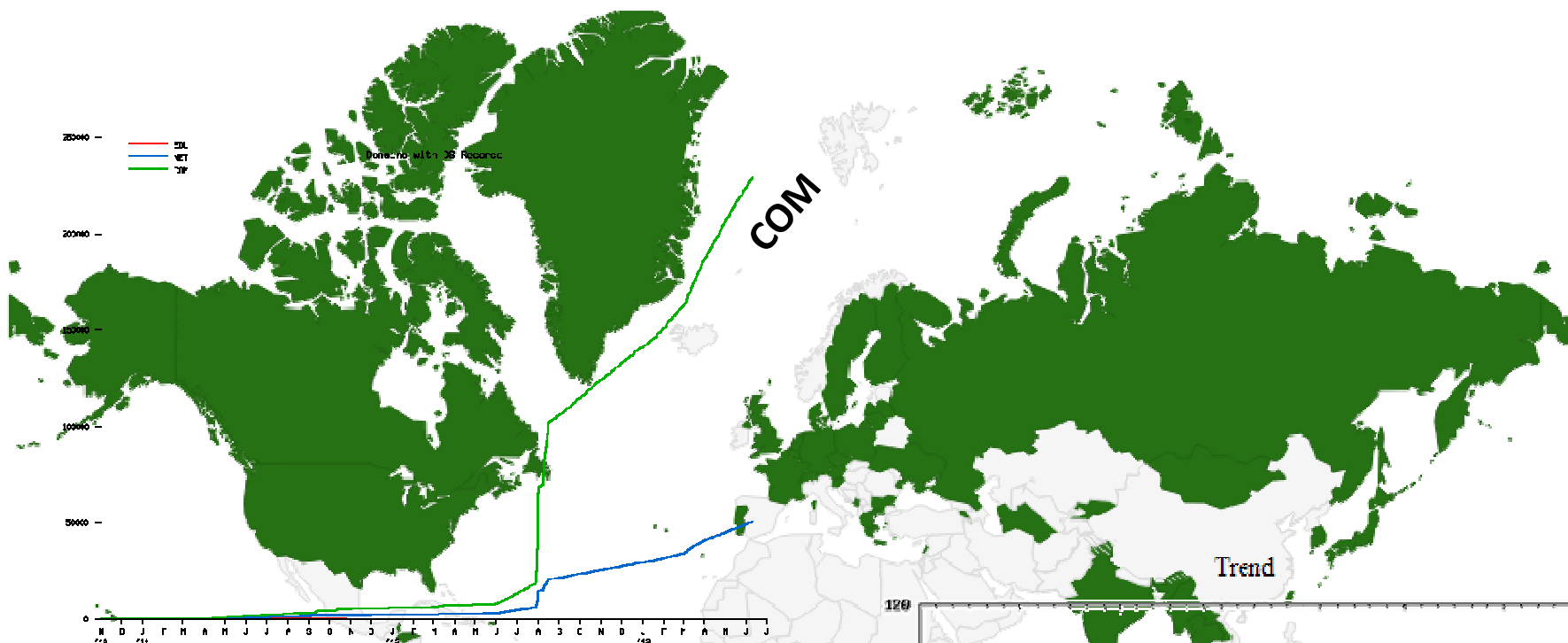
DNSSEC interest from governments

- Sweden, Brazil, Netherlands, Czech Republic and others encourage DNSSEC deployment to varying degrees

- Mar 2012 - AT&T, CenturyLink (Qwest), Comcast, Cox, Sprint, TimeWarner Cable, and Verizon have pledged to comply and abide by US FCC [1] recommendations that include DNSSEC.. "A report by Gartner found 3.6 million Americans getting redirected to bogus websites in a single year, costing them $3.2 billion.,"[2].

- 2008 US .gov mandate. >60% operational. [3]

[1] FCC=Federal Communications Commission=US communications Ministry
[2] http://securitywatch.pcmag.com/security/295722-isps-agree-to-fcc-rules-on-anti-botnet-dnssec-internet-routing
[3] http://www.whitehouse.gov/sites/default/files/omb/memoranda/fy2008/m08-23.pdf

COM

Trend

NL

DNSSEC
TLDs

Total number of DNSSEC delegations

- Signed NL delegations
- Signed CZ delegations
- Signed BR delegations
- Signed SE delegations

1955916
1629930
1303944
977958
651972
325986
0

1-May-2012   1-Jul-2012   1-Sep-2012   1-Nov-2012   1-Jan-2013   1-Mar-2013   1-May-2013   1-Jul-2013

120

100

80

60

40

20

0

05/10   11/10   05/11   11/11   05/12   10/12   04/13   10/13

month/year

# of signed TLDs in root

DNSSEC - Where we are

- Deployed on 107/317 TLDs (.th .mm .my .in .kg .lk .nc .nz .la .pw .tv .kr .jp .ru .pф .de .my ماليسيا. .asia .tw 台灣, .kr 한국 .com .net, .post, … and soon .cn)

- Root signed** and audited

- >86% of domain names could have DNSSEC

- Required in new gTLDs

- Growing ISP support*

- 3rd party signing solutions***

- Growing S/W H/W support: NLNetLabs, ISC, Microsoft, PowerDNS, Secure64…? openssl, mozilla: early DANE support

- IETF standard on DNSSEC SSL certificates (RFC6698)

- Growing support from major players…(Apple iPhone/iPad, Google 8.8.8.8,…)

*COMCAST Internet (18M), TeliaSonera SE, Sprint,Vodafone CZ,Telefonica CZ, T-mobile NL, SurfNet NL, SANYO Information Technology Solutions JP, others..

**Int'l bottom-up trust model /w 21 TCRs from: TT, BF, RU, CN, US, SE, NL, UG, BR, Benin, PT, NP, Mauritius, CZ, CA, JP, UK, NZ…

*** Partial list of registrars: https://www.icann.org/en/news/in-focus/dnssec/deployment

But…

- But deployed on < 1% (~2M) of 2nd level domains. Many have plans. Few have taken the step (e.g., yandex.com, paypal.com*, comcast.com).

- DNSChanger and other attacks highlight today's need. (e.g end-2-end DNSSEC validation would have avoided the problems)

- Innovative security solutions (e.g., DANE) highlight tomorrow's value.

 * http://fedv6-deployment.antd.nist.gov/cgi-bin/generate-com
http://www.thesecuritypractice.com/the_security_practice/2011/12/all-paypal-domains-are-now-using-dnssec.html
http://www.nacion.com/2012-03-15/Tecnologia/Sitios-web-de-bancos-ticos-podran-ser-mas-seguros.aspx

DNSSEC: So what's the problem?

- Not enough IT departments know about it or are too busy putting out other fires.

- When they do look into it they hear old stories of FUD and lack of turnkey solutions.

- Registrars/DNS providers see no demand leading to "chicken-and-egg" problems.

