

# Swiss Army Knife Network Sniffer (NSAK)

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# Introduction

# Motivation

## Subtitle

- Cyberangriffe nehmen zu Angriffsbarrieren sinken, Automatisierung steigt
- Sicherheit erfordert Sichtbarkeit Netzwerkangriffe sind oft nur auf Layer 2–4 erkennbar
- Bestehende Frameworks sind komplex Hoher Konfigurations- und Betriebsaufwand
- Unser Ansatz (PoC) Modularer, kontrollierter Network-Sniffer für Angriffsszenarien





Eher alles als Bilder (Franky)

# Design and Architecture



# NSAK Design and Architecture Overview

## Resources and Concepts

### Resources:

-  **Devices** Physical or virtual machine which can be provisioned as a NSAK device
-  **Environments** Network topology incl. infrastructure components, servers, clients and services
-  **Scenarios** Designed to be run in environments, consisting of a sequence of drills
-  **Drills** Reusable building blocks for configuration, reconessance or exploitation

### Concepts:

-  **Operator** A single IT-specialist, a red, blue or purple team
-  **Operation** Deployment of NSAK in a real network or lab

# Hardware Evaluation

# Hardware Selection

## Banana Pi R4



- RAM: 8 GB
- CPU: Quad-Core ARM
- Ports: 4× 1 GbE + 2× 10GB
- Wi-Fi: Optional

## NanoPi R76S



- RAM: 16 GB
- CPU: RK3588S
- Ports: 2× 2.5 GbE
- Wi-Fi: Optional

# Implementation



# NSAK Framework Implementation

Components, technology stack and dependencies

## Framework Components (Monorepo):

- Core: Framework implementation
- CLI: Uses the core to enable user interaction
- Resource Library: Contains devices, environments, scenarios and drills

## System dependencies:

- Language and tooling: python3, uv
- OCI containers: podman, podman-compose
- Networking: iptables, nftables

## Python dependencies:

- Linter and formatter: ruff
- Type checker: mypy
- Testing framework: pytest
- pre-commit: Package to enforce code quality tools for each commit
- pyyaml: Library for loading, validating and reading yaml files
- scapy: Library for red team operations
- click: Library for building CLIs

# MITM Scenario Implementation

ARP-spoofing / Transparent TCP Proxy

## Drills:

- Discover Hosts: Scans the target network
- ARP Spoof: Spoofs the MAC Addresses of discovered hosts
- Transparent TCP Proxy:
  - ▣ Creates a TCP client and server
  - ▣ Redirects traffic with IPTables / NfTables
  - ▣ Reads and modifies intercepted packages

## Environment:

- Simulation with podman/docker compose
- Instructions for building a lab with two Raspberry Pis and a switch

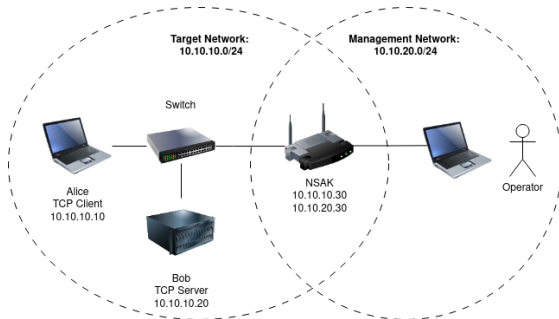
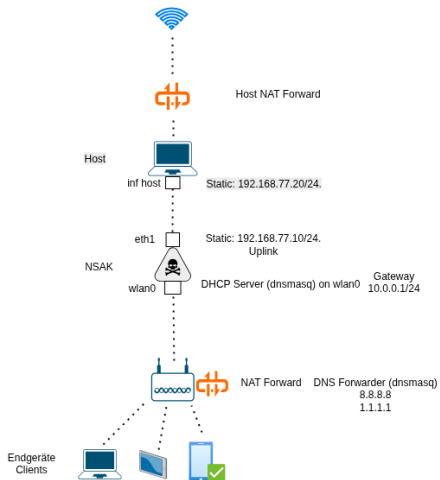


Figure: Simple TCP client - server environment

► Demo Video

# Rogue AP – Drill Order

## Controlled Wi-Fi Scenario



## Drills







- **hostapd**  
Start Rogue AP
- **network setup**  
IP, interfaces, routing
- **dnsmasq**  
DHCP + DNS
- **forwarding**  
NAT / IP forwarding
- **tshark**  
Traffic capture
- **future drills**  
Captive portal, deauth

# Evaluation and Discussion

# Future Work and Conclusion

## Key Insights and Takeaways

### Future Work

-  REST API: Integration of frontends or systems
-  GUI: Better UX and lower entry barrier
-  Redesign cleanup management
-  Implement configuration management
-  Test coverage: Correctness and maintainability
-  Security Concept: NSAK must be secure

### Conclusion

We could show the feasibility of a PoC realization of a Network Swiss Army Knife (NSAK) and that the modular drills can be combined to effectively build scenarios, which can be executed on constraint hardware in simulated or real-world network environments.

The key difficulty is that the automation of scenarios requires a lot of assumptions about the target environment, which potentially renders them very brittle.

# Access Point Demo: Can you spot the rogue AP?

## Open questions?