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DFIR IN OPEN RAN

Präsentation im Kolloquium

Implementierung eines Dashboards für Pentesting
in einer Digital Forensics and Incident Response (DFIR) Umgebung in Open RAN

24.01.2025

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Inhalt

- Allgemein
  - Vision
  - Architektur
- Implementierungen
  - Angriffspfad, Matrix-Rework,
  - ACEMA O-RAN (Klement et al.)
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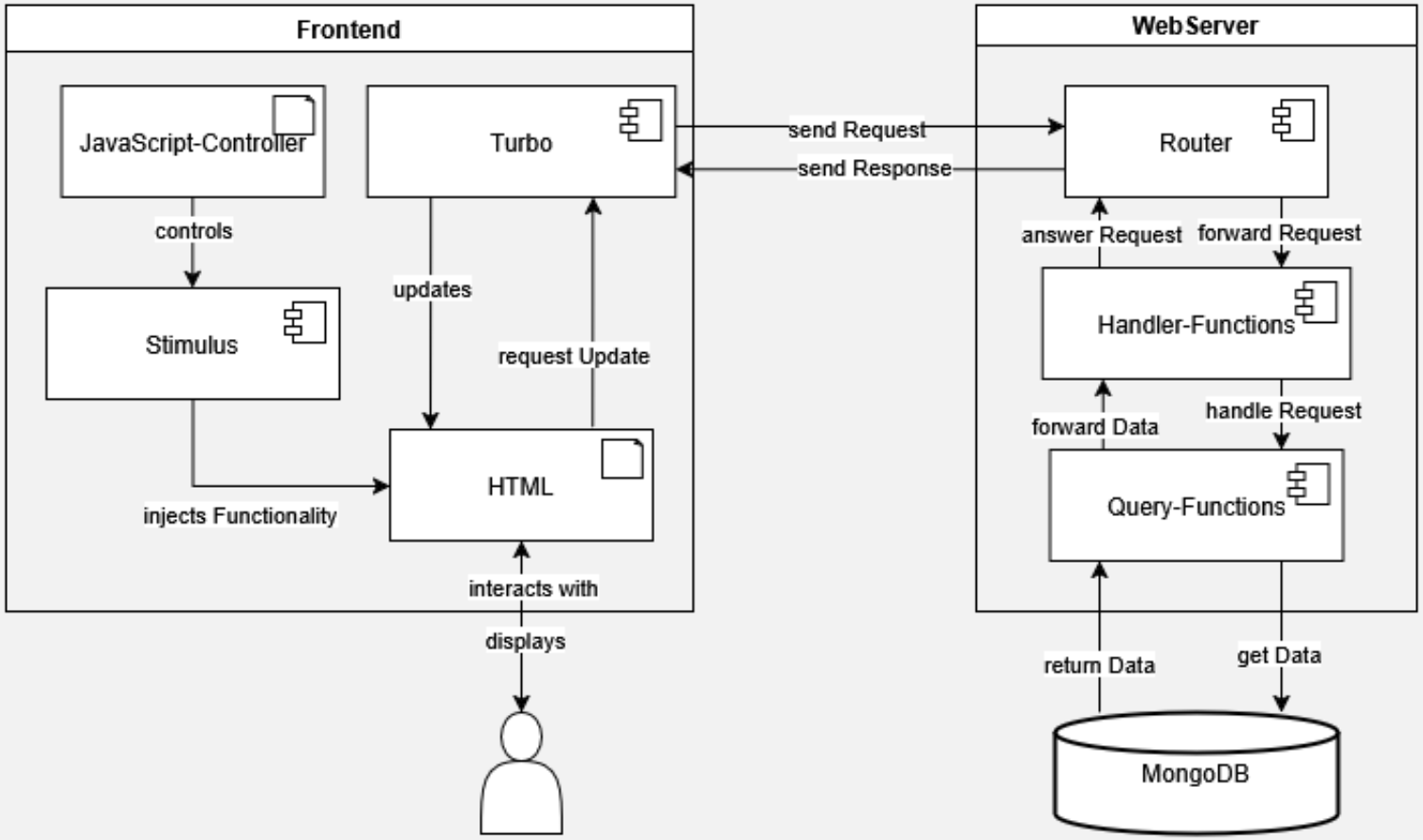
Vision

