.TR CCTLD

DNSSEC DEPLOYMENT

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OUTLINE

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.TR CCTLD

.TR ccTLD MANAGEMENT

- Information and Telecommunication Authority of Turkiye (BTK)

TRABIS EXTENSION

- TR Network Information System
- http://www.trabis.tr

DUTIES of TRABIS

- Real Time Domain Name Operations
- Management of Central Database

RESPONSIBILITIES

- Service Continuity - %99.9 DNS
- Dispute Resolution
- Security of DNS & Domain Names

.TR CCTLD HISTORY

1991	17th April 2019	14th Sept. 2022
METU	Transfer of .tr ccTLD from University to BTK	

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.TRABİS

.tr AĞ BİLGİ SİSTEMİ

- Written TRABIS Legislation
- MODEL: Registry - Registrar
  .tr Domain Name Registry
- Document-Free Domain Name REGISTRATION & TRANSFER (com.tr, net.tr, org.tr)
- Dispute Resolution Mechanism
- 20 Registrars - 2 Dispute Res. Providers
  TRABIS-KK: gov, edu, pol, tsk, k12

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.TRABİS
.tr AĞ BİLGİ SİSTEMİ

NUMBER OF .TR ACTIVE DOMAIN NAMES

Before TRABIS (Nic.TR)

