DNSSEC
Basics, Risks and Benefits

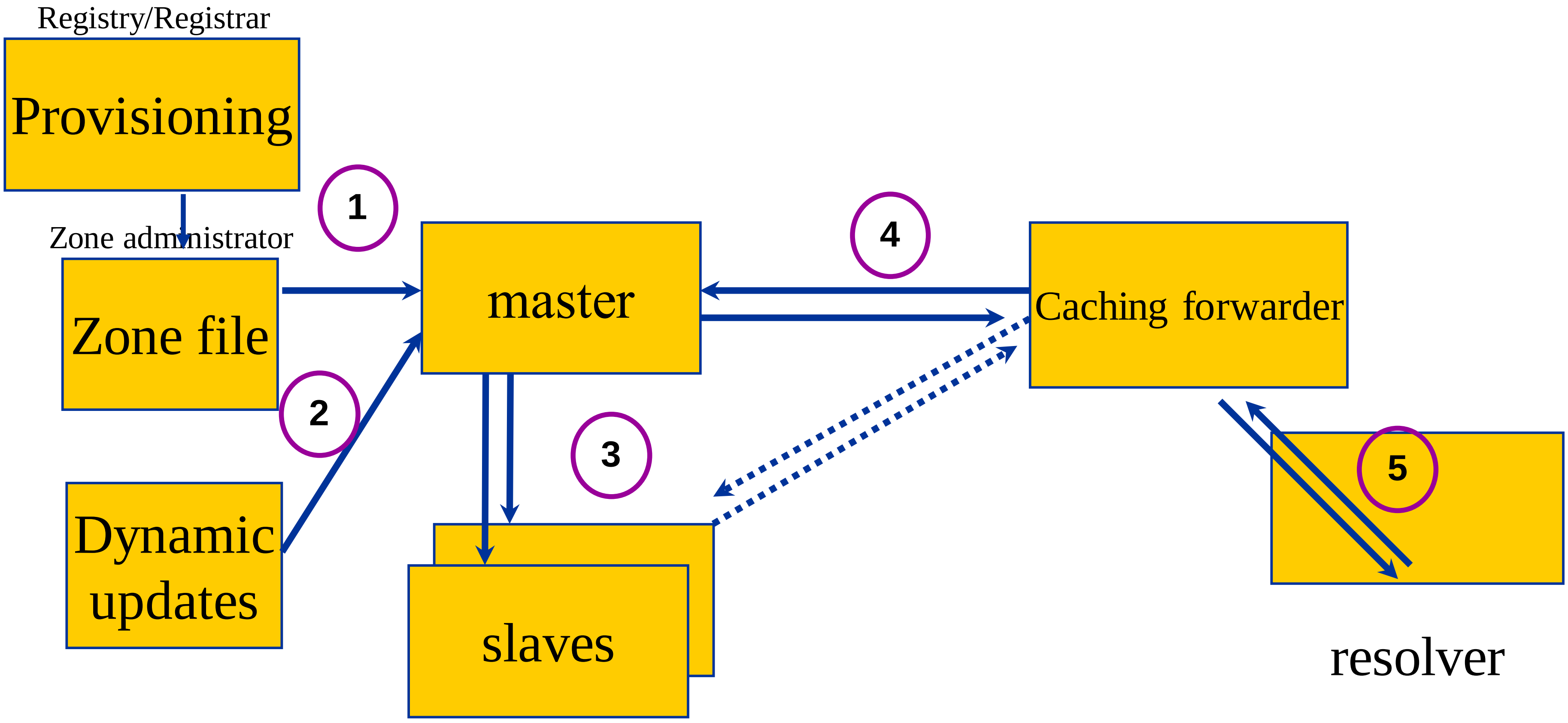
Olaf M. Kolkman

olaf@ripe.net

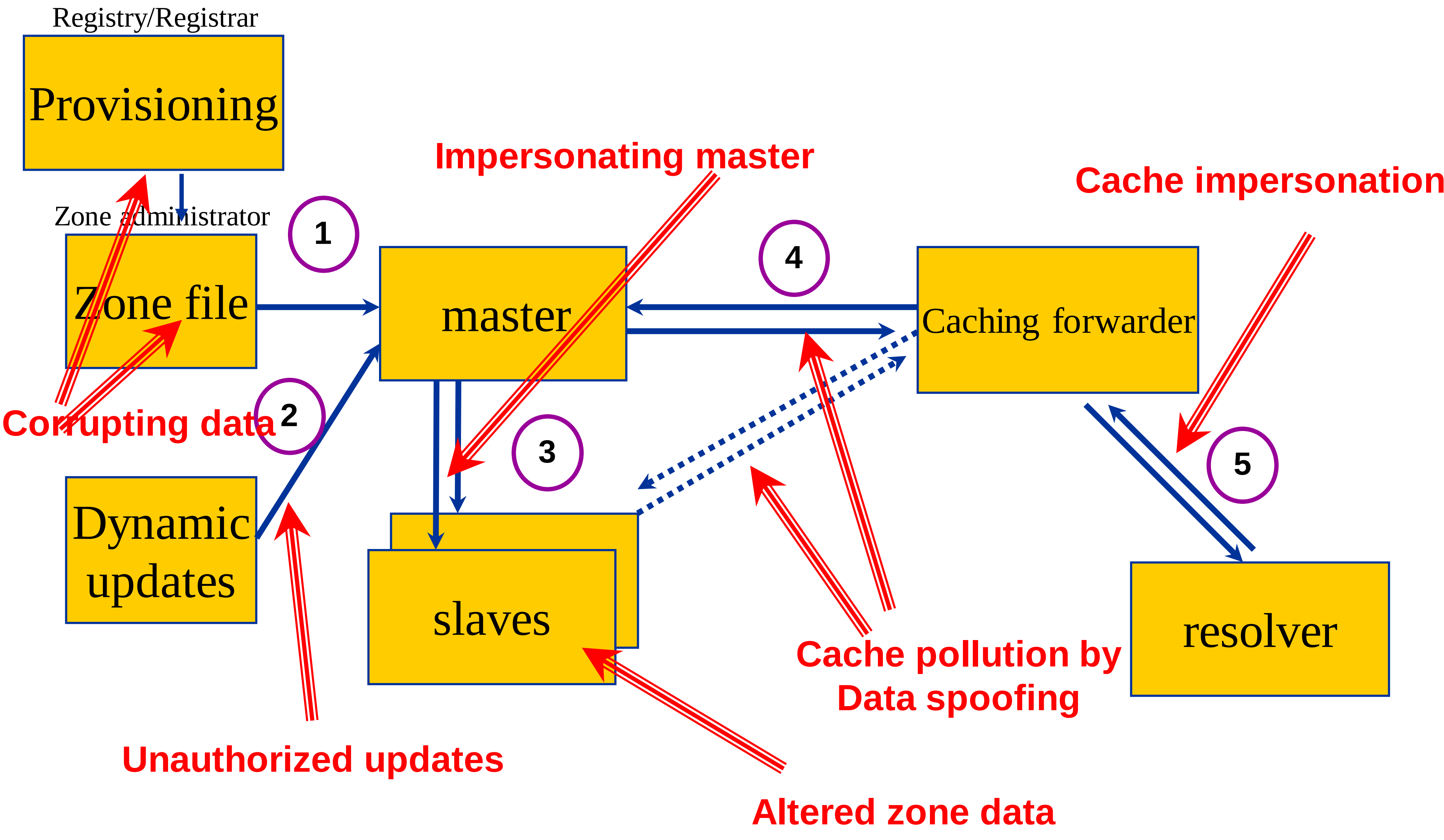
This presentation

- About DNS and its vulnerabilities
- DNSSEC status