„ Es existiert ein Dashboard zur aussagekräftigen Visualisierung aller Angriffe des Attacktools. Die Daten aus dem AT werden mit CVSS-Werten anreichert und es lassen sich Relationen zu anderen Klassifikationssystemen, insbesondere dem ORAN Threat-Model[1] herstellen. “

[1] “O-RAN Security Threat Modeling and Risk Assessment 4.0.” Oktober 2024. Available: https://specifications.o-ran.org/download?id=774

Architektur



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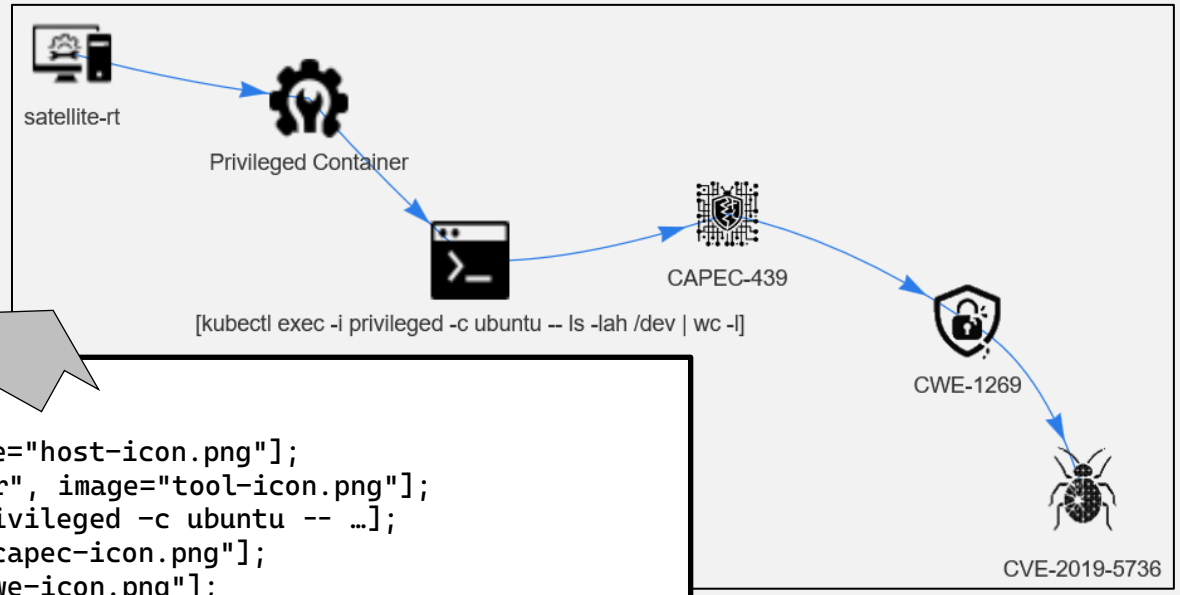
Visualisierung des Angriffspfads

Mithilfe von

- DOT
- Vis.js

```
{
  "hostname": "satellite-rt",
  "ip": "192.168.40.22",
  "tool_name": "Privileged Container",
  "command": [
    "kubectl exec -i privileged -c ubuntu -- …"
  ],
  "mitre": {
    "TA0004": [
      "MS-TA9018"
    ]
  },
    "cve": [
      "CVE-2019-5736"
  ]
}
```

