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Cómo protegerse de ataques avanzados en las redes de telecomunicaciones

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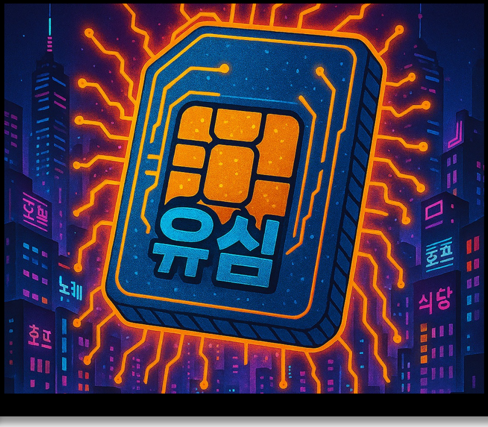
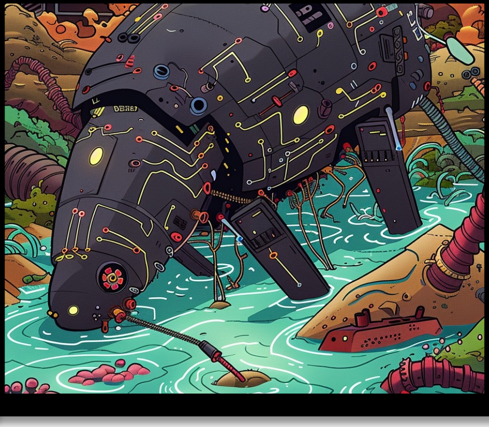
Some APT Groups Focused on Telco

Salt Typhoon

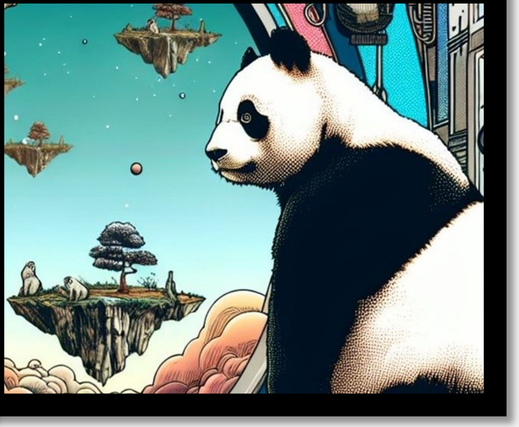
SