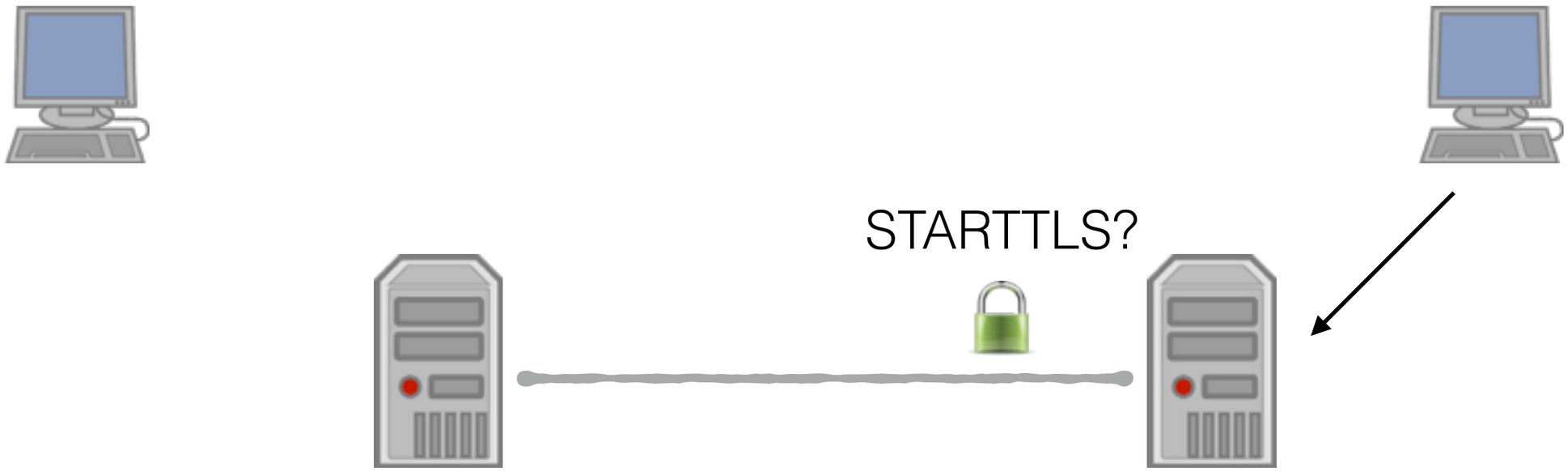
DA(e)NEn lügen nicht

Patrick Ben Koetter
Carsten Strotmann

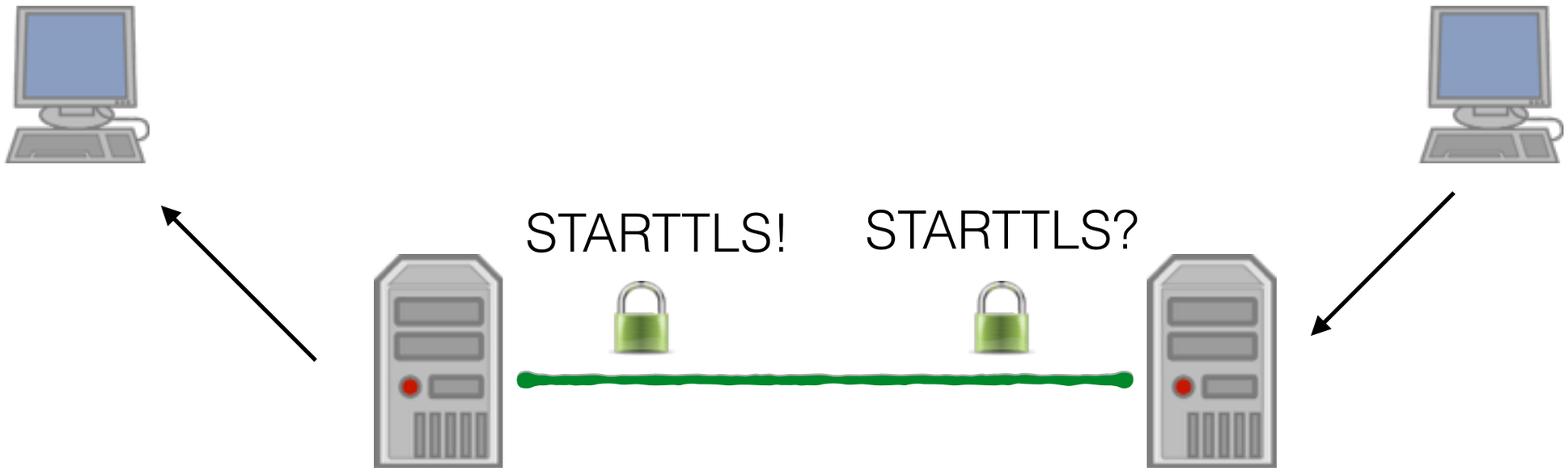
FrOSCon 2014

TLS und SMTP

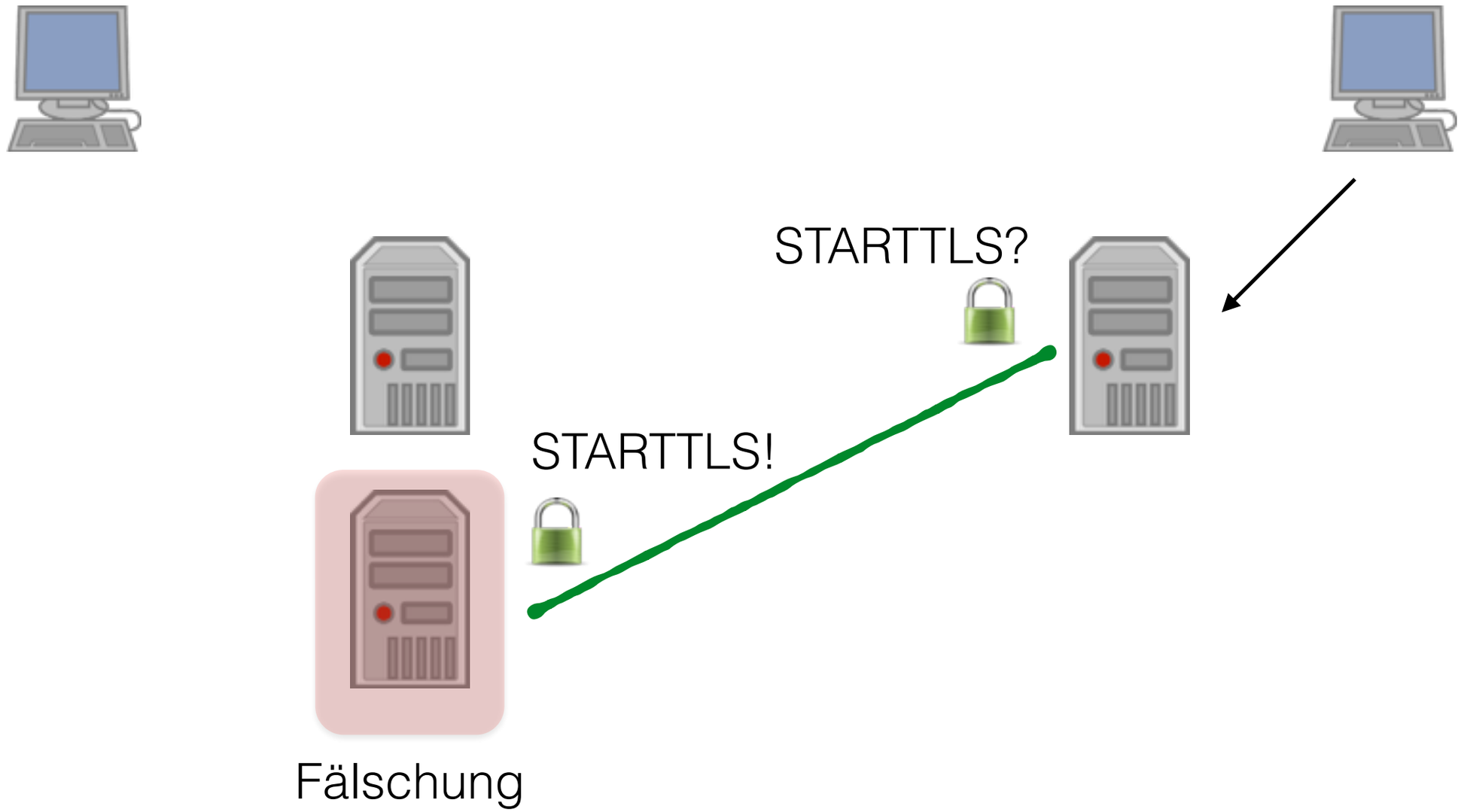
TLS und SMTP



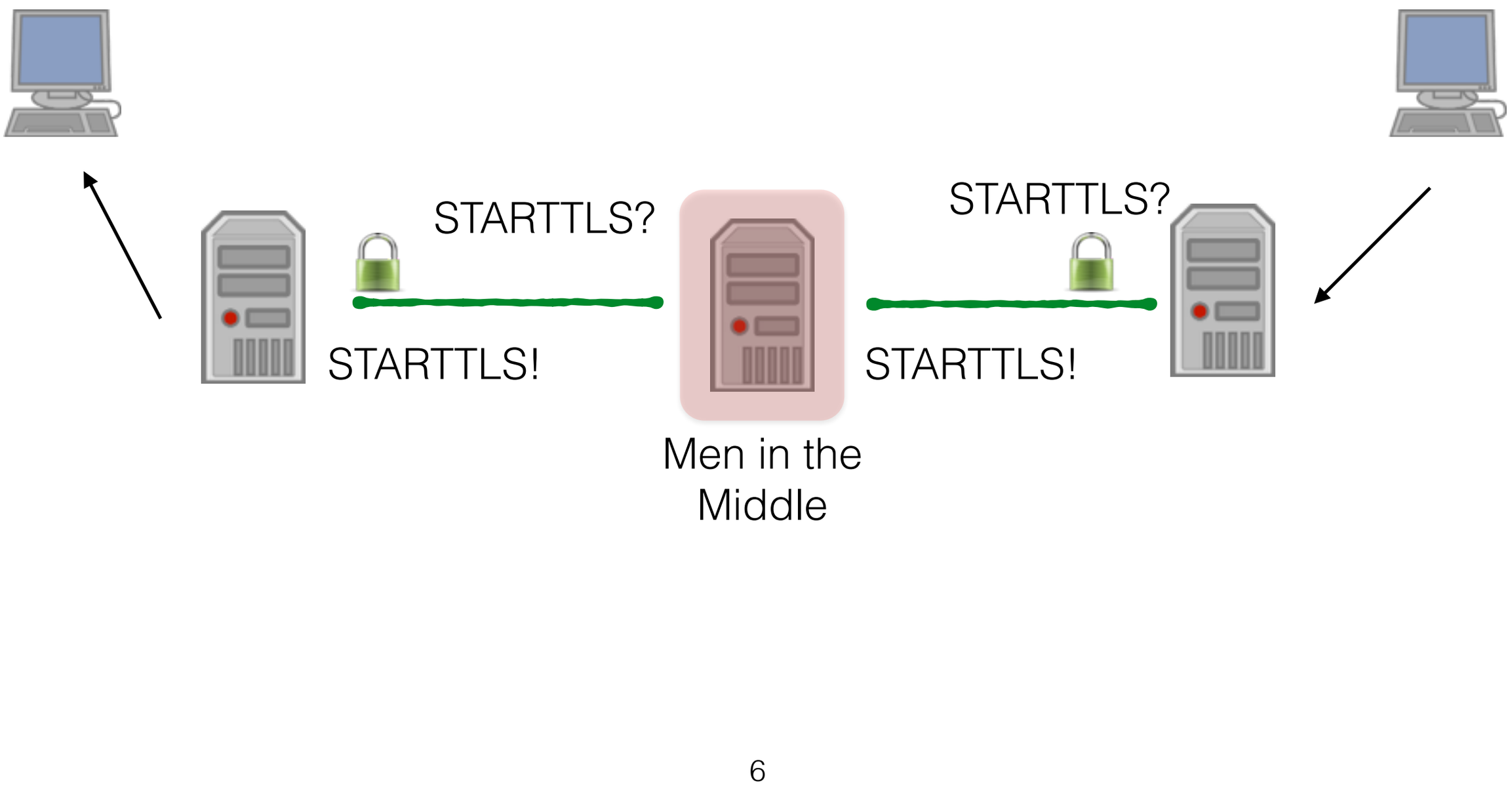
TLS und SMTP