- DNSSEC near term future

DNS: Data Flow

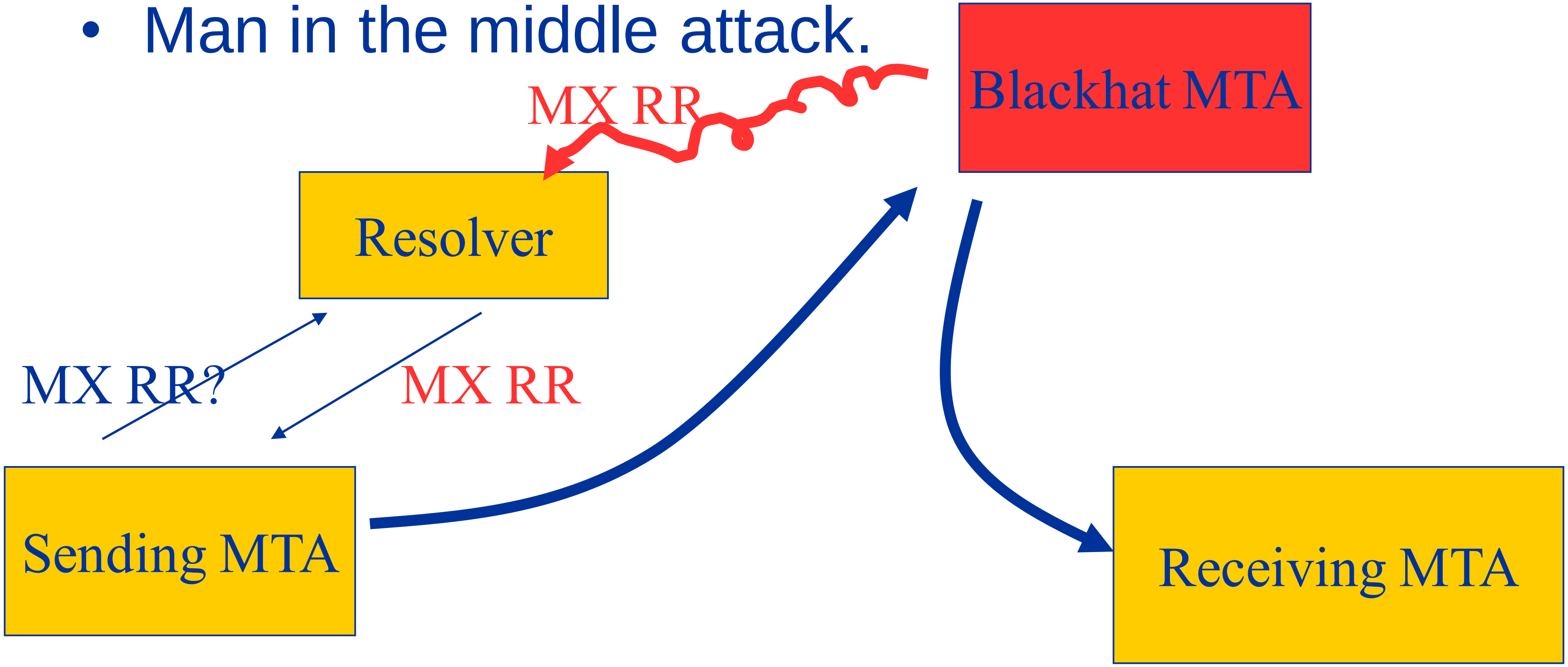


DNS Vulnerabilities



DNS exploit example

- Mail gets delivered to the MTA listed in the MX RR.
- Man in the middle attack.