Industry DNSSEC Enabled Domains
- 1069 tested on 2012.07.28 -

What you can do

- *For Companies:*
  - Sign your corporate domain names
  - Just turn on validation on corporate DNS resolvers
- *For Users:*
  - Ask ISP to turn on validation on their DNS resolvers
- *For All:*
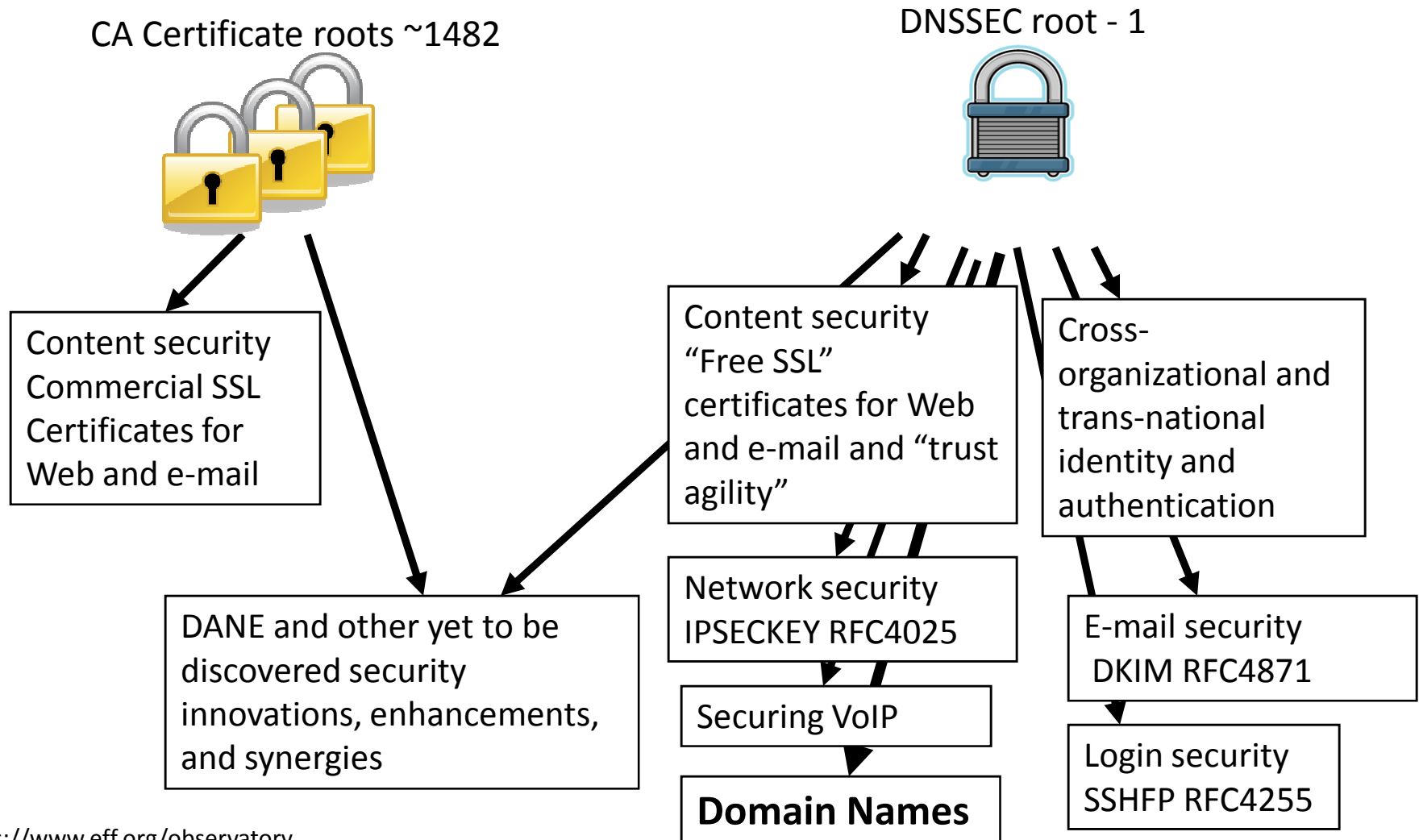 - Take advantage of ICANN, ISOC and other organizations offering DNSSEC education and training

I smell opportunity !

Game changing Internet Core Infrastructure Upgrade

- "More has happened here today than meets the eye. An infrastructure has been created for a hierarchical security system, which can be purposed and re-purposed in a number of different ways. .." – Vint Cerf (June 2010)

The Bad: SSL Dilution of Trust
The Good: DNSSEC = Global "free" PKI

CA Certificate roots ~1482

DNSSEC root - 1

Content security
Commercial SSL
Certificates for
Web and e-mail

Content security
"Free SSL"
certificates for Web
and e-mail and "trust
agility"

Cross-
organizational and
trans-national
identity and
authentication

DANE and other yet to be
discovered security
innovations, enhancements,
and synergies

Network security
IPSECKEY RFC4025

E-mail security
DKIM RFC4871

Securing VoIP

Login security
SSHFP RFC4255

Domain Names

https://www.eff.org/observatory
http://royal.pingdom.com/2011/01/12/internet-2010-in-numbers/

Opportunity: New Security Products

- Improved Web SSL and certificates for all*
- Secured e-mail (S/MIME) for all*
- Validated remote login SSH, IPSEC*
- Securing VoIP
- Cross organizational digital identity systems
- Secured content delivery (e.g. configurations, updates, keys)
- Securing Smart Grid efforts
- A global PKI
- Increasing trust in e-commerce
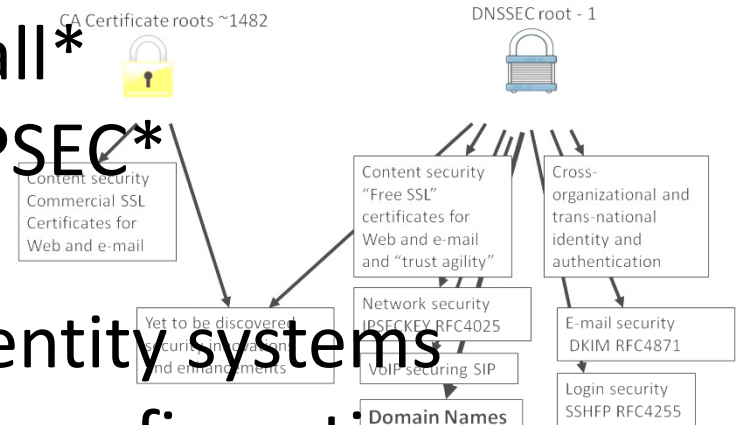
A good ref http://www.internetsociety.org/deploy360/dnssec/
*IETF standards complete or currently being developed

Hmm…how do I trust it?