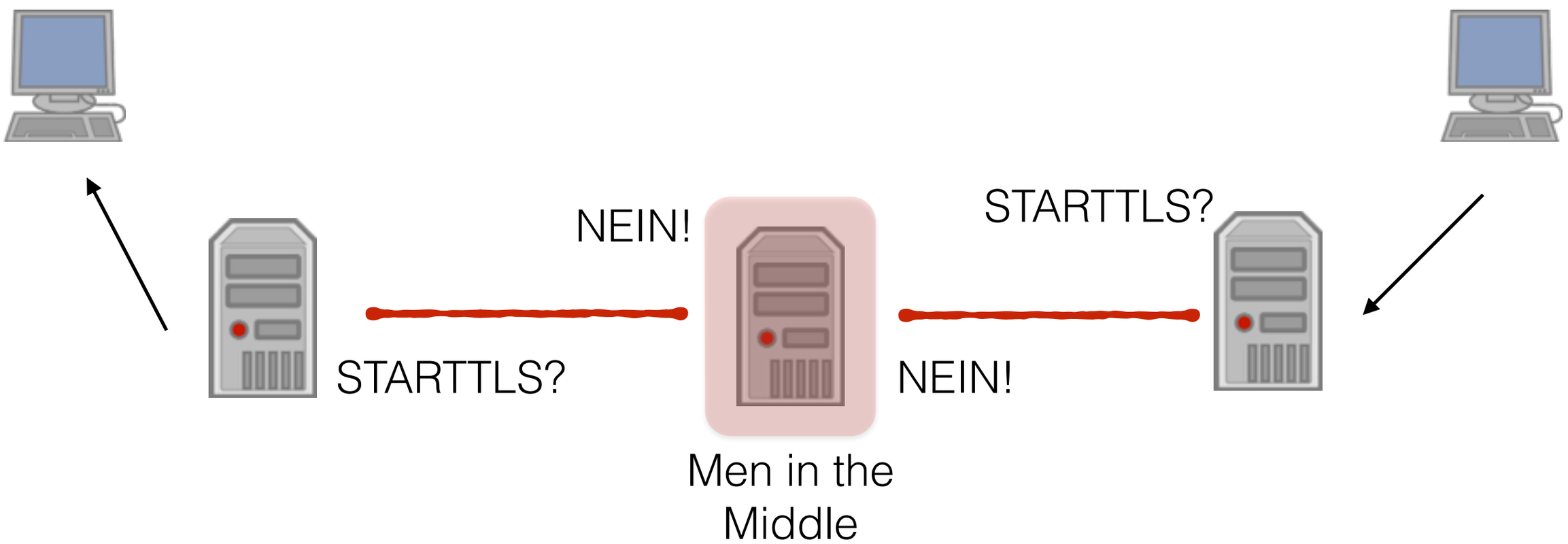
TLS und SMTP



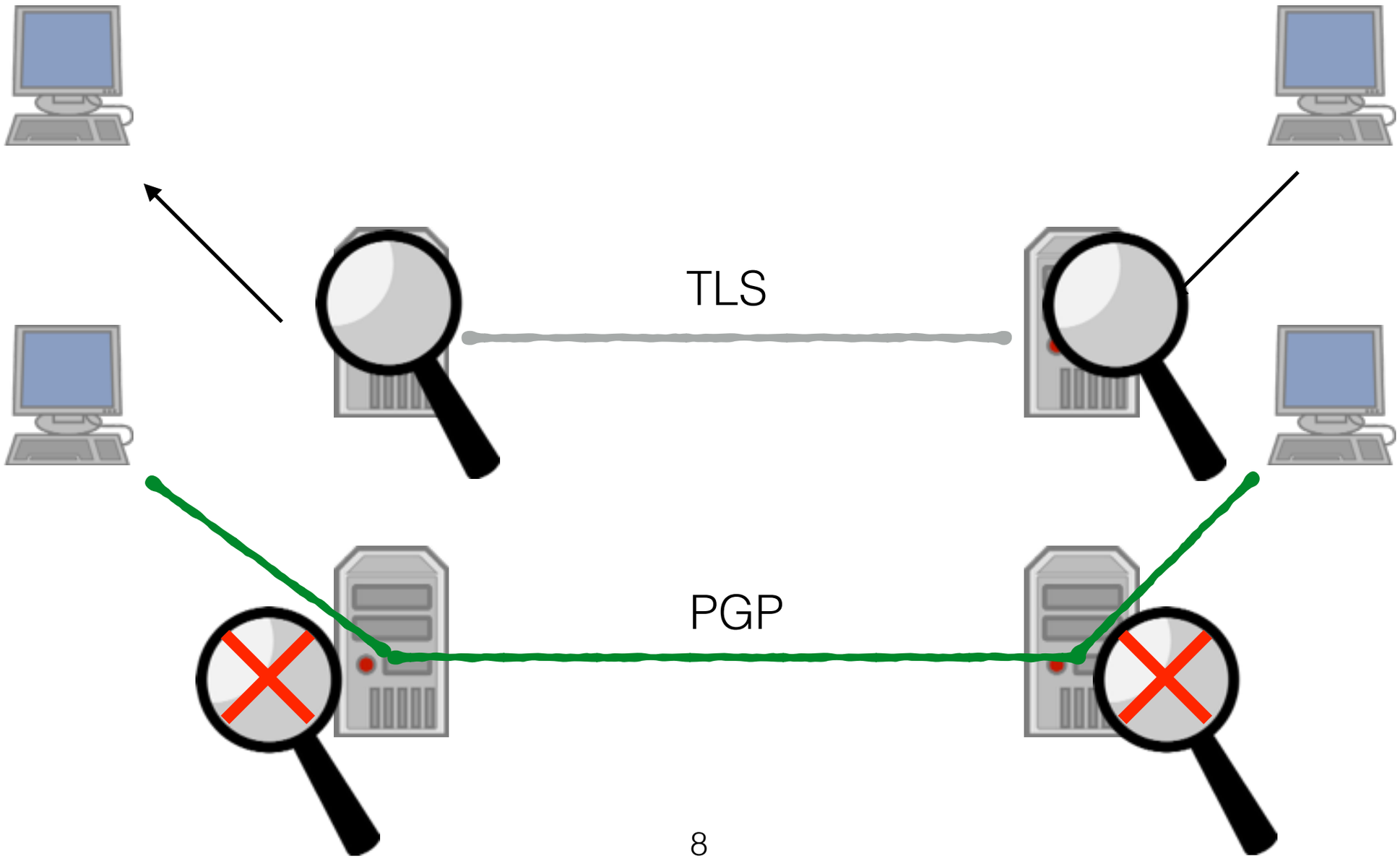
TLS und SMTP



TLS und SMTP



TLS != PGP



TLSA/SMTP

- Absicherung von TLS Zertifikaten über DNS(SEC)
- Hash des Zertifikates (oder das ganze Zertifikat) werden im DNS gespeichert
- Annahme: der Besitzer der DNS-Domain ist auch Besitzer des Zertifikates

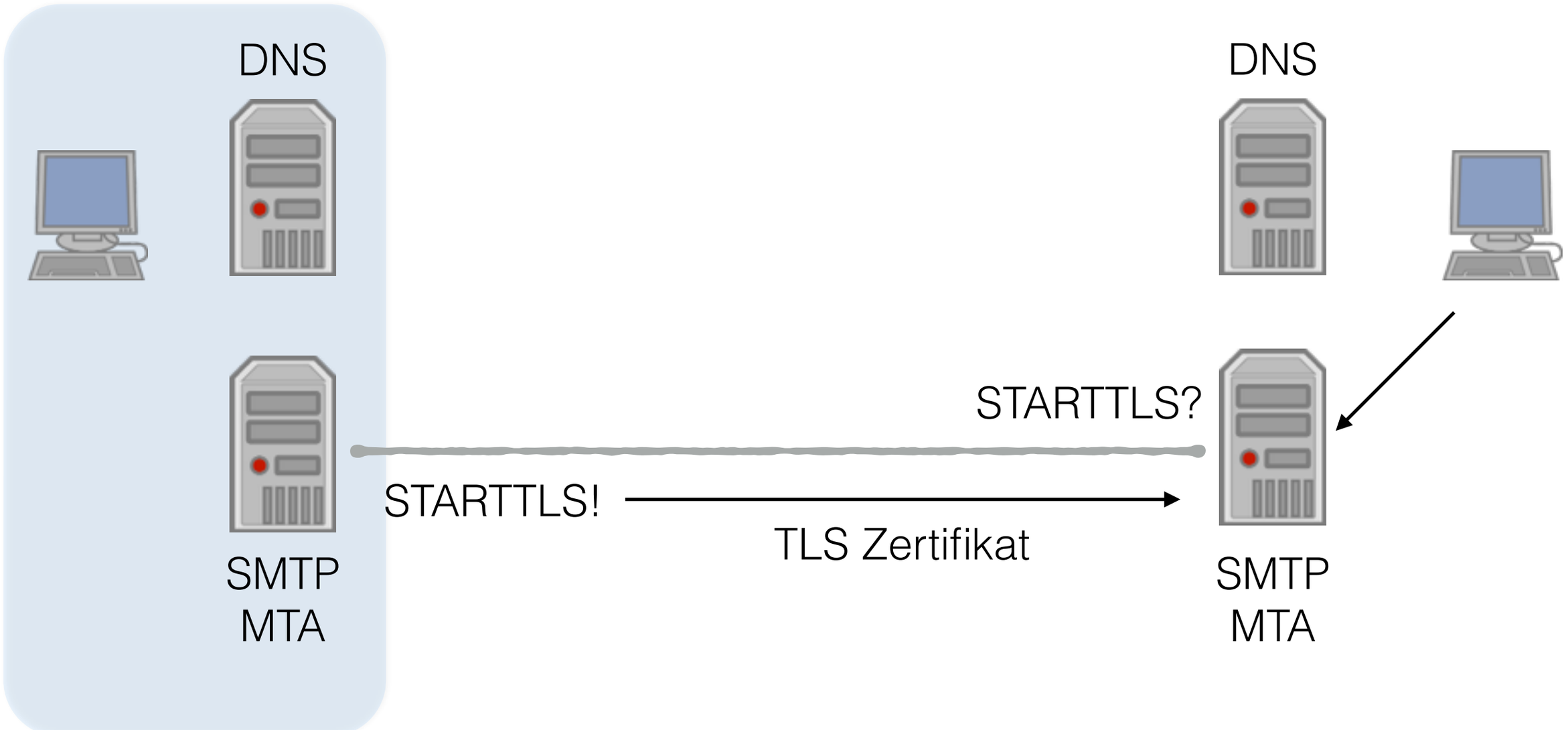
TLSA/SMTP

- Sicherheitslevel ist vergleichbar mit Domain-(E-Mail) validierten Zertifikaten

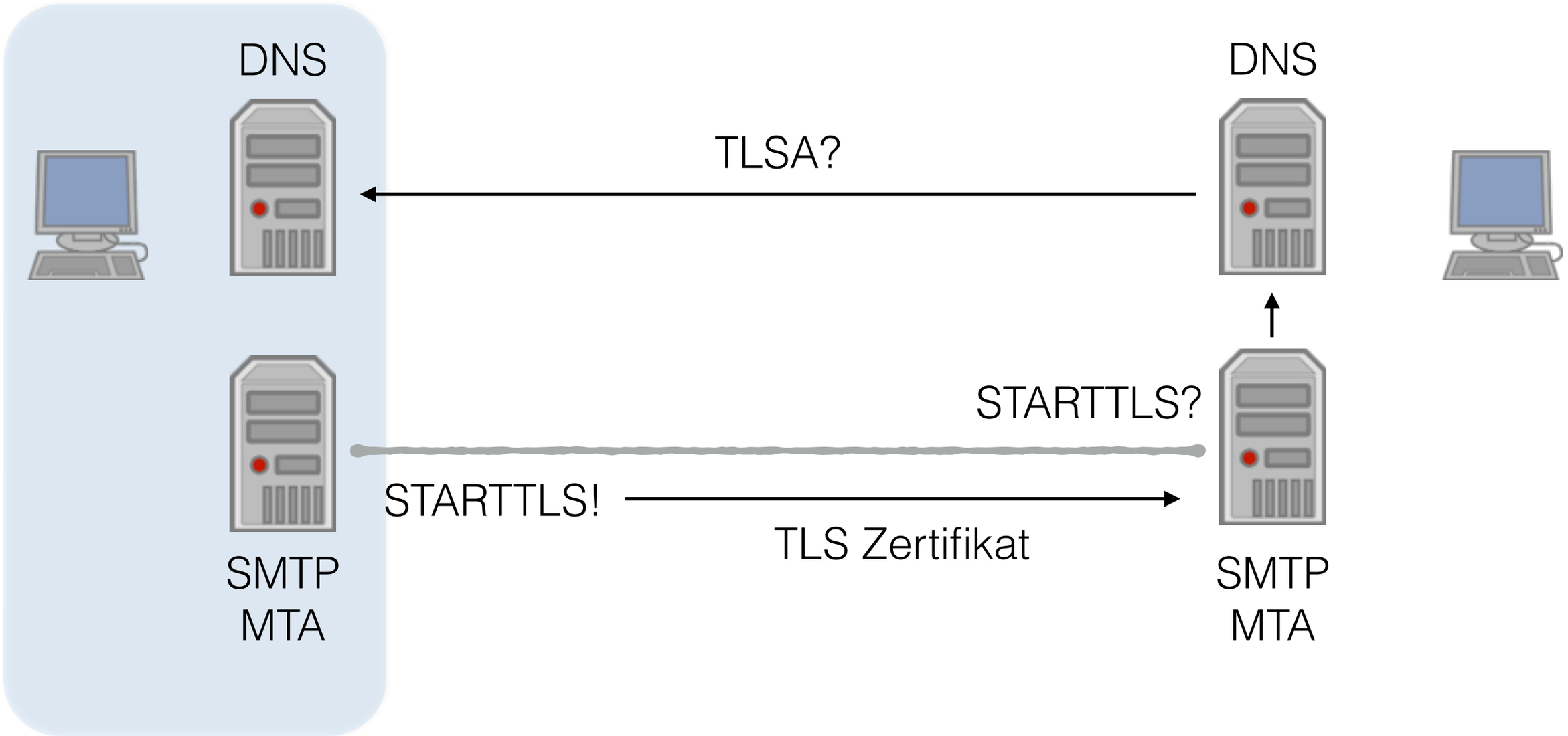
- TLSA kann self-signed Zertifikate absichern