Mail man in the middle

- ‘Ouch that mail contained stock sensitive information’
  - Who per default encrypts all their mails?
- We’ll notice when that happens, we have log files
  - You have to match address to MTA for each logline.

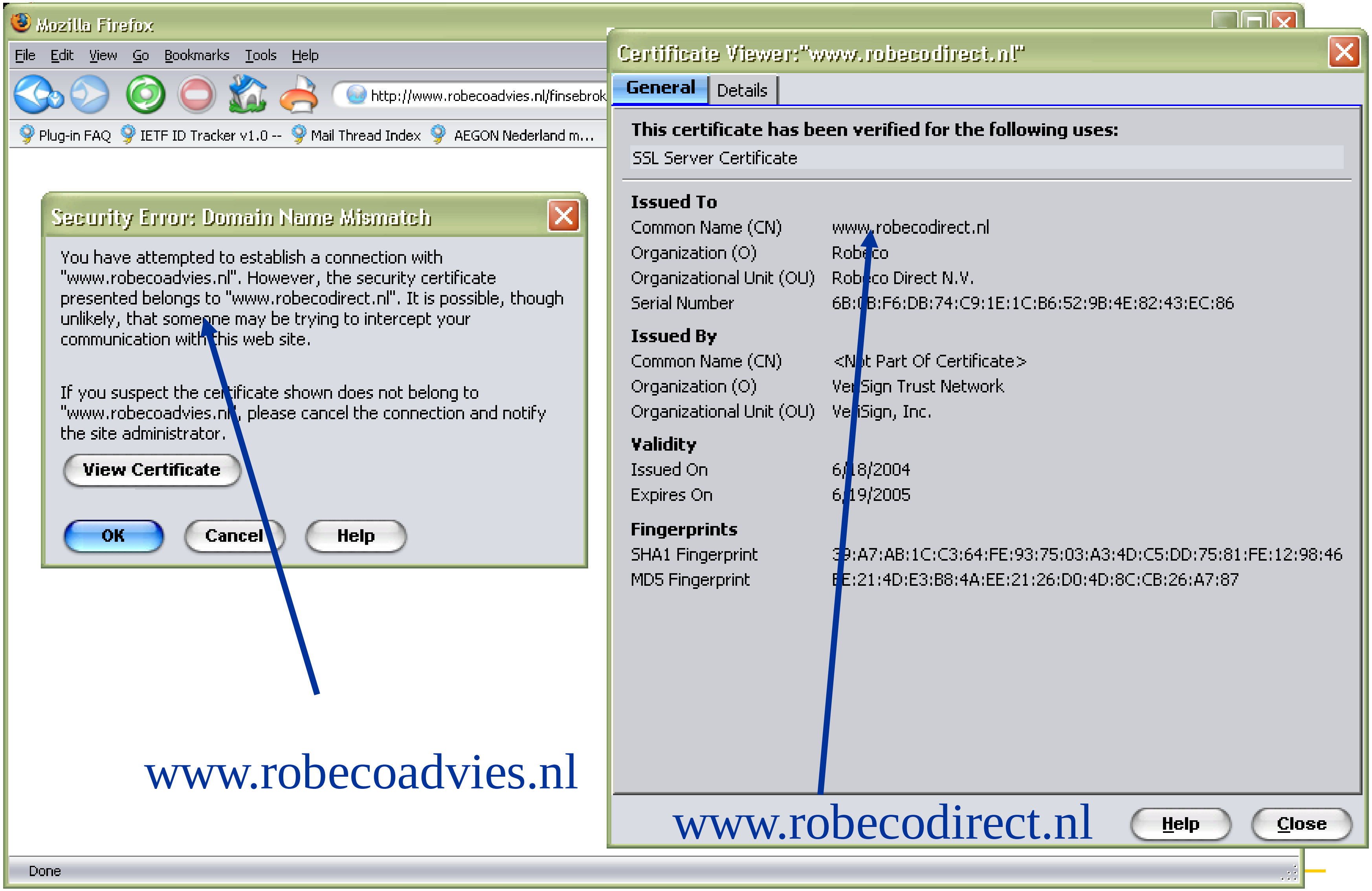
Other possible DNS targets

- SPF, DomainKey and family
  - Technologies that use the DNS to mitigate spam and phishing: $$$ value for the black hats
- StockTickers, RSS feeds
  - Usually no source authentication but supplying false stock information via a stockticker and via a news feed can have $$$ value
- ENUM
  - Mapping telephone numbers to services in the DNS
    - As soon as there is some incentive

Mitigate by deploying SSL?