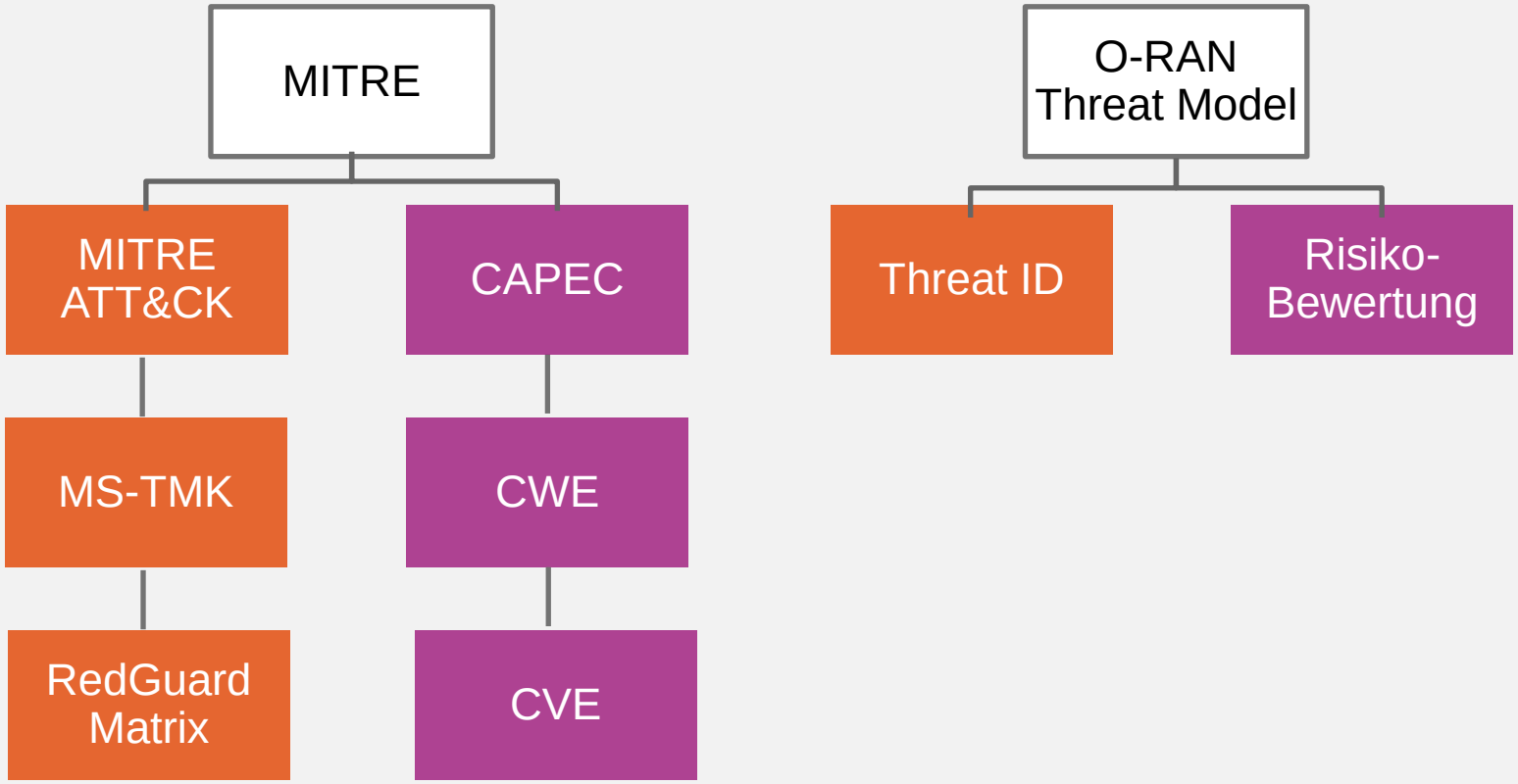
```
digraph attack {
      node [shape=square];
      n1 [label="satellite-rt", image="host-icon.png"];
      n2 [label="Privileged Container", image="tool-icon.png"];
      n3 [label="[kubectl exec -i privileged -c ubuntu -- …];
      n4 [label="CAPEC-439", image="capec-icon.png"];
      n5 [label="CWE-1269", image="cwe-icon.png"];
      n6 [label="CVE-2019-5736\n", image="cve-icon.png"];
      n1 -> n2 -> n3 -> n4 -> n5 -> n6;
}
```