- TLSA kann X509 Zertifikate von Certification Authorities (Symantec, Comodo, StartSSL, CACert . . .) absichern

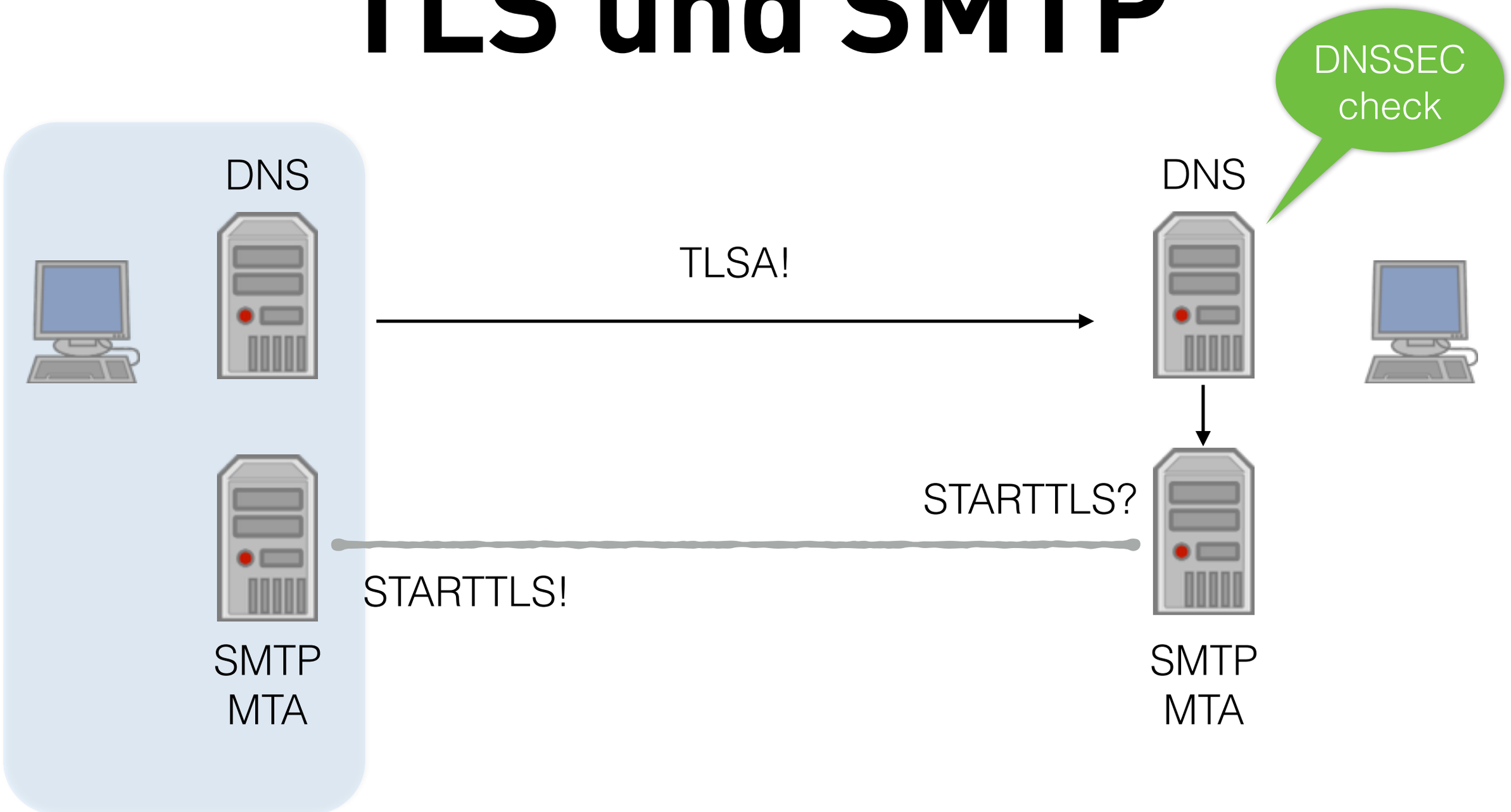
TLS und SMTP



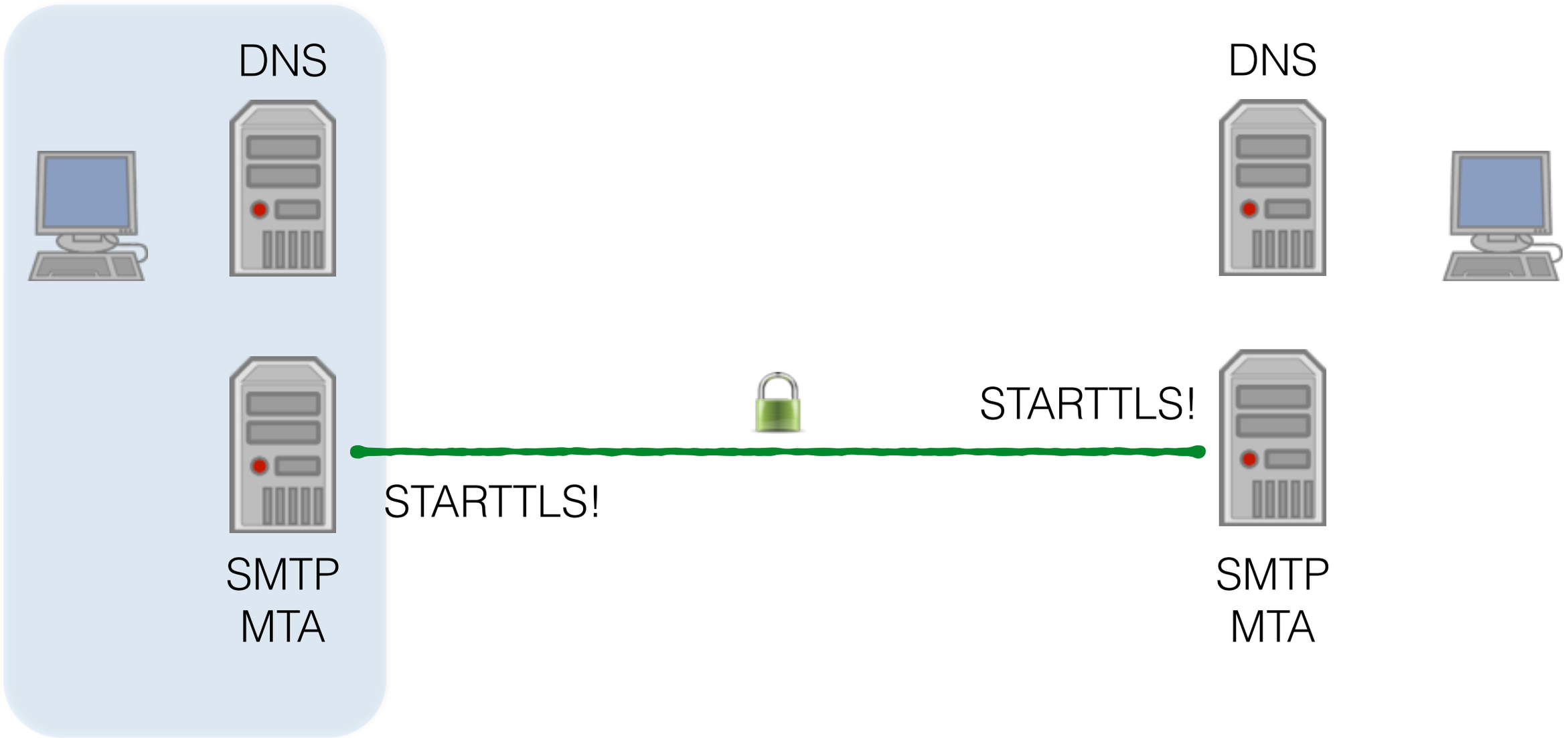
TLS und SMTP


DNS
DNS
TLSA?
STARTTLS?
STARTTLS!
TLS Zertifikat
SMTP
MTA
SMTP
MTA

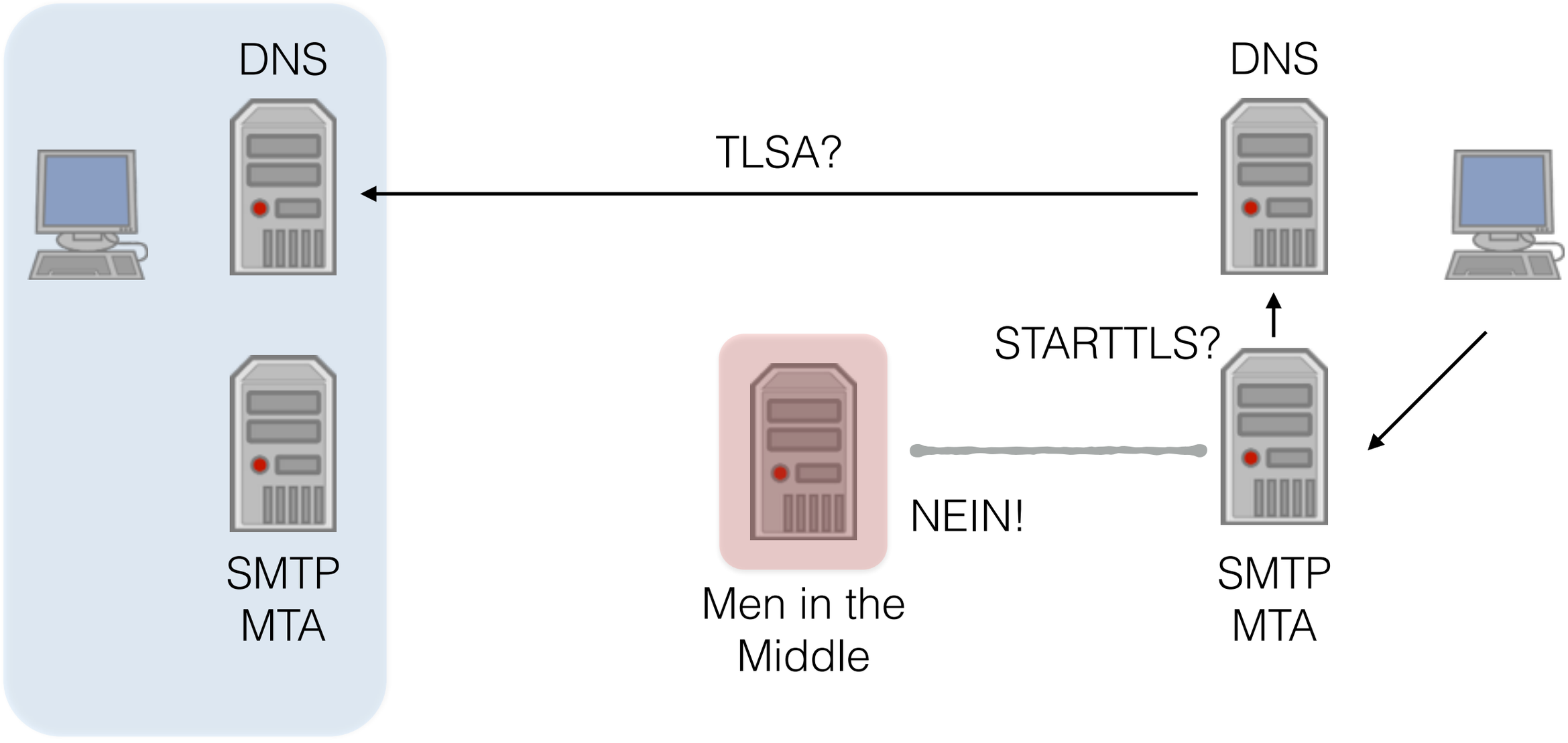
TLS und SMTP


DNS
TLSA!
DNS
DNSSEC
check
STARTTLS?
STARTTLS!
SMTP
MTA
SMTP
MTA

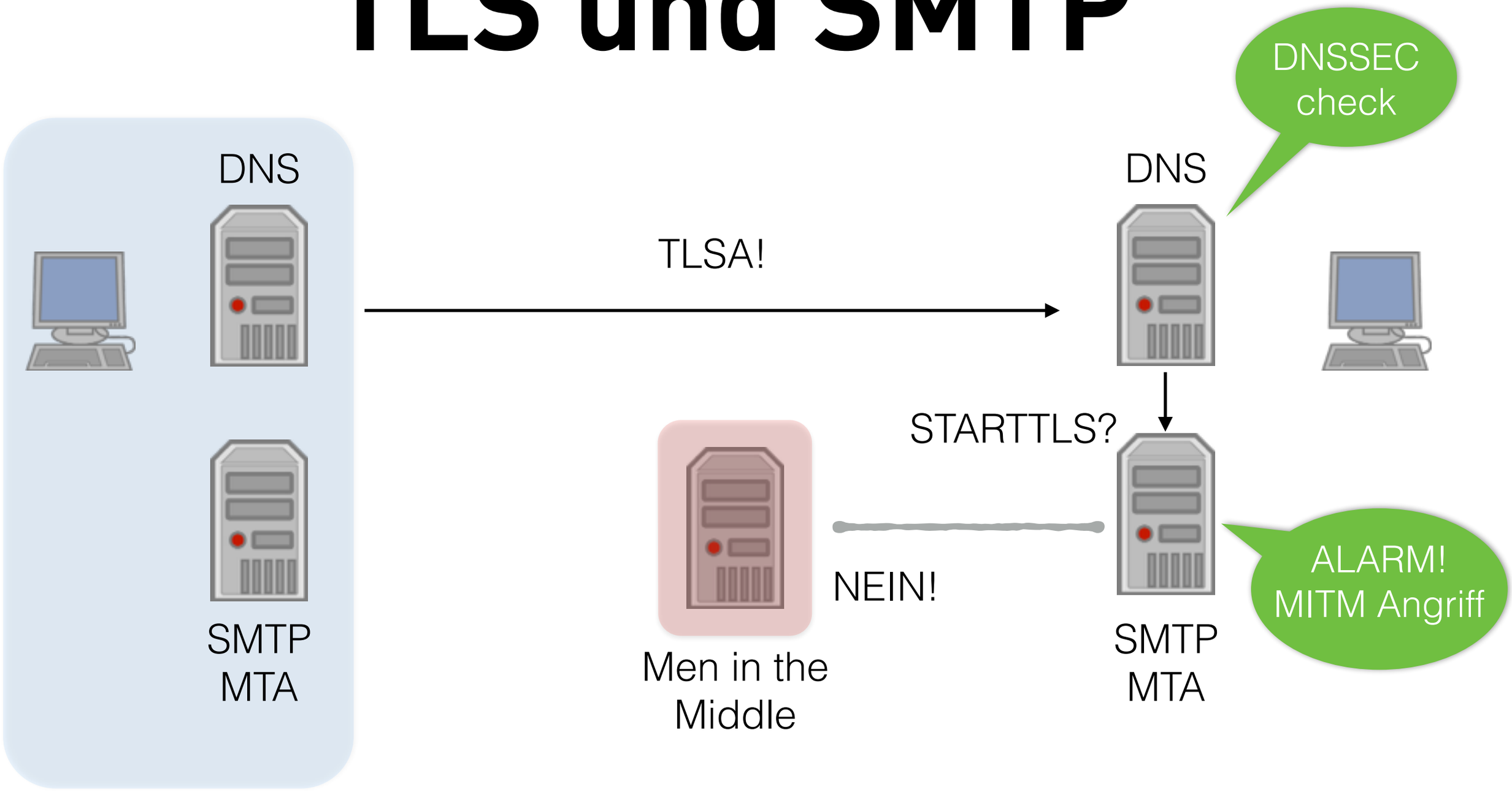
TLS und SMTP



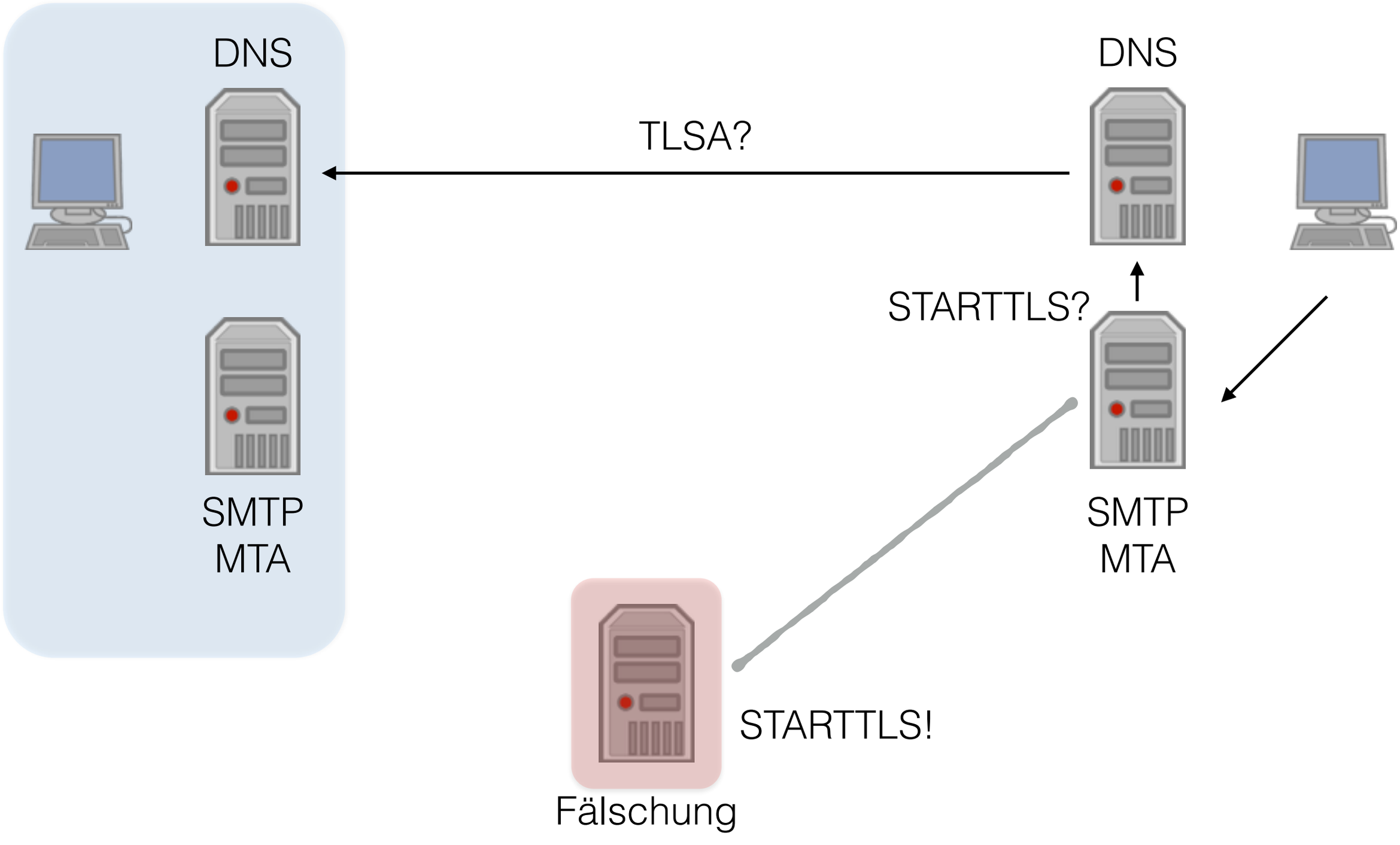
TLS und SMTP


DNS
DNS
TLSA?
STARTTLS?
NEIN!
SMTP
MTA
Men in the
Middle
SMTP
MTA

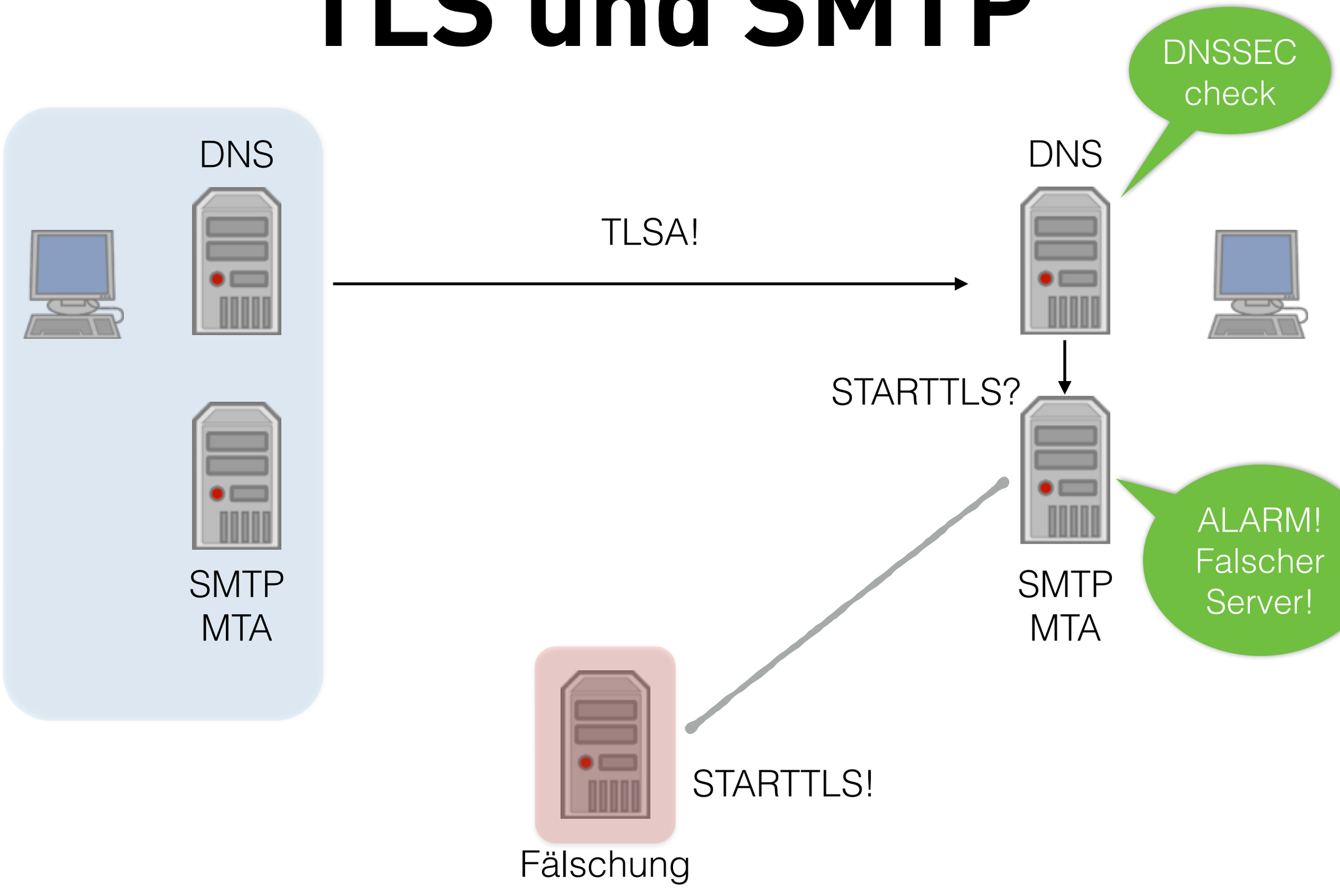
TLS und SMTP


DNS
TLSA!
DNS
DNSSEC
check
STARTTLS?
NEIN!
ALARM!
MITM Angriff
SMTP