After TRABIS

Total

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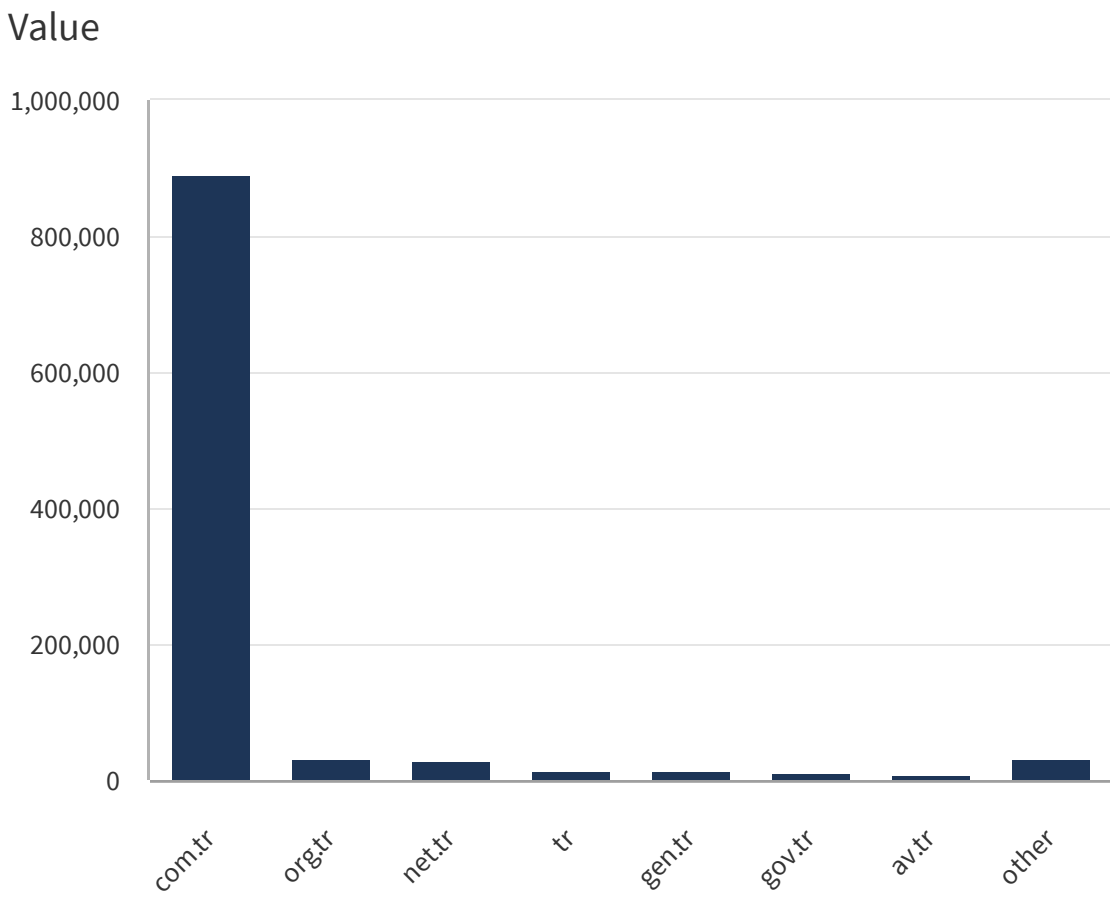
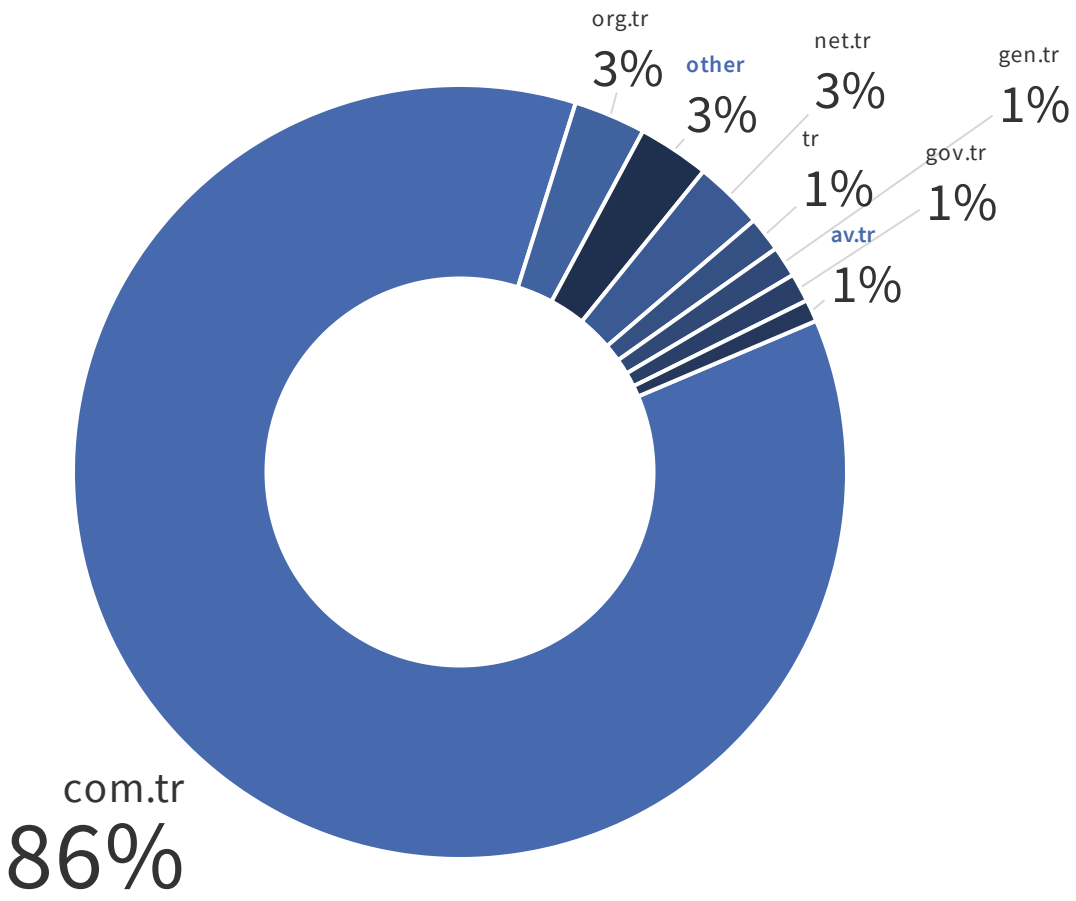
.TRABİS .tr AĞ BİLGİ SİSTEMİ

ACTIVE DOMAIN NAMES / EXTENSIONS





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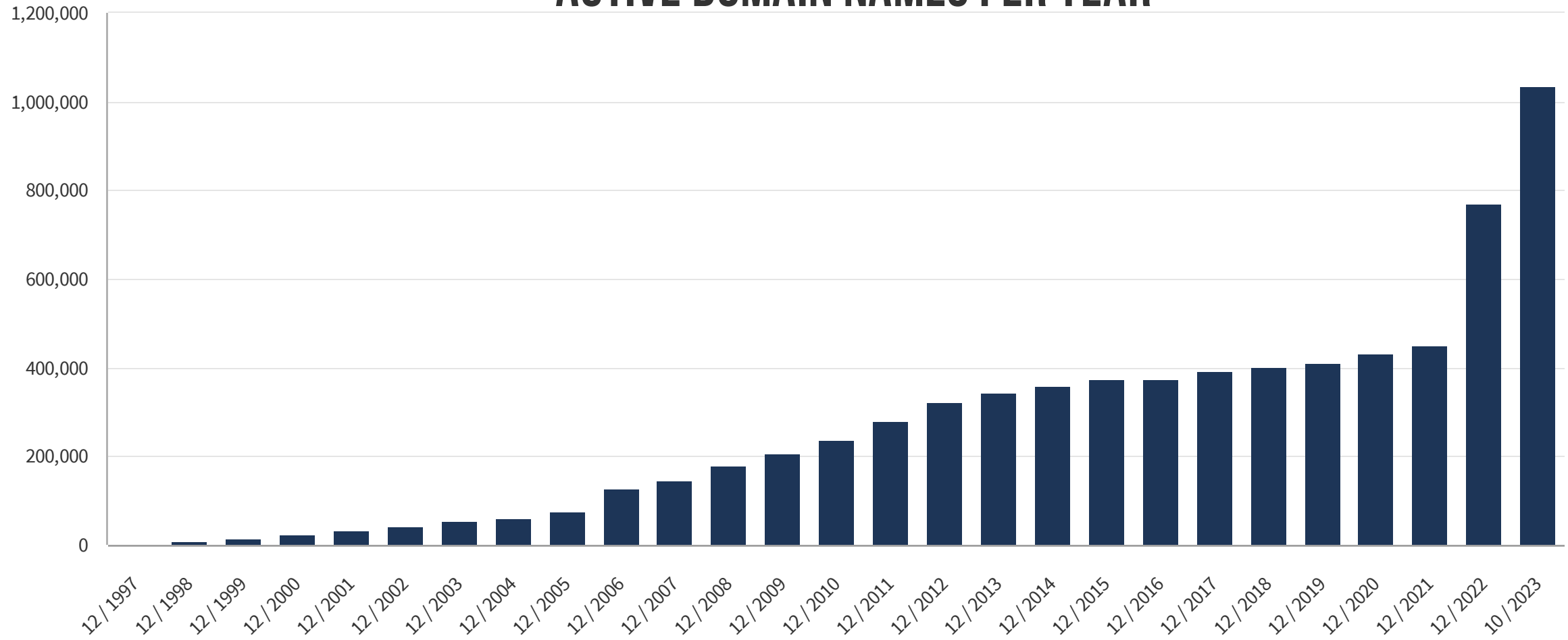
.TRABİS .tr AĞ BİLGİ SİSTEMİ

ACTIVE DOMAIN NAMES PER YEAR



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.TR DNS INFRASTRUCTURE

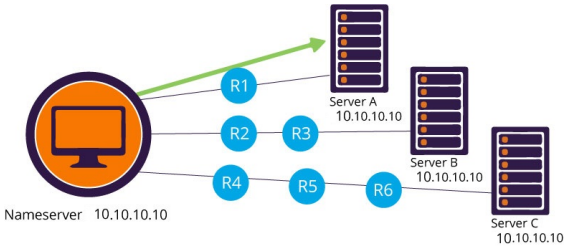
* A Hidden Master & Slave DNS Servers

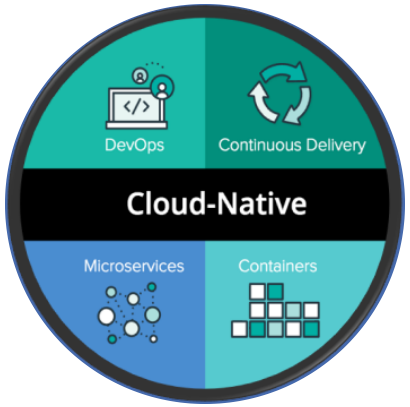
* Geographically distributed servers

* Monitoring DNS and zone (creation, transfer etc.)