ICANN DNSSEC Deployment @Root

- **Multi-stakeholder, bottom-up trust model* /w 21 crypto officers from around the world**
- **Broadcast Key Ceremonies and public docs**
- **SysTrust audited**
- **FIPS 140-2 level 4 HSMs**

Root DNSSEC Design Team

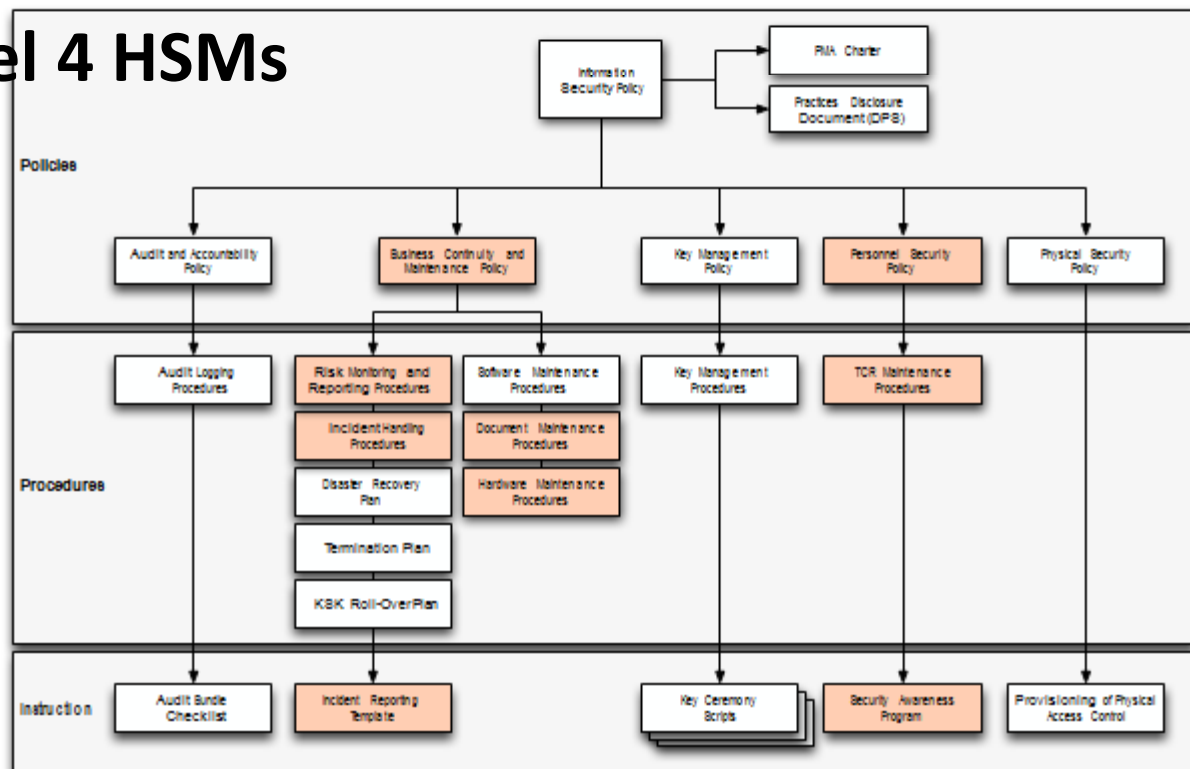DNSSEC Practice Statement for the Root Zone KSK

Abstract

This document is the DNSSEC Practice Statement (DPS)
Zone Key Signing Key (KSK) Operator. It states the
provisions that are used to provide Root Zone Key Si
Distribution services. These include, but are not l
issuing, managing, changing and distributing DNS key
with the specific requirements of the U.S. Departmen

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Copyright 2009 by VeriSign, Inc., and by Internet Co
Assigned Names and Numbers. This work is based on t
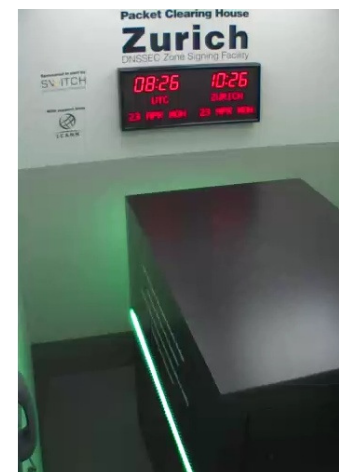
Root DPS