MTA
Men in the
Middle
SMTP
MTA

TLS und SMTP



TLS und SMTP


DNS
TLSA!
DNS
DNSSEC check
STARTTLS?
SMTP MTA
ALARM! Falscher Server!
SMTP MTA
STARTTLS!
Fälschung

Infrastruktur DNS

- DNSSEC Validierung (Caching DNS Resolver)
  - BIND 9, Unbound, dnsmasq, Windows 2012
- DNSSEC signierte Zonen (Authoritativer DNS Server)
  - BIND 9, NSD, Knots, Y.A.D.I.F.A., PowerDNS, Bundy-DNS, Windows 2012*

* Windows 2012(R2) unterstützt derzeit nicht den TLSA Record Typ

Infrastruktur Mail

- MTA mit TLSA Unterstützung
  - Postfix 2.11, Exim (in Vorbereitung)
- TLS Zertifikate
  - EV-Zertifikat (Extended Validation)
  - DV-Zertifikat (Domain Validation)
  - Self-signed Zertifikat

BIND 9.9.x DNSSEC

- **DNSSEC Validierung einschalten:**

```
options {
    …
    dnssec-validation auto;
    dnssec-lookaside auto;
};
```

TLSA-Record

- **TLSA hash manuell erstellen:**

```
$ openssl x509 -in mail.example.de.crt -outform DER | openssl sha256  (stdin)=
8cb0fc6c527506a053f4f14c8464bebbd6dede2738d11468dd953d7d6a3021f1
```

- **TLSA Record:**

```
_25._tcp.mail.example.de.  3600 IN TLSA 3 0 1 (
                                8cb0fc6c527506a053f4f14c8464bebbd6dede
                                2738d11468dd953d7d6a3021f1 )
```

TLSA-Record

- **TLSA Record mit ldns-dane erstellen:**

```
$ ldns-dane create www.bund.de 443
_443._tcp.www.bund.de. 3600 IN  TLSA 3 0 1
8f28b062eaa9f917042a63d35d99e017c68d89eaa314c49a3ef94b6e770b0a49
```

