

Asserting Wireless Network Connections Using DNS Resolvers' Identities

[draft-wing-opsawg-authenticating-network-01](#)

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Problem Statement

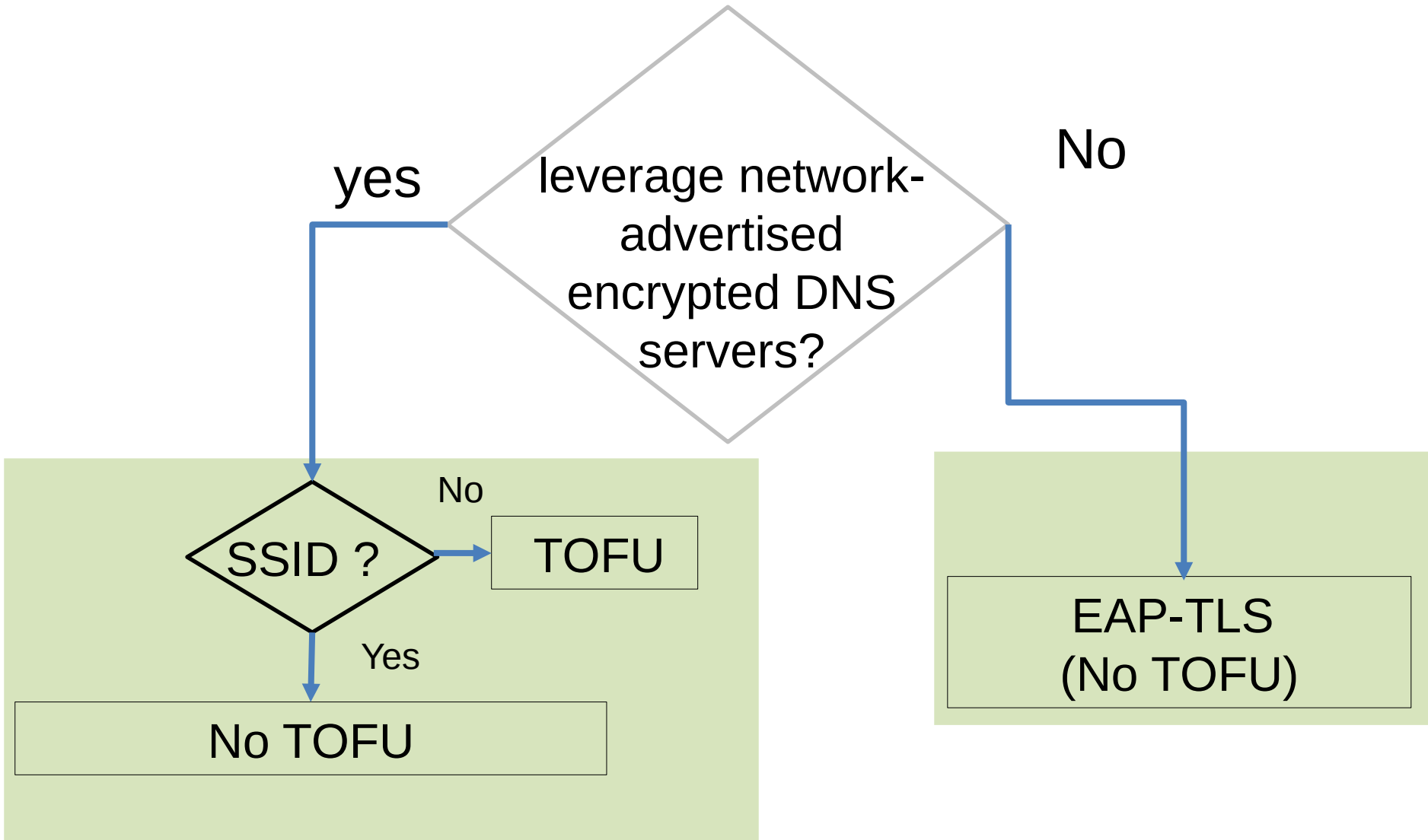
- 802.1X is not widely deployed
- Evil-Twin Attack: WLAN with the same SSID and WPA-PSK as the victim's network
 - Home Networks, Coffee shops
 - Small office/Home office networks

Active Attack: PSK is shared with all the devices including attackers

Problem Statement

- Networks using opportunistic Wireless Encryption [[RFC8110](#)]
- LTE/5G mobile networks where the long-term key in the SIM card on the UE can be compromised (FS for [EAP-AKA'](#))

Proposed Solutions



TOFU: DNR/DDR

- On first use, uniquely identify the network:

```
{
  "networks": [
    {
      "SSID": "Example WiFi 1",
      "PSK-ID": 12,
      "Discovery": "DNR",
      "Encrypted DNS": "resolver1.example.com"
    },
    {
      "SSID": "Example WiFi 2",
      "PSK-ID": 42,
      "Discovery": "DDR",
      "Encrypted DNS": [
        "8.8.8.8",
        "1.1.1.1"
      ]
    }
  ]
}
```

TOFU: DNR/DDR

- On subsequent connection to the network:
 - ❖ Encrypted DNS server's identity must match

Evil-Twin: Encrypted DNS server's identity differs

No TOFU: DNR/DDR

- SSID name and DNS server's SAN match
 - Public WiFi hotspots: coffee-bar.example.com
 - May not be a viable option for home networks (John-Jones.example.net)

No TOFU and no dependency on network-advertised encrypted DNS servers

- SSID name matches SAN in EAP-TLS server certificate.
 - Endpoints not managed by MDM
 - Networks where client authentication is not required (e.g., Emergency services)
 - During the device registration process

Security Considerations

- Attacker network conveys the same encrypted resolver as the legitimate network
 - Reduced visibility to traffic (with TLS 1.3 and ECH).
 - Larger anonymity set of backend servers offers better hiding.
 - Attacker will have to rely on traffic metadata

Attacker will not have access to DNS messages, won't be able to remove DNS records with ECH keys

Discussion:

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- Comments and suggestions are welcome