DNSSEC Practice Statement

ICANN DNSSEC Deployment @Root
(and elsewhere)

FIPS 140-2 level 4

DCID 6/9

http://www.flickr.com/photos/kjd/sets/72157624302045698/

Photos: Kim Davies

N Sepulveda Blvd

Hughes Wy

E Maple Ave

Indiana Ct

1920 E Maple Ave, El Segundo, CA 90

January 27, 2010
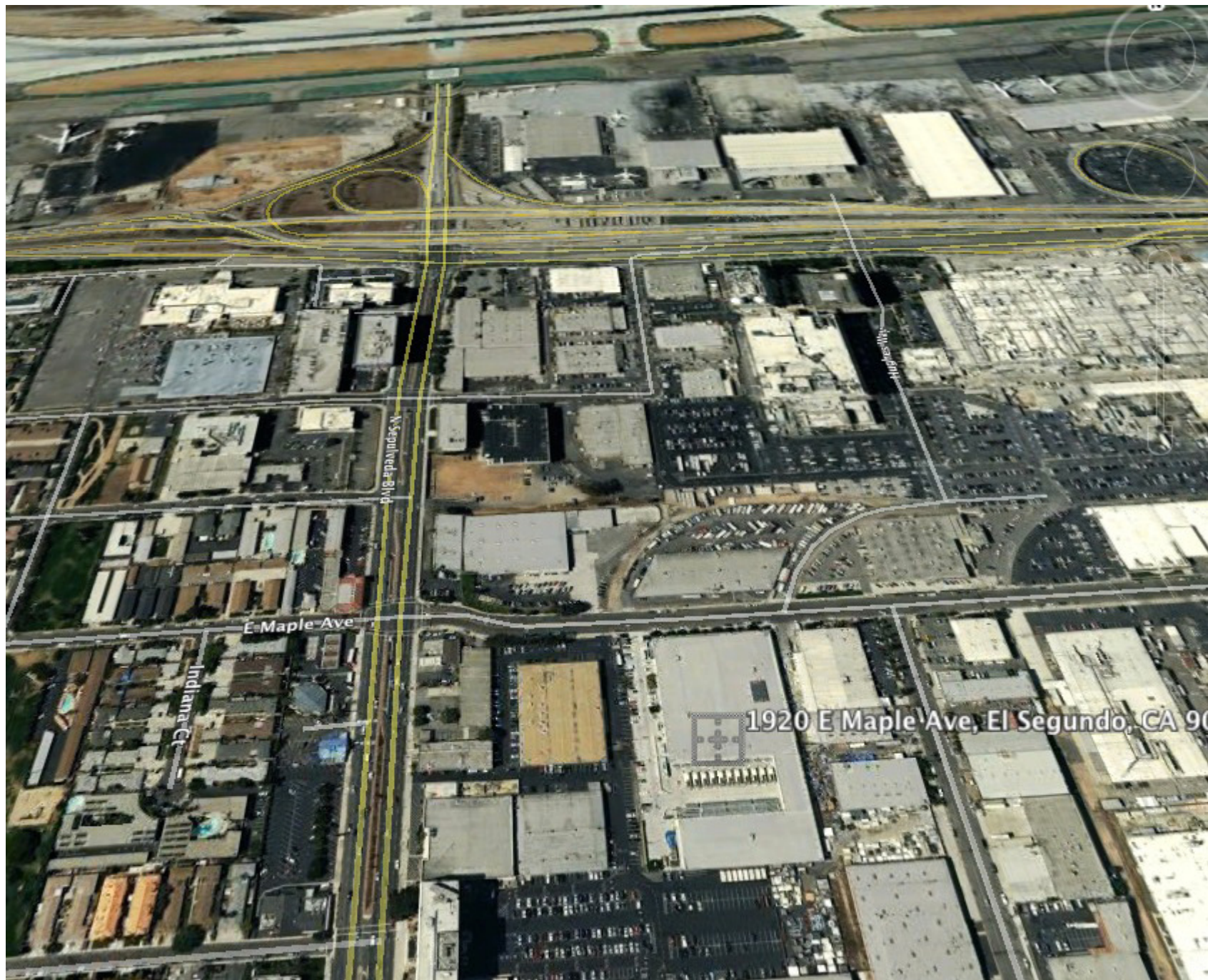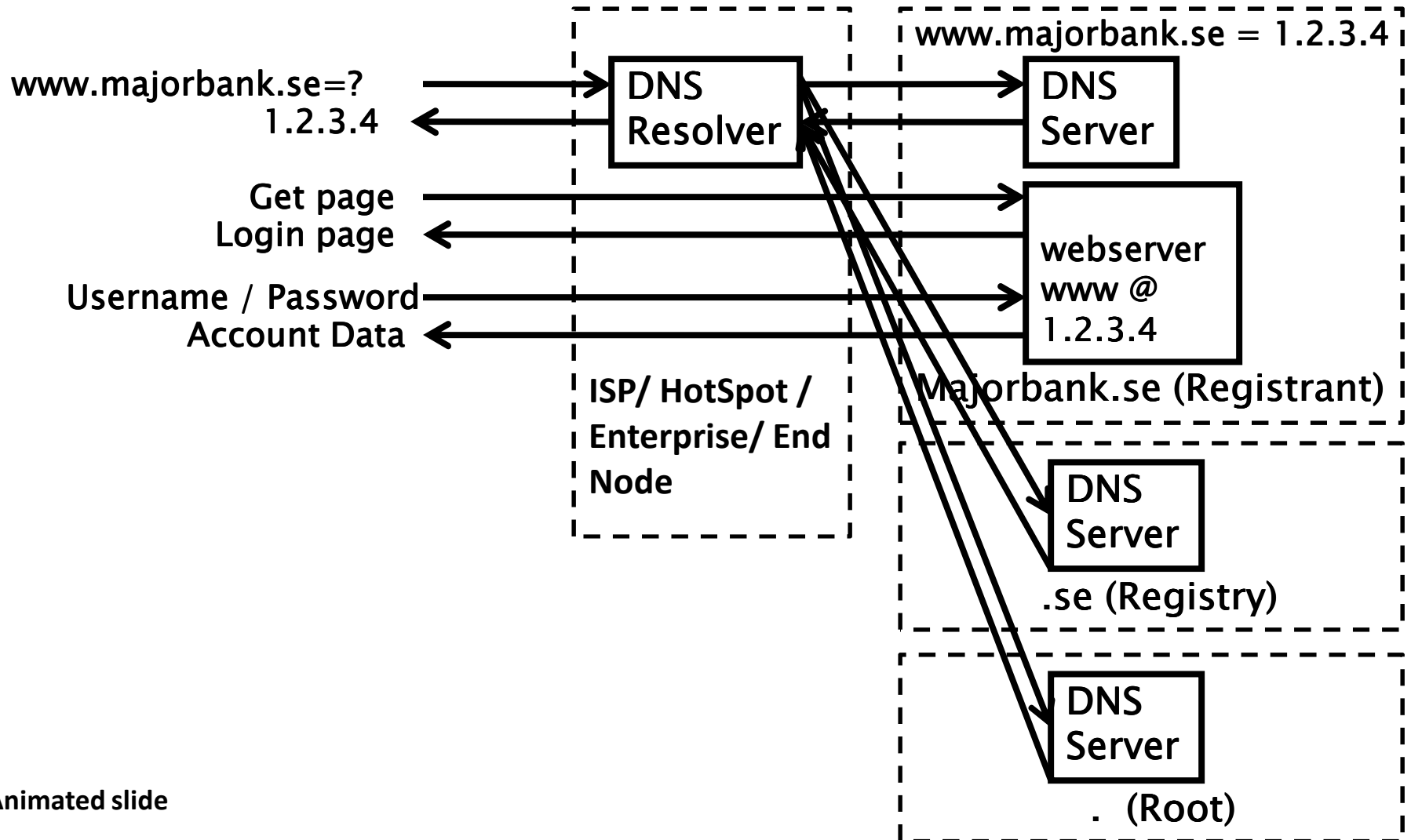
Photos: Kim Davies

DNSSEC: Internet infrastructure upgrade to help address today's needs and create tomorrow's opportunity.

The Internet's Phone Book - Domain Name System (DNS+DNSSEC)

www.majorbank.se = 1.2.3.4

www.majorbank.se=?

1.2.3.4

DNS Resolver

DNS Server

Get page
Login page

webserver
www @
1.2.3.4

Username / Password
Account Data

ISP/ HotSpot /
Enterprise/ End
Node

Majorbank.se (Registrant)

DNS Server

.se (Registry)

DNS Server

. (Root)

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