- **TLSA Record mit ldns-dane prüfen:**

```
$ ldns-dane verify www.bund.de 443
77.87.229.48 dane-validated successfully
```

TLSA-Record testen

```
shell> dig _25._tcp.ma                                  ec +m
 ; <<>> DiG 9.9.5 <<>> _                                mple.de TLSA +dnssec +m
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 13973
;; flags: qr rd ra ad; QUERY: 1, ANSWER: 2, AUTHORITY: 0, ADDITIONAL: 0

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags: do; udp: 4096
;; QUESTION SECTION:
;_25._tcp.mail.example.de. IN TLSA

;; ANSWER SECTION:
_25._tcp.mail.example.de.  3588 IN TLSA 3 1 1 (
                                8cb0fc6c527506a053f4f14c8464bebbd6dede
                                2738d11468dd953d7d6a3021f1 )
_25._tcp.mail.example.de.  3588 IN RRSIG TLSA 8 5 3600 (
                                20140324063111 20140317121843 4390 example.de.
                                RBgAAzQx3gks0KKJHuJ7qKd61jpY8E6dwDM6inPPa6Ee
                                xV8OBnAzhF4RMKSabHF0LNwRzWqE5xNfPibMQFDoDRKJ
                                /QiNgux/IXti3JqtH4BkT0w7Ooi+8DZsil9BTjg6WkaX
                                1FuJ4rJ2r3hXS7eIOFWtOF7pPVPdIIaRB6xp+1A= )

;; Query time: 9 msec
;; SERVER: 127.0.0.1#53(127.0.0.1)
;; WHEN: Mon Mar 17 19:29:45 CET 2014
;; MSG SIZE  rcvd: 142
```

DNSSEC check OK

TLSA Record

DNSSEC Signatur

Postfix Konfiguration

- **TLSA Prüfung in der Postfix Konfiguration:**

```
shell> postconf -e "smtpd_use_tls = yes"
shell> postconf -e "smtp_dns_support_level = dnssec"
shell> postconf -e "smtp_tls_security_level = dane"
```

STARTTLS testen

- **Test einer STARTTLS-Verbindung zum Mailserver:**

```
shell> openssl s_client -connect mail1.example.de:25 -starttls smtp
CONNECTED(00000003)
---
Certificate chain
 0 s:/C=DE/ST=State/L=City/O=Company/OU=Mailserver/CN=mail1.example.de
   i:/C=DE/ST=State/L=City/O=Company/OU=Mailserver/CN=mail1.example.de
---
Server certificate
-----BEGIN CERTIFICATE-----
[..]
    Start Time: 1394991261
    Timeout   : 300 (sec)
    Verify return code: 18 (self signed certificate)
---
221 2.0.0 Bye
closed
shell>
```

Postfix log (ungesichertes TLS)

- **Postfix log TLS ohne DNSSEC TLSA Prüfung (DANE):**

```
Mar 16 19:10:55 m3 postfix/qmgr[25923]: 2B1A680337:
from=<root@myinfrastructure.org>, size=291, nrcpt=1 (queue active)

Mar 16 19:11:03 m3 postfix/smtp[25929]: Untrusted TLS connection established to
mail1.example.de[2001:db8:100::25]:25: TLSv1 with cipher ECDHE-RSA-AES256-SHA
(256/256 bits)

Mar 16 19:11:05 m3 postfix/smtp[25929]: 2B1A680337: to=<benutzer@example.de>,
relay=mail1.example.de[2001:db8:100::25]:25, delay=16, delays=6.2/0.01/7.9/2.1,
dsn=2.0.0, status=sent (250 2.0.0 Ok: queued as 3fn80C2DP5zTT)

Mar 16 19:11:05 m3 postfix/qmgr[25923]: 2B1A680337: removed
```

Postfix log
(DNSSEC gesichertes TLS)

- **Postfix log TLS mit DNSSEC TLSA Prüfung (DANE):**

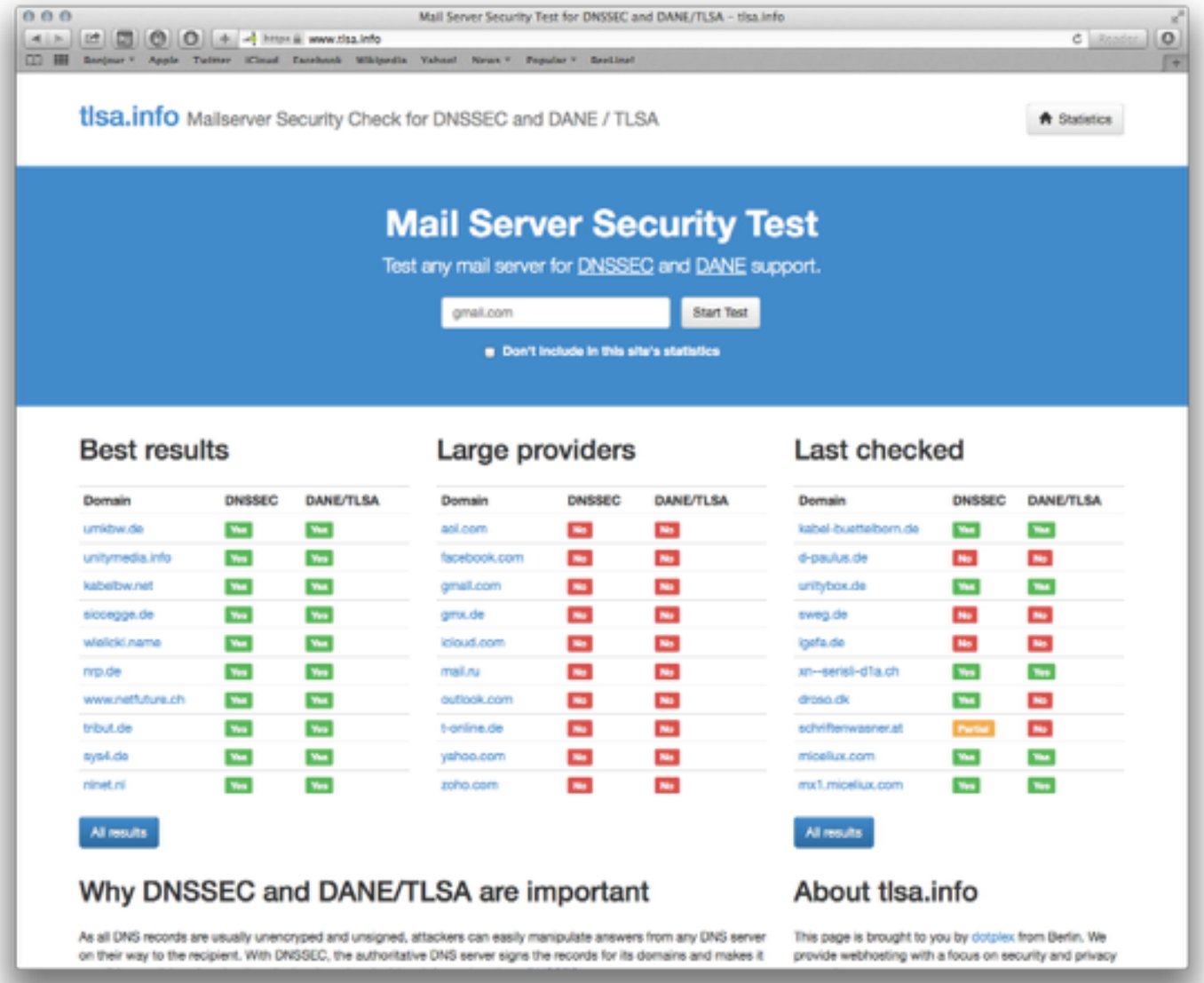
```
Mar 16 19:20:01 m3 postfix/qmgr[26122]: 8FBEE80337:
from=<root@myinfrastructure.org>, size=285, nrcpt=1 (queue active)

Mar 16 19:20:01 m3 postfix/smtp[26131]: Verified TLS connection established to
mail.example.de[2001:db8:100::25]:25: TLSv1 with cipher ECDHE-RSA-AES256-SHA
(256/256 bits)

Mar 16 19:20:03 m3 postfix/smtp[26131]: 8FBEE80337: to=<benutzer@example.de>,
relay=mail.example.de[2001:db8:100::25]:25, delay=149, delays=147/0.03/0.13/1.8,
dsn=2.0.0, status=sent (250 2.0.0 Ok: queued as 3fn8BY3ltPzTT)

Mar 16 19:20:03 m3 postfix/qmgr[26122]: 8FBEE80337: removed
```

posttls-finger (DNSSEC gesichertes TLS)