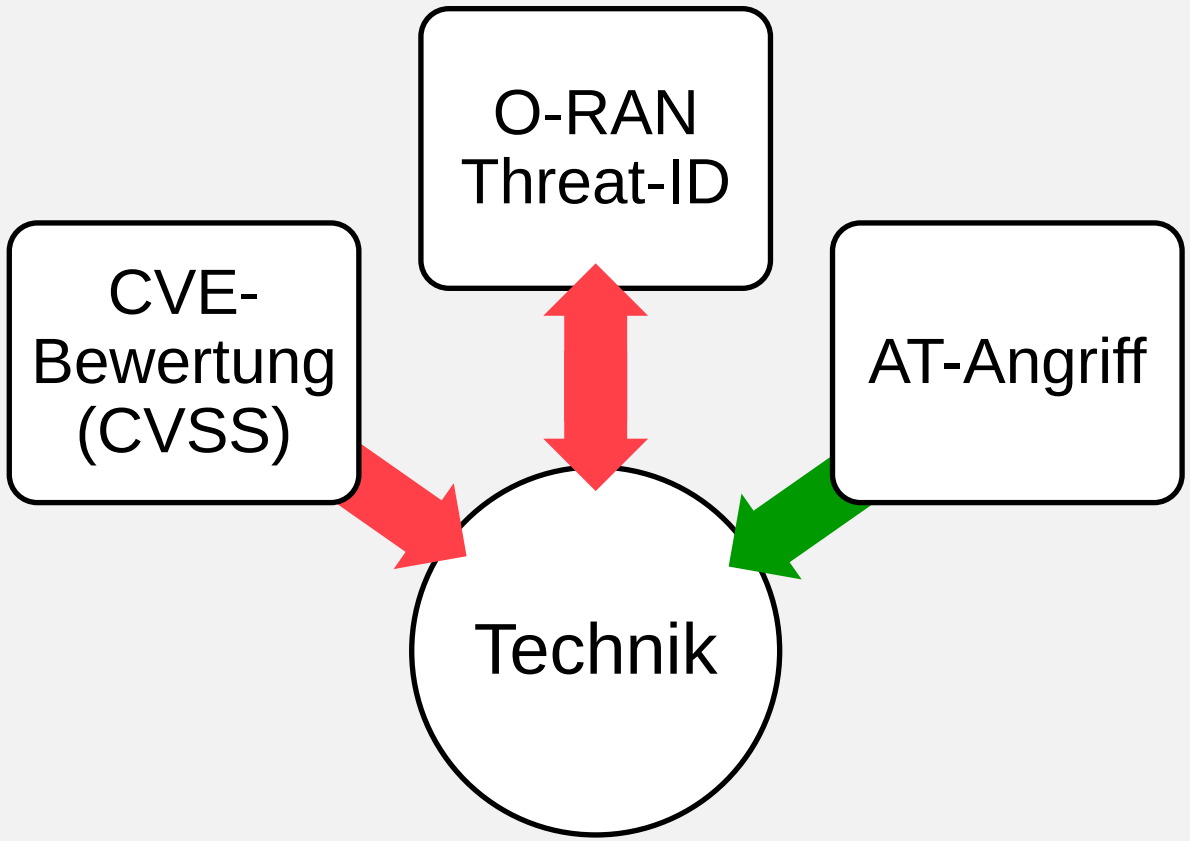
Rework der Matrix

Kategorisierung

Klassifizierung



Verknüpfung der Systeme



MS-TA9002
Compromised image In registry

T1525,T1195.002
Implant Internal Image with malicious code

T-IMG-01
VM/Container images tampering

MS-TA9040
Denial of Service

T1498,T1499
Endpoint/Network Denial of Service

T-ADMIN-01
Denial of service against NFO/FOCOM

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ACEMA O-RAN

A Comprehensive Empirical Method to Analyze Threats in O-RAN Environments

- Felix Klement
  - E-Mail: felix.klement@uni-passau.de

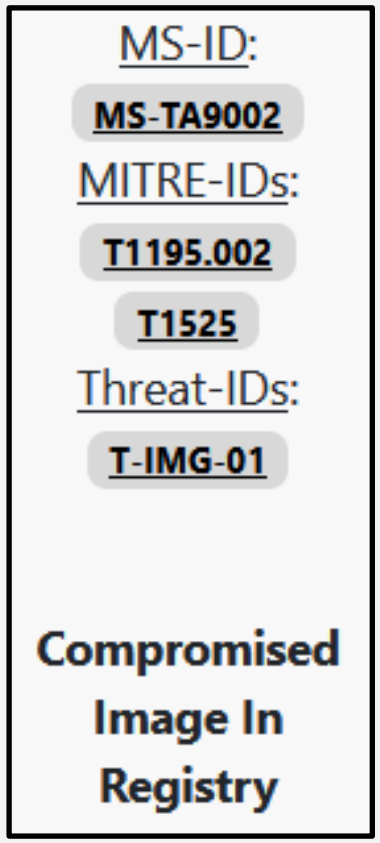
F. Klement, W. Liu, and S. Katzenbeisser, “Toward Securing the 6G Transition: A Comprehensive Empirical Method to Analyze Threats in O-RAN Environments Available: https://ieeexplore.ieee.org/document/10339923/

ACEMA O-RAN: Input

Mapping von MITRE-Technik zu O-RAN-Threat-ID

- Basis: MS-*Threat Matrix for Kubernetes*
- 66 Mappings

```
ThreatID;  Name;                          MITREID;  Tactic
T-IMG-01;  Compromised Image In Registry;T1195.002;initial-access
T-IMG-01;  Compromised Image In Registry;T1525;    initial-access
T-ADMIN-01;Denial of service;             T1498;    impact
T-ADMIN-01;Denial of service;             T1499;    impact
...
```



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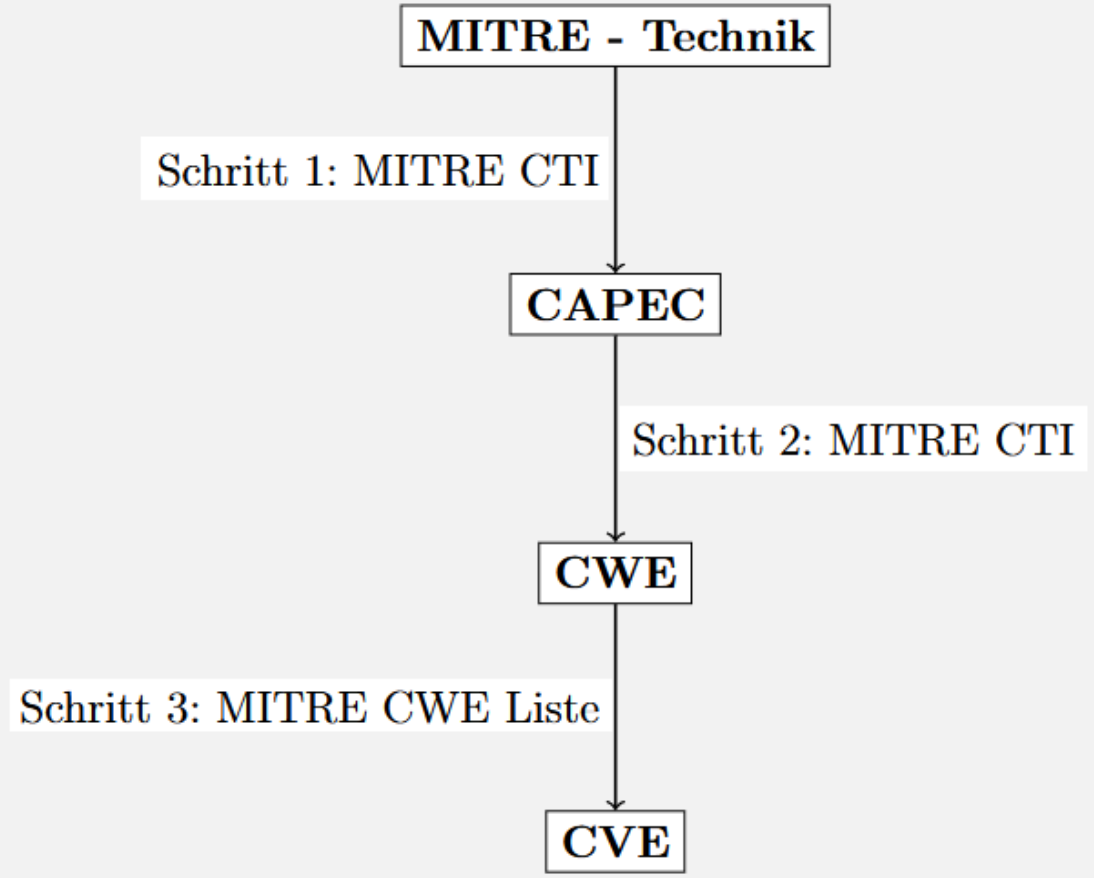
ACEMA O-RAN: Gathering