* DDOS Protection mechanisms

SECURITY & BUSSINESS CONTINUITY





ANYCAST

Disaster Recovery

Centralized Management
& Scalability

TR-CERT - AZAD
Phishing Analysis

1123 Phishing Domain Detection

FURTHER PRECOUTIONS

RESTRICTED DOMAINS

- Similarity Words: finance, bank
- Exact Match: city names

NON-REGISTERED DOMAINS

Domain Names Contrary to;

- Legislation
- public order
- public moral

DOMAIN ABUSE COMPLAINTS

- Procedure defines mitigation against abusive domain names.
- TR-CERT capabilities / phishins site & malware analysis

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.TR DNSSEC DEPLOYMENT

PRE-DEPLOYMENT STUDIES

1. Assessment of Current .TR DNS Infrastructure
2. ICANN Experience Sharing & Hands-on Training (hands on experince)
3. Test Environment / Test Plan / Test Scenarios
4. Deployment Strategy & Specifications (Keys, Algorithm etc.) & Configuration
5. Simulation (with real zone files - 20 2nd Level Zones)

TEST ENVIRONMENT & PHASES

Setup Test Env. / Inline Signing

- Software: OpenDNSSEC
- Key Generation & Storage: SoftHSM
- DNS / BIND

Key Generation

- Generate KSK & ZSK

Zone Signing

- Get unsigned zone into Signer server
- Sign the zone

Validate & Publish Zone

- Validate zone files before publishing on DNS

Scheduled / Emergency Rollovers

- Key/Signature Rollover Tests

Rollback Test

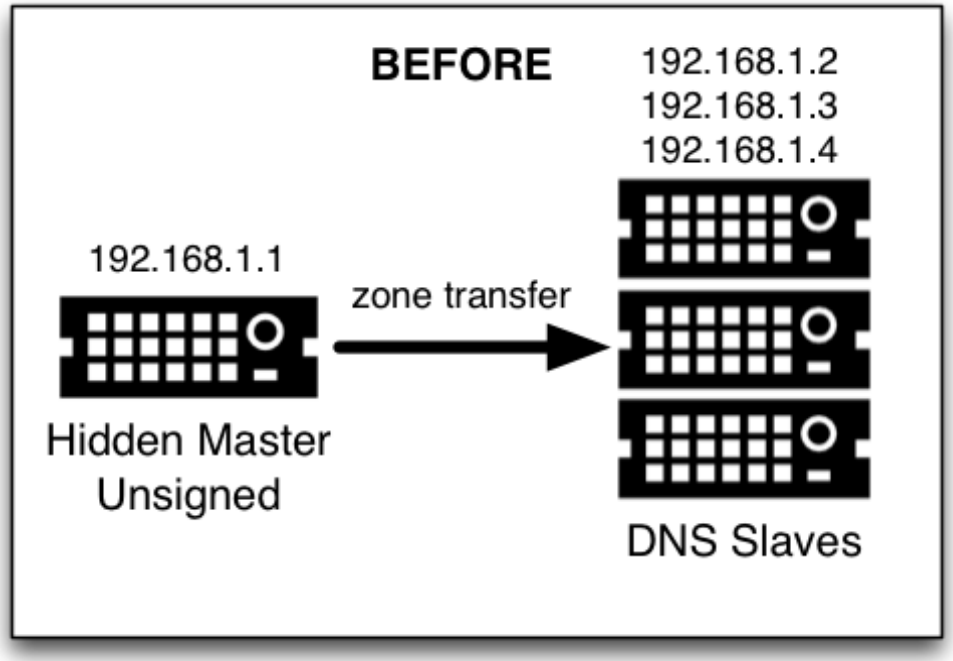
- serve unsigned zones (stripped of all DNSSEC information)
- Remove DS records from parent zone