- Claim: SSL is not the magic bullet
  - (Neither is DNSSEC)
- Problem: Users are offered a choice
  - happens to often
  - users are not surprised but annoyed
- Not the technology but the implementation and use makes SSL vulnerable
- Examples follow

Example 1: mismatched CN



Security Error: Domain Name Mismatch

You have attempted to establish a connection with "www.robecoadvies.nl". However, the security certificate presented belongs to "www.robecodirect.nl". It is possible, though unlikely, that someone may be trying to intercept your communication with this web site.

If you suspect the certificate shown does not belong to "www.robecoadvies.nl", please cancel the connection and notify the site administrator.

Certificate Viewer:"www.robecodirect.nl"

This certificate has been verified for the following uses:

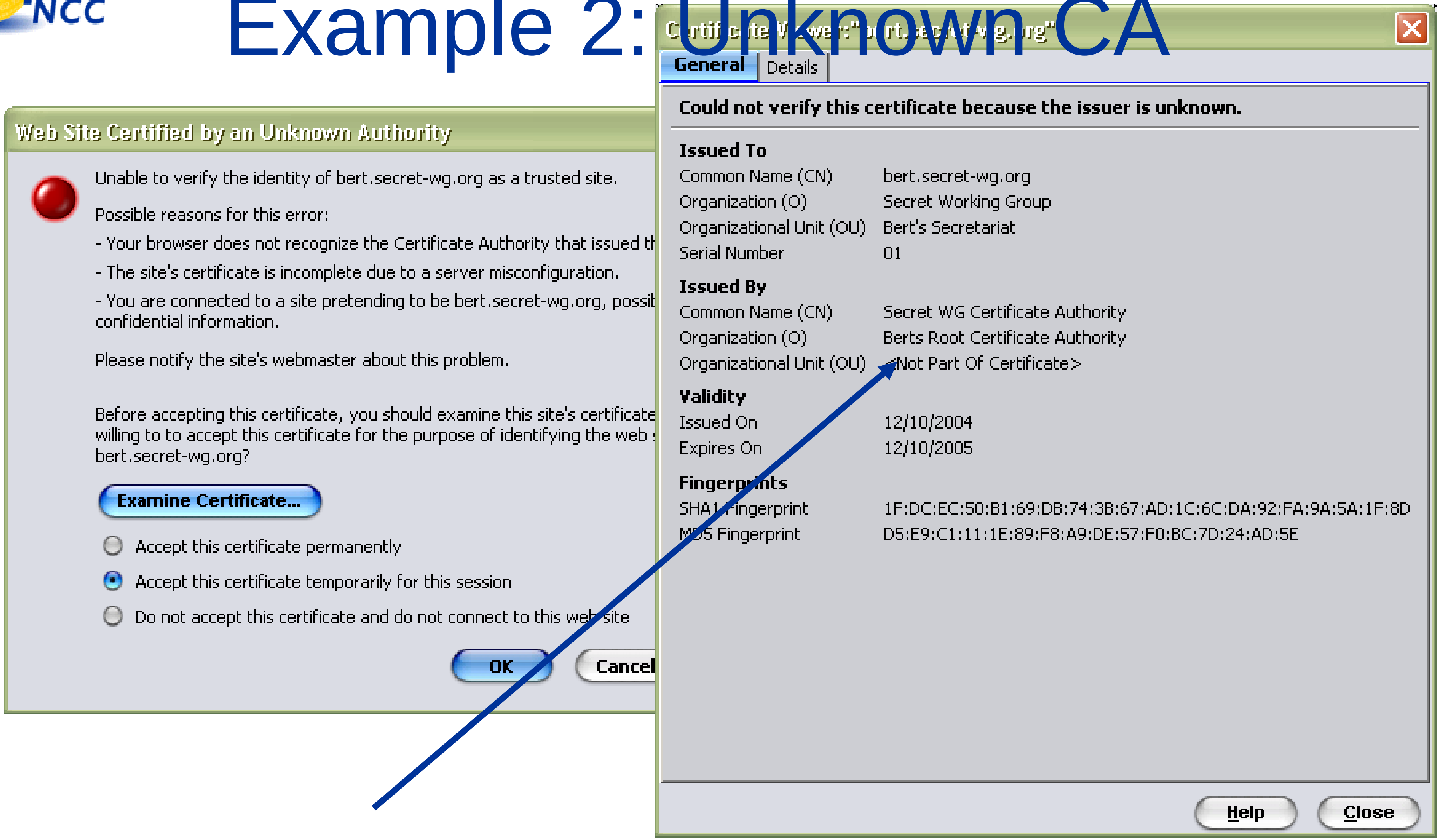
SSL Server Certificate

Issued To	
Common Name (CN)	www.robecodirect.nl
Organization (O)	Robeco
Organizational Unit (OU)	Robeco Direct N.V.
Serial Number	6B:0B:F6:DB:74:C9:1E:1C:B6:52:9B:4E:82:43:EC:86
Issued By	
Common Name (CN)	<Not Part Of Certificate>
Organization (O)	VeriSign Trust Network
Organizational Unit (OU)	VeriSign, Inc.
Validity	
Issued On	6/18/2004
Expires On	6/19/2005
Fingerprints	
SHA1 Fingerprint	39:A7:AB:1C:C3:64:FE:93:75:03:A3:4D:C5:DD:75:81:FE:12:98:46
MD5 Fingerprint	EE:21:4D:E3:B8:4A:EE:21:26:D0:4D:8C:CB:26:A7:87

www.robecoadvies.nl

www.robecodirect.nl

Example 2: Unknown CA



Web Site Certified by an Unknown Authority

Unable to verify the identity of bert.secret-wg.org as a trusted site.