Mapping von MITRE-Technik zu CVE

- Schritt 1 & 2
  - mitreattack.attackToExcel.stixToDf .techniquesToDf(data, "enterprise-attack")
- Schritt 3
  - cwe2.Database().get(…)
- Weitere Infos über CVEs
  - nvdlib.searchCVE(…)



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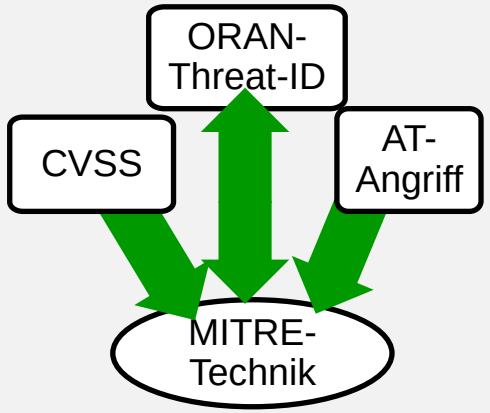
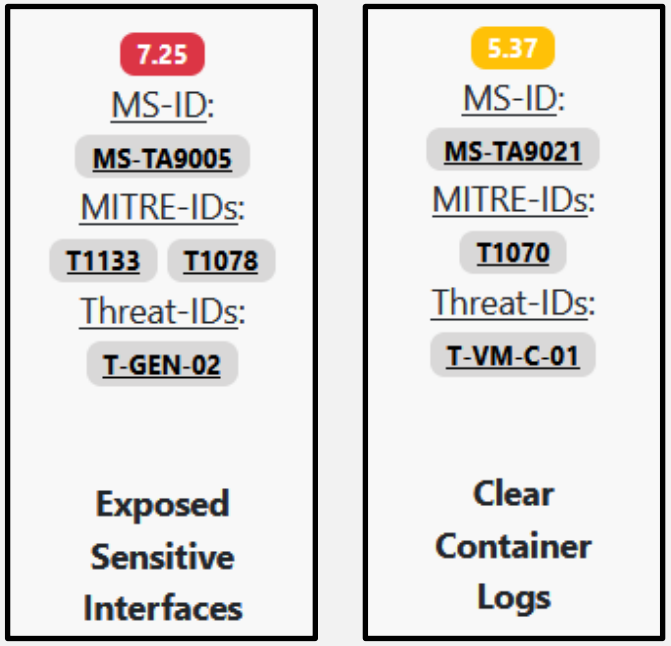
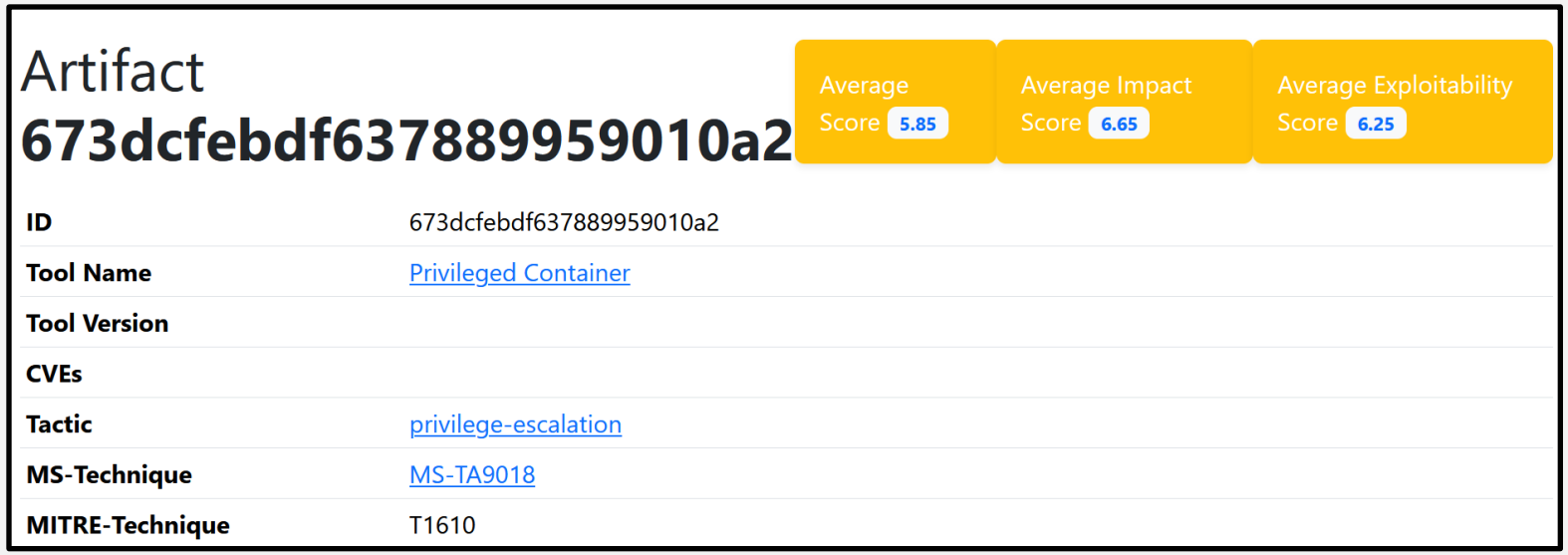
ACEMA O-RAN: Analysis

Anwendung im Dashboard





Anwendung in der Matrix



Anwendung in der Detailansicht eines Artefakts

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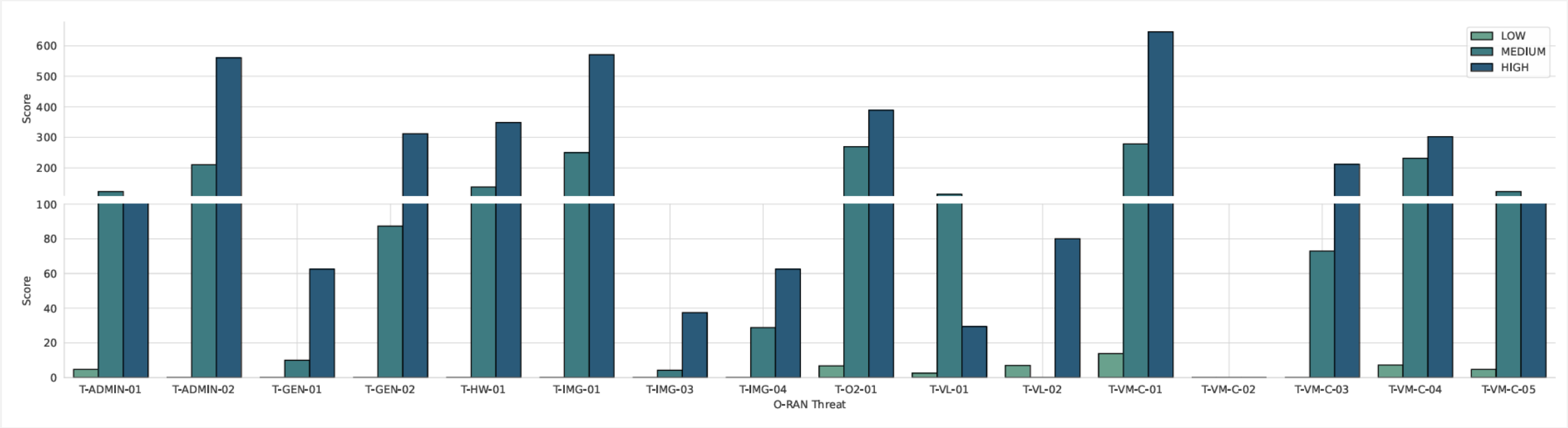
ACEMA O-RAN: Analysis