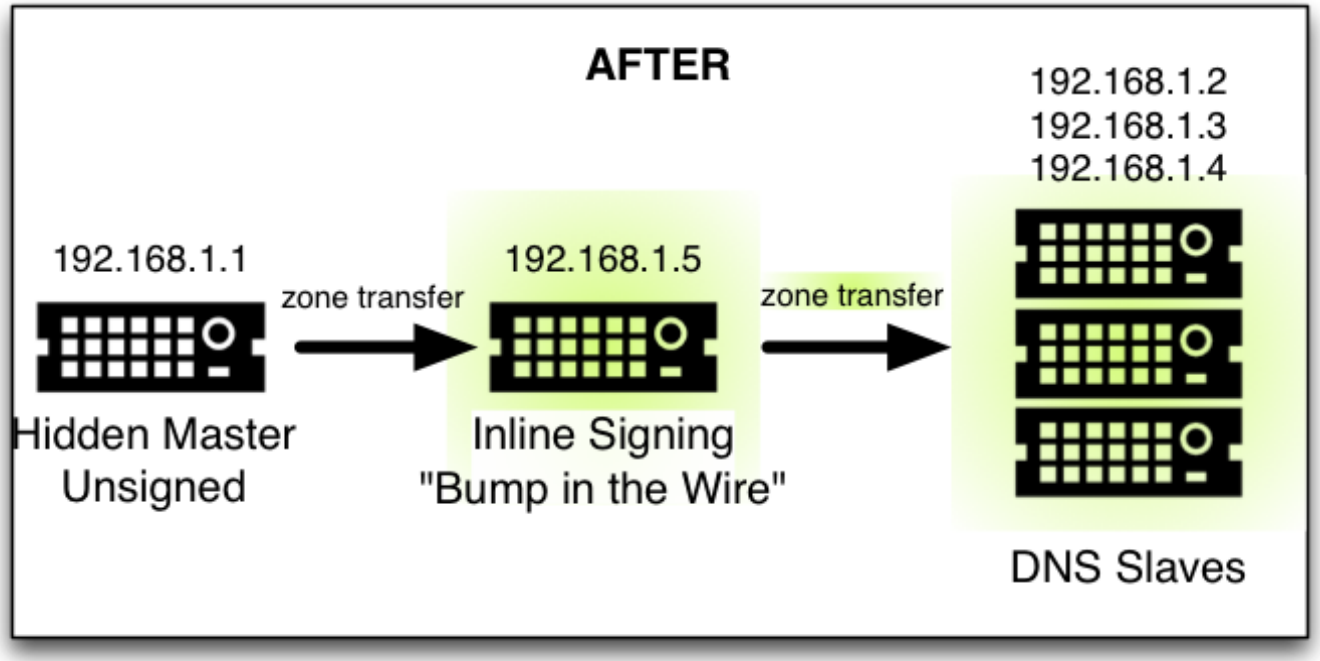
Simulation of The PROD Env.

- Transfer zone files into test bed
- Repeat all test steps
- Check results

SIGNING STRATEGY

INLINE SIGNING (BUMP IN THE WIRE)





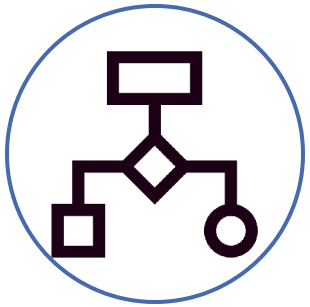
TECHNICAL SPECIFICATIONS

PUBLIC KEY CRYPTOGRAPHY

- **Public-Private Key Pairs** are used during the signing processes.
- Private keys stored in **SoftHSM**.

KEY TYPES

- **ZSK** is used for Zone Signing.
- **KSK** is used for Key Signing.



ALGORITHM

- **Elliptic Curve Digital Signature Algorithm / RFC 6605**
- **13 / ECDSAP256SHA256**
- **ECDSA Curve P-256 with SHA-256**

DENIAL OF EXISTANCE

- **NSEC3 feature** is used to enhance data privacy and protect against zone walking.

KEY ROLLOVERS & SIGNATURE LIFETIME

KSK ROLLOVER

- KSK lifte time is a year.
- New KSK is GENERATED & PUBLISHED 3 months before rollover
- After one month rollover takes place / old key is removed.

ZSK ROLLOVER

- ZSK is renewed in every 90 days.
- New ZSK is GENERATED & PUBLISHED 1 month before rollover
- After one month rollover takes place / old key is removed.

SIGNATURE LIFETIME & RE-SIGNING FREQUENCY

- ZSK signature has the validity of one month.
- KSK signature has the validity of two months.
- ZSK re-signing period is once a week.
- KSK re-signing period is once a month.

RR VERIFICATION & TTL VALUES

VERIFICATION

- Before publish
- Verify all RRs
- In terms of conformance with the protocol standards

RESOURCE RECORDs TTL

- KEYS: 43200
- DS: 21600
- NSEC3: 3600
- RRSIG: same as the TTL of the RRset it covers.