Possible reasons for this error:

- Your browser does not recognize the Certificate Authority that issued th

- The site's certificate is incomplete due to a server misconfiguration.

- You are connected to a site pretending to be bert.secret-wg.org, possib confidential information.

Please notify the site's webmaster about this problem.

Before accepting this certificate, you should examine this site's certificate willing to to accept this certificate for the purpose of identifying the web bert.secret-wg.org?

○ Accept this certificate permanently

● Accept this certificate temporarily for this session

○ Do not accept this certificate and do not connect to this web site

Certificate Viewer:"bert.secret-wg.org"

Could not verify this certificate because the issuer is unknown.

Issued To

Common Name (CN)	bert.secret-wg.org
Organization (O)	Secret Working Group
Organizational Unit (OU)	Bert's Secretariat
Serial Number	01

Issued By

Common Name (CN)	Secret WG Certificate Authority
Organization (O)	Berts Root Certificate Authority
Organizational Unit (OU)	<Not Part Of Certificate>

Validity

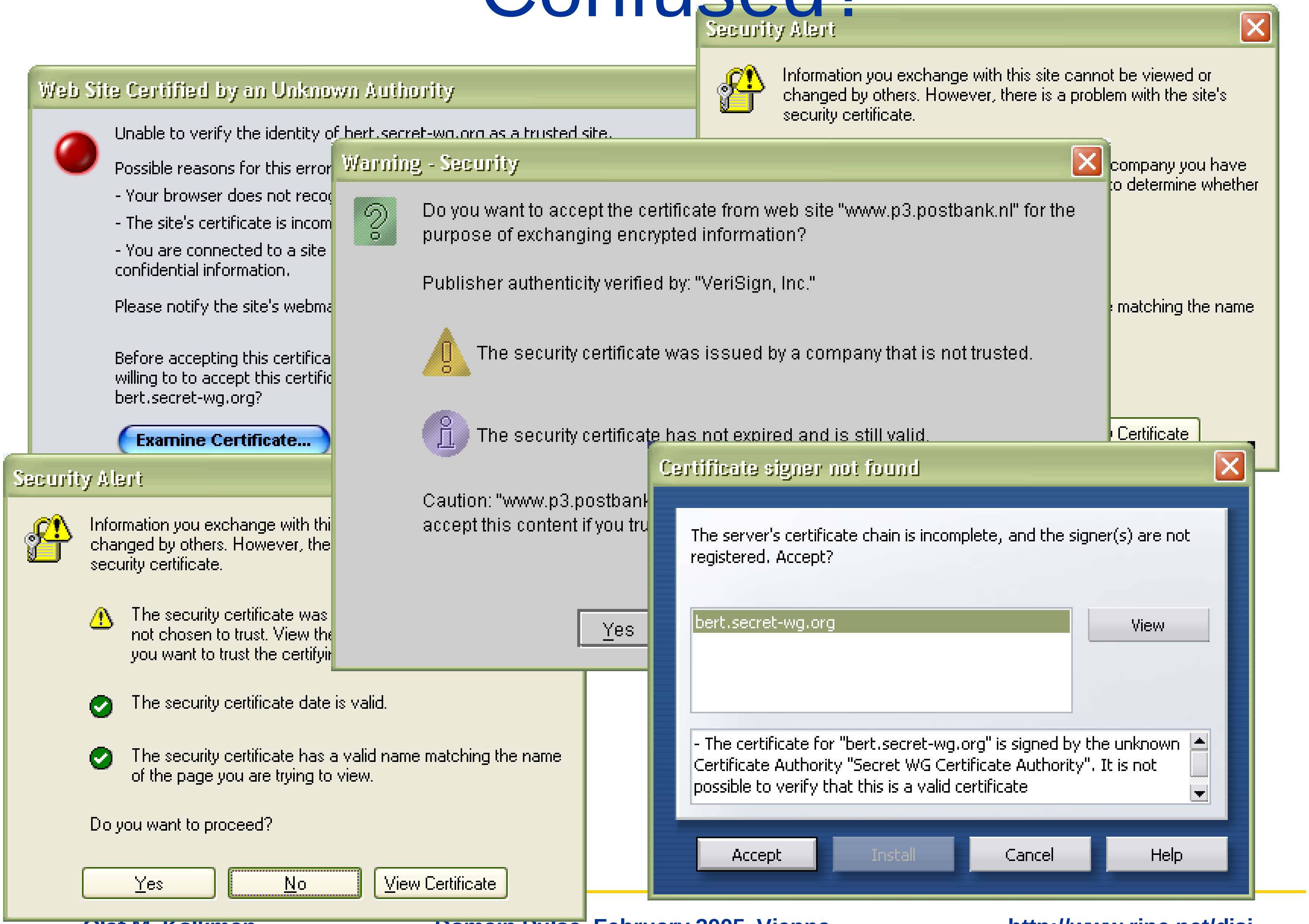
Issued On	12/10/2004
Expires On	12/10/2005

Fingerprints

SHA1 Fingerprint	1F:DC:EC:50:B1:69:DB:74:3B:67:AD:1C:6C:DA:92:FA:9A:5A:1F:8D
MD5 Fingerprint	D5:E9:C1:11:1E:89:F8:A9:DE:57:F0:BC:7D:24:AD:5E

Unknown Certificate Authority

Confused?