Wissenschaftliche Erkenntnisse #1

O-RAN Threats, denen CVEs mit hohem CVSS zugeordnet werden



ACEMA O-RAN: Analysis

Wissenschaftliche Erkenntnisse #2

Analyse der CVSS Vektoren

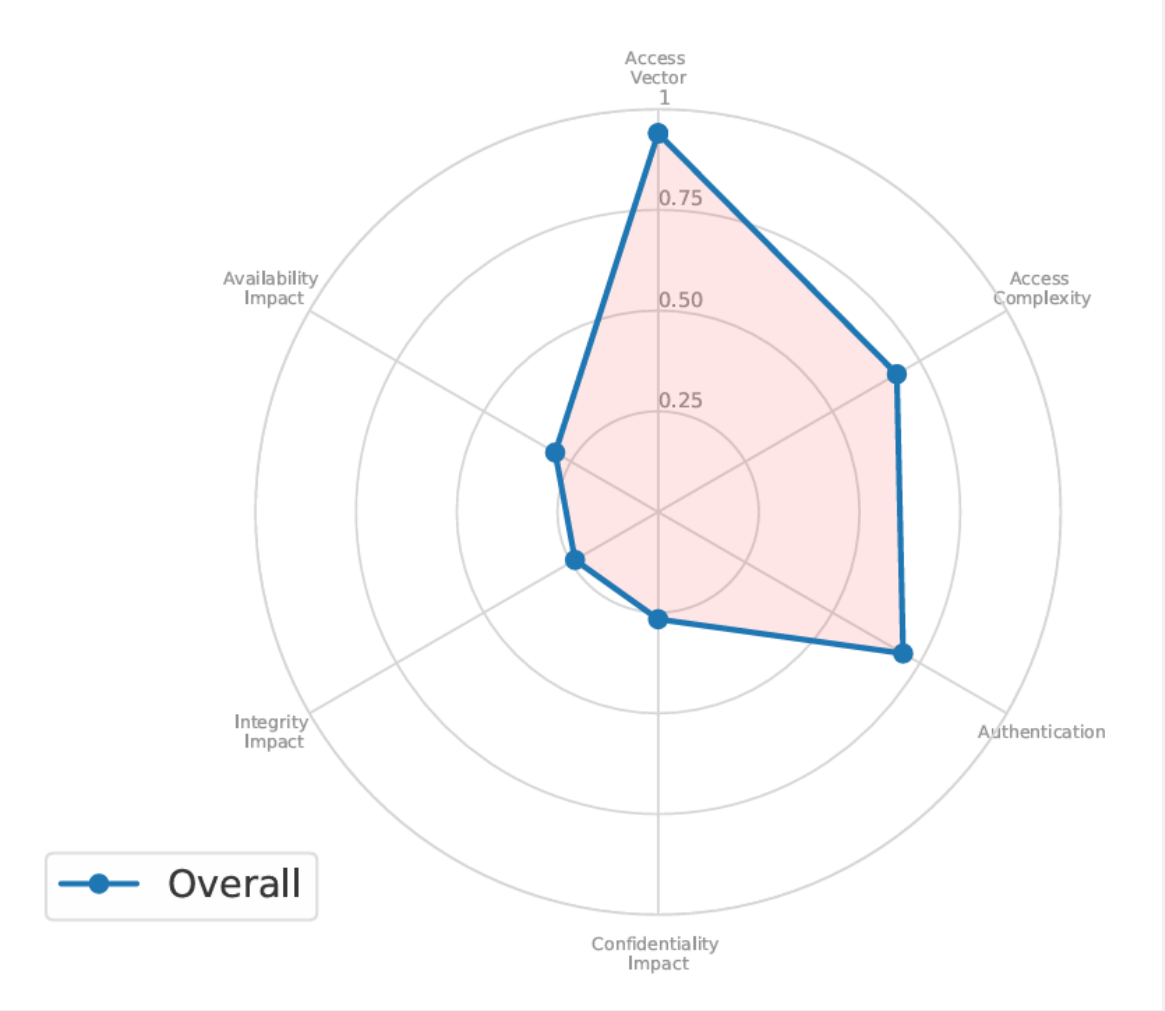
```
AccessVector =
      local access: 0.395
      adjacent network accessible: 0.646
      network accessible: 1.0

AccessComplexity =
      high: 0.35
      medium: 0.61
      low: 0.71

Authentication =
      requires multiple instances of authentication: 0.45
      requires single instance of authentication: 0.56
      requires no authentication: 0.704

* Impact =
      none: 0.0
      partial: 0.275
      complete: 0.66
```

[2]



[2] “CVSS v2 Complete Documentation,” Available: https://www.first.org/cvss/v2/guide

Wo gibt’s was & Fragen

Das Dashboard läuft unter
database-attack.foran.lab

ACEMA Quellcode mit allen Daten und Diagrammen
github.com/dumpeldown/acema_oran

Arbeit & Präsentation
github.com/dumpeldown/foran-ba