- **Posttls-finger TLSA Prüfung (ab Postfix 2.11):**

```
$ posttls-finger mail.bund.de
posttls-finger: using DANE RR: _25._tcp.mx2.bund.de IN TLSA 3 0 1 59:E3:CF:5F:A1:51:55:3F:45:76:C9:4C:
25:00:D7:05:EF:DD:D8:55:B6:A5:9D:88:D2:8D:03:28:87:6A:04:CB
posttls-finger: Connected to mx2.bund.de[77.87.228.110]:25
posttls-finger: < 220 mx2.bund.de ESMTP
posttls-finger: > EHLO m3.myinfrastructure.org
posttls-finger: < 250-bn4-node11.sc.bund.de
posttls-finger: < 250-PIPELINING
posttls-finger: < 250-SIZE 20961280
posttls-finger: < 250-ETRN
posttls-finger: < 250-STARTTLS
posttls-finger: < 250-ENHANCEDSTATUSCODES
posttls-finger: < 250 8BITMIME
posttls-finger: > STARTTLS
posttls-finger: < 220 2.0.0 Ready to start TLS
posttls-finger: mx2.bund.de[77.87.228.110]:25: depth=0 matched end entity certificate sha256 digest 59:E3:CF:5F:A1:51:55:3F:
45:76:C9:4C:25:00:D7:05:EF:DD:D8:55:B6:A5:9D:88:D2:8D:03:28:87:6A:04:CB
posttls-finger: mx2.bund.de[77.87.228.110]:25: Matched subjectAltName: mx2.bund.de
posttls-finger: mx2.bund.de[77.87.228.110]:25 CommonName mx2.bund.de
posttls-finger: mx2.bund.de[77.87.228.110]:25: subject_CN=mx2.bund.de, issuer_CN=CA IVBB Deutsche Telekom AG 11,
fingerprint=72:78:BE:C8:3E:61:A0:12:BE:BF:3B:79:F0:CE:9A:A2:8C:26:24:FF, pkey_fingerprint=3A:3E:5F:A4:50:F8:DD:FC:56:35:FF:
08:2A:F9:ED:82:B9:AB:7B:82
posttls-finger: Verified TLS connection established to mx2.bund.de[77.87.228.110]:25: TLSv1 with cipher DHE-RSA-AES256-SHA (256/256
bits)
posttls-finger: > EHLO m3.myinfrastructure.org
posttls-finger: < 250-bn4-node11.sc.bund.de
posttls-finger: < 250-PIPELINING
posttls-finger: < 250-SIZE 20961280
posttls-finger: < 250-ETRN
posttls-finger: < 250-ENHANCEDSTATUSCODES
posttls-finger: < 250 8BITMIME
posttls-finger: > QUIT
posttls-finger: < 221 2.0.0 Bye
```

TLSA-Info Webseite



http://tlsa.info

DANE TLSA Vorteile

- Verschlüsselte Verbindung zwischen Server wird authentisiert
- STARTTLS "downgrade" Angriffe werden verhindert
- TLS/SSL Zertifikate sind gegen Fälschung abgesichert
- CRL/OCSP wird nicht benötigt, um TLS/SSL Zertifikate auszutauschen

Mehr als nur SMTP

- TLSA für HTTPS
- OPENPGPKEY — PGP Schlüssel im DNS
- IPSECKEY — IPSEC Schlüssel im DNS
- SSHFP — SSH Server Fingerprints
- S/MIME
- SRV — DNS Service Discovery

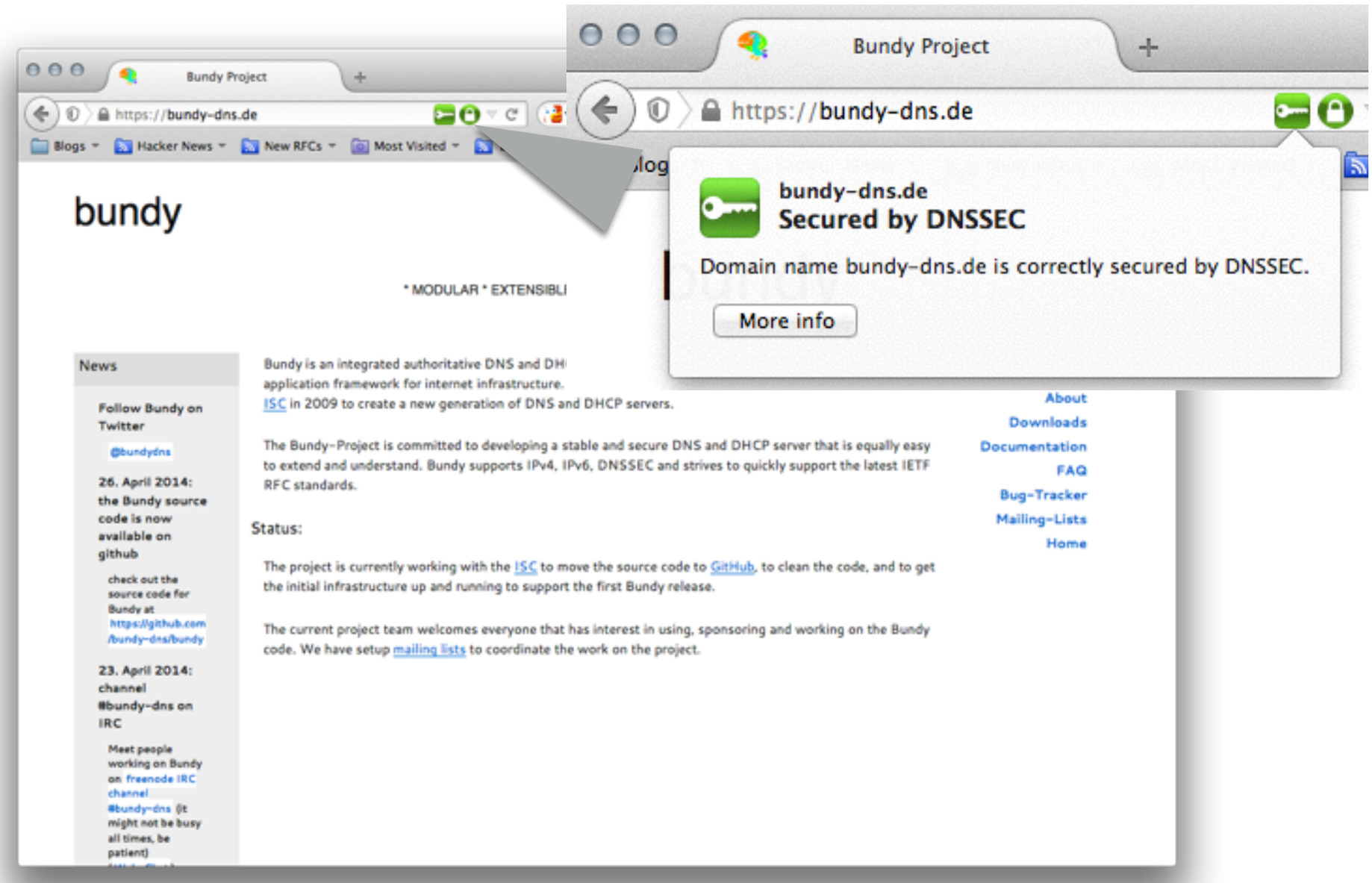
- Prosody Jabber Server

  http://bridge.grumpy-troll.org/2014/05/xmpp-dane-with-prosody/

- Gajim Jabber Client

  https://github.com/irl/gajim

www.dnssec-validator.cz



MEN&MICE

We do ASCII

[?]

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cs@sys4.de

Links und weitere Infos

- **Sys4 Blog -** http://blog.sys4.de
- **DNSWorkshop -** http://dnsworkshop.org
- **Postfix TLS Readme-** http://www.postfix.org/TLS_README.html
- **Wietse Venema "Postfix 2.11" FOSDEM 2014 Video -** https://fosdem.org/2014/schedule/event/postfix_lessons_learned_and_recent_developments/
- **IETF "DANE" Arbeitsgruppe -** http://datatracker.ietf.org/wg/dane/
  - **TLSA RFC 6698 -** http://datatracker.ietf.org/doc/rfc6698/
  - **TLSA/SMTP Draft -** http://datatracker.ietf.org/doc/draft-ietf-dane-smtp-with-dane/
- **c't Ausgabe 11/2014 – Seite 194 "Geleitschutz"**
- **c't Ausgabe 18/2014 – Seite 162ff "DANE auf Linux Servern" und "DNSSEC für Clients und Client-Netze einrichten"**
- **TLSA generator webpage -** https://www.huque.com/bin/gen_tlsa
- **NLnetLabs "ldns"** – https://www.nlnetlabs.nl/projects/ldns/
- **"hash-slinger" von Paul Wouters (Red Hat) -** http://people.redhat.com/pwouters/hash-slinger/
- **DNSSEC Schulungen —**
  http://www.linuxhotel.de/kurs/dnssec/
  http://www.menandmice.com/support-training/training/dnssec-workshop/