Web Site Certified by an Unknown Authority

Unable to verify the identity of bert.secret-wg.org as a trusted site.

Possible reasons for this error

- Your browser does not recog
- The site's certificate is incom
- You are connected to a site

confidential information.

Please notify the site's webma

Before accepting this certifica
willing to to accept this certific
bert.secret-wg.org?

Warning - Security

Do you want to accept the certificate from web site "www.p3.postbank.nl" for the purpose of exchanging encrypted information?

Publisher authenticity verified by: "VeriSign, Inc."

The security certificate was issued by a company that is not trusted.

The security certificate has not expired and is still valid.

Caution: "www.p3.postbank
accept this content if you tru

Security Alert

Information you exchange with this site cannot be viewed or changed by others. However, there is a problem with the site's security certificate.

company you have
to determine whether

matching the name

Security Alert

Information you exchange with thi
changed by others. However, the
security certificate.

The security certificate was
not chosen to trust. View the
you want to trust the certifyi

The security certificate date is valid.

The security certificate has a valid name matching the name of the page you are trying to view.

Do you want to proceed?

Certificate signer not found

The server's certificate chain is incomplete, and the signer(s) are not registered. Accept?

bert.secret-wg.org

- The certificate for "bert.secret-wg.org" is signed by the unknown Certificate Authority "Secret WG Certificate Authority". It is not possible to verify that this is a valid certificate

How does DNSSEC come into this picture

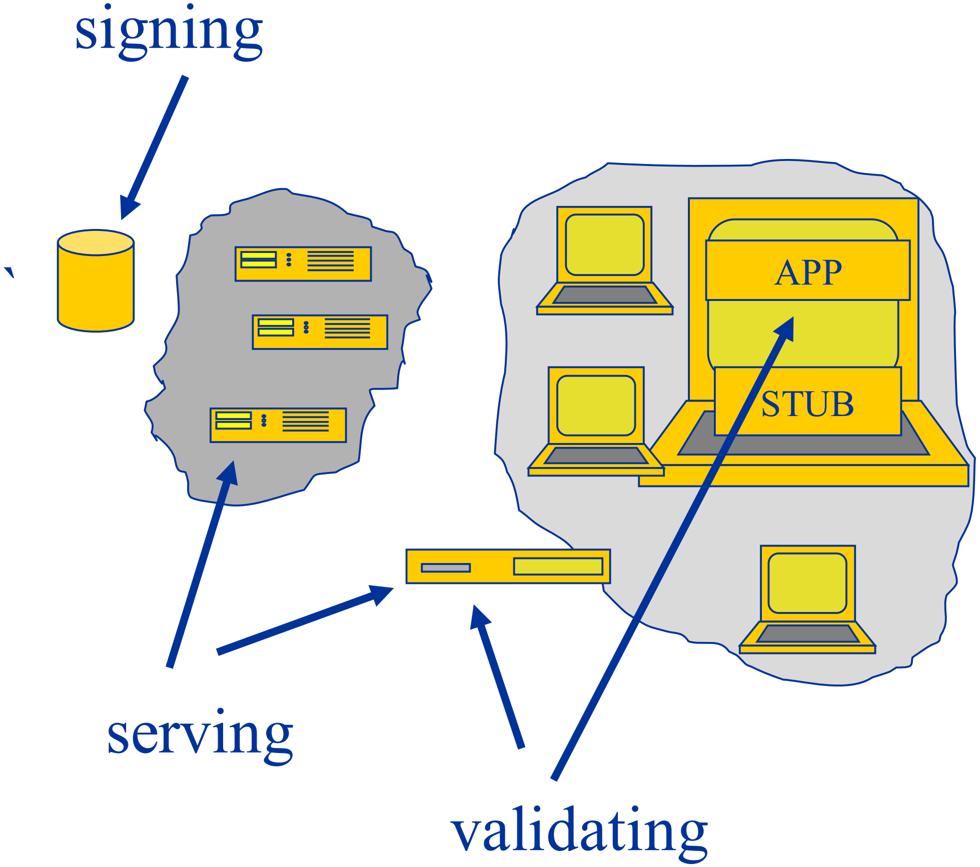
- DNSSEC secures the name to address mapping
  - before the certificates are needed
- DNSSEC provides an “independent” trust path.
  - The person administering “https” is most probably a different from person from the one that does “DNSSEC”
  - The chains of trust are most probably different
  - See acmqueue.org article: “Is Hierarchical Public-Key Certification the Next Target for Hackers?”

Any Questions so far?

- We covered some of the possible motivations for DNSSEC deployment

- Next: What is the status of DNSSEC, can it be deployed today?