DPS

- DNSSEC Practice Statement
- www.trabis.tr

.TR DNSSEC DEPLOYMENT CURRENT SITUATION

1 Phase-1: Inline Signer Conf. / Authomated Signing

2 **Phase-2**: Staged 2nd-Level Zone Signing

Stage1: tel.tr, kep.tr, bbs.tr etc.

Stage2: com.tr, org.tr, net.tr etc.

3 **Phase-3**: Sign .tr Zone

4 **Phase-4**: Publish DS Record / Chain-of-Trust

5 **Phase-5**: Involvement of Registrars & the other parties

DELEGATION SIGNER (DS) VALIDATION

Syntax Check

DS format control

KeyTag Check

Should be greater than 1, less than 65535

Algorithm Check

RFC-8624 Algorithm Implementation Requirements and Usage Guidance for DNSSEC

5: RSA/SHA-1 [RSASHA1]

8: RSA/SHA-256 [RSASHA256]

10: RSA/SHA-512 [RSASHA512]

13: ECDSA Curve P-256 with SHA-256 [ECDSAP256SHA256]

14: ECDSA Curve P-384 with SHA-384 [ECDSAP384SHA384]

15: Ed25519 [ED25519]

16: Ed448 [ED448]

Digest Type

RFC 8624 - Algorithm Implementation Requirements and Usage Guidance for DNSSEC

1: SHA-1

2: SHA-256

3: GOST R 34.11-94 (DS validation is NOT obligatory)

4: SHA-384

Digest should meet following conditions

Type:1 => max. length of digest **40** characters

Type:2 => max. length of digest **64** characters

Type:4 => max. length of digest **96** characters

Validate RRSIG Record

Analyzing DNSSEC problems for www.kizilay.org.tr

not signed yet

.	✓ Found 2 DNSKEY records for . ✓ DS=20326/SHA-256 verifies DNSKEY=20326/SEP ✓ Found 1 RRSIGs over DNSKEY RRset ✓ RRSIG=20326 and DNSKEY=20326/SEP verifies the DNSKEY RRset
tr	✓ Found 1 DS records for tr in the . zone ✓ DS=48972/SHA-256 has algorithm ECDSAP256SHA256 ✓ Found 1 RRSIGs over DS RRset ✓ RRSIG=46780 and DNSKEY=46780 verifies the DS RRset ✓ Found 2 DNSKEY records for tr ✓ DS=48972/SHA-256 verifies DNSKEY=48972/SEP ✓ Found 1 RRSIGs over DNSKEY RRset ✓ RRSIG=48972 and DNSKEY=48972/SEP verifies the DNSKEY RRset
org.tr	✓ Found 1 DS records for org.tr in the tr zone ✓ DS=57515/SHA-256 has algorithm ECDSAP256SHA256 ✓ Found 1 RRSIGs over DS RRset ✓ RRSIG=28835 and DNSKEY=28835 verifies the DS RRset ✓ Found 2 DNSKEY records for org.tr ✓ DS=57515/SHA-256 verifies DNSKEY=57515/SEP ✓ Found 1 RRSIGs over DNSKEY RRset ✓ RRSIG=57515 and DNSKEY=57515/SEP verifies the DNSKEY RRset
kizilay.org.tr	✗ No DS records found for kizilay.org.tr in the org.tr zone ✗ No DNSKEY records found ✓ ns2.kizilay.org.tr is authoritative for www.kizilay.org.tr ✓ www.kizilay.org.tr A RR has value 185.225.164.15 ✗ No RRSIGs found
kizilay.org.tr	✓ ns1.kizilay.org.tr is authoritative for www.kizilay.org.tr ✓ www.kizilay.org.tr A RR has value 185.225.164.15 ✗ No RRSIGs found

FURTHER STUDIES

Involvement of Registrars & Third Parties

ISPs, Governmental Institutes (e.g. e-devlet), Universities, Commercial and etc.

Experince Sharing

Meetings, trainings and events

Test Bed & Hands-on Training

SUMMARY

Assessment of current DNS infrastructure

Check updates & configurations

Training (teoritical & practical)

Defining Strategy & DNSSEC Specs

Testing all schenarios (rollover / rollback)

Monitoring