DEPLOYMENT NOW
DNS server infrastructure related



Protocol spec is clear on:

- Signing
- Serving
- Validating

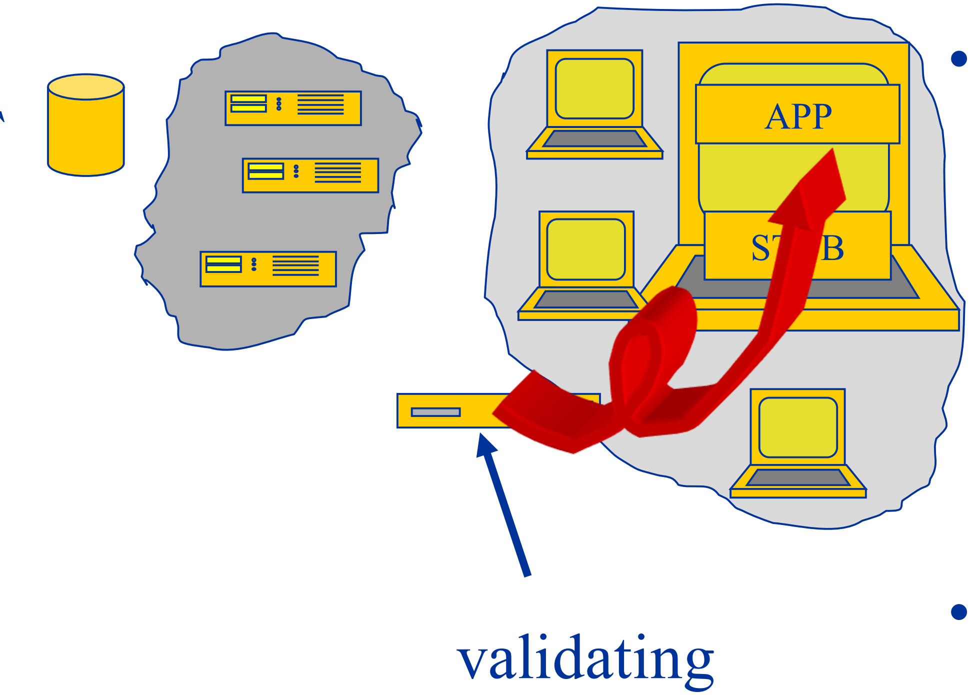
Implemented in

- Signer
- Authoritative servers
- Security aware recursive nameservers

Main improvement Areas

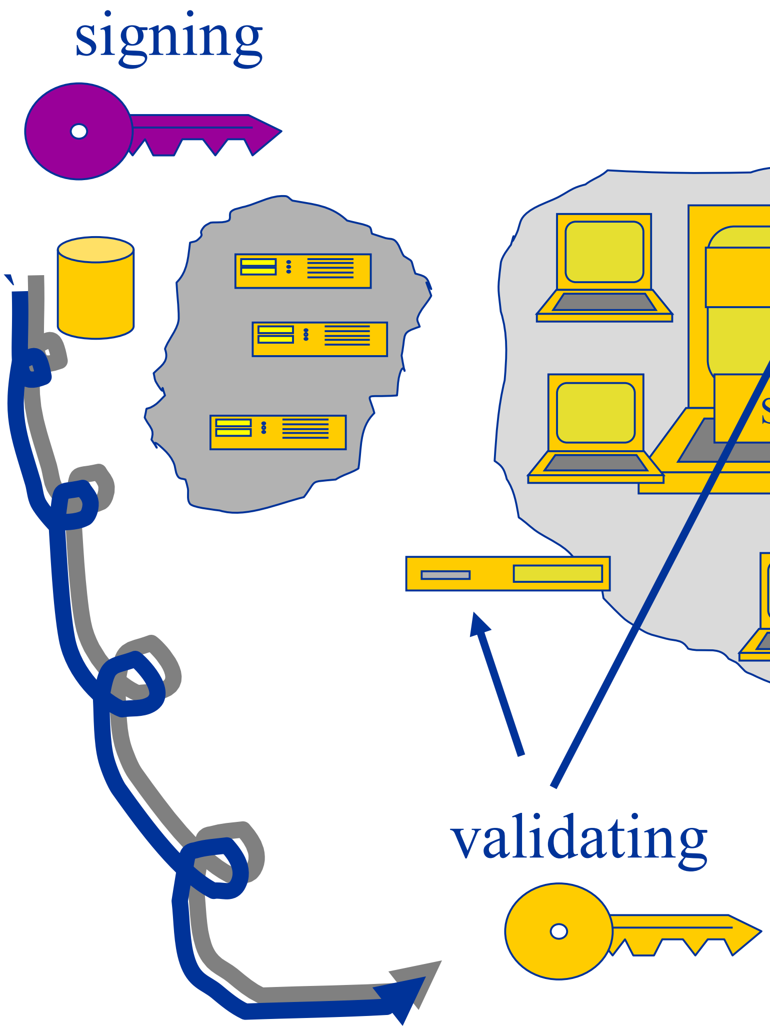
- “the last mile”
- Key management and key distribution
- NSEC walk

The last mile



- How to get validation results back to the user
- The user may want to make different decisions based on the validation result
  - Not secured
  - Time out
  - Crypto failure
  - Query failure
- From the recursive resolver to the stub resolver to the Application

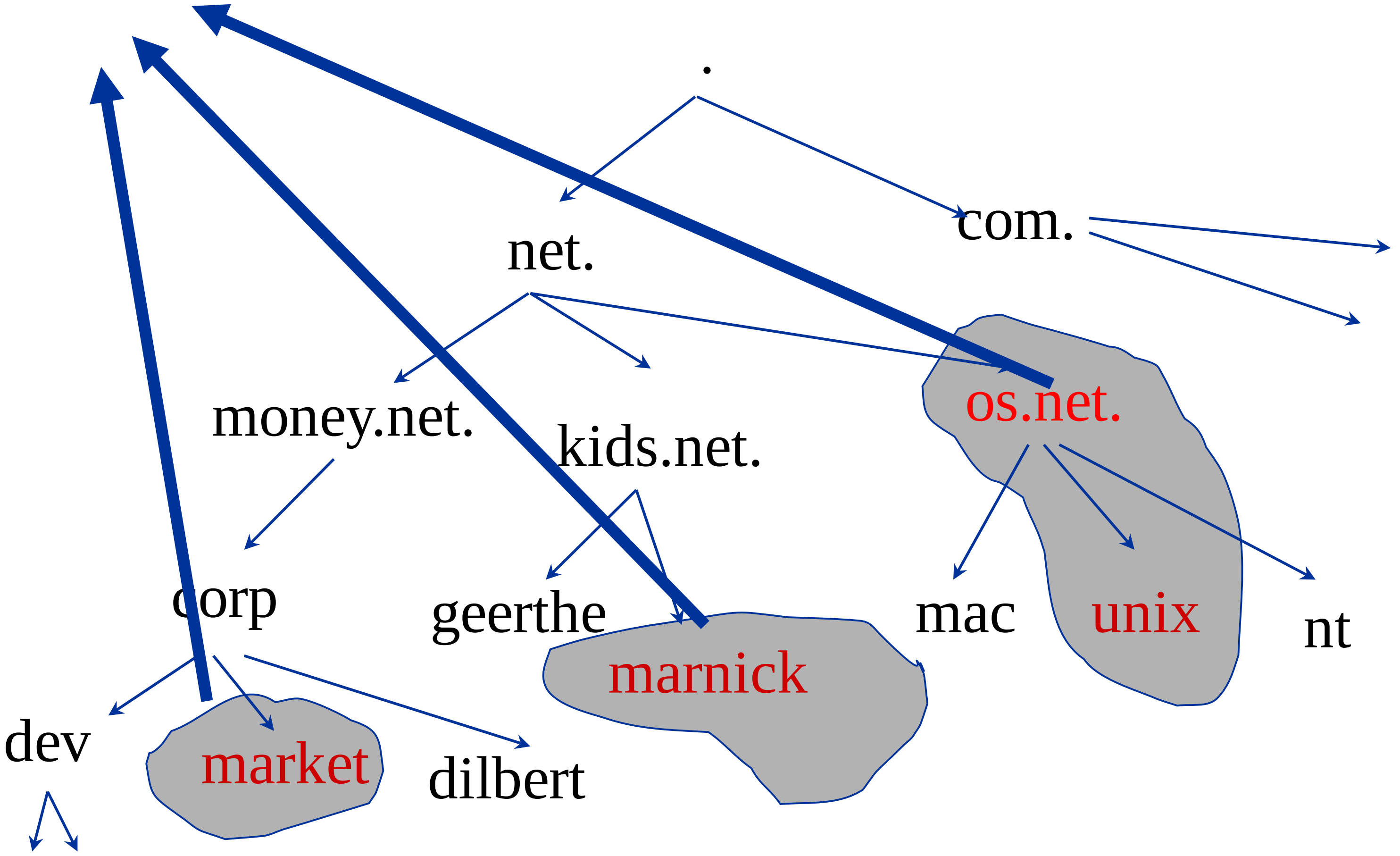
Problem Area



Key Management

- Keys need to propagate from the signer to the validating entity
- The validating entity will need to “trust” the key to “trust” the signature.
- Possibly many islands of security

Secure Islands and key management



Secure Islands

- Server Side
  - Different key management policies for all these islands
  - Different rollover mechanisms and frequencies

- Client Side
  (Clients with a few to 10, 100 or more trust-anchors)
  - How to keep the configured trust anchors in sync with the rollover
  - Bootstrapping the trust relation

NSEC walk

- The record for proving the non-existence of data allows for zone enumeration
- Providing privacy was **not** a requirement for DNSSEC
- Zone enumeration does provide a deployment barrier
- Work starting to study possible solutions
  - Requirements are gathered
  - If and when a solution is developed it will be co-existing with DNSSEC-BIS !!!
  - Until then on-line keys will do the trick.

Current work in the IETF

(a selection based on what fits on one slide)

Last Mile

- draft-gieben-resolver-application-interface

Key Rollover

- draft-ietf-dnsext-dnssec-trustupdate-timers
- draft-ietf-dnsext-dnssec-trustupdate-treshold

Operations

- draft-ietf-dnsop-dnssec-operations

NSEC++

- draft-arends-dnsnr
- draft-ietf-dnsext-nsec3
- draft-ietf-dnsext-trans

Questions…?

Ask

or send questions and feedback to olaf@ripe.net

References and Acknowledgements

- Some links
  - www.dnssec.net
  - www.dnssec-deployment.org
  - www.ripe.net/disi/dnssec_howto

- “Is Hierarchical Public-Key Certification the Next Target for Hackers” can be found at:

  http://www.acmqueue.org/modules.php?name=Content&pa=showpage&pid=181

- The participants in the dnssec-deployment working group provided useful feedback used in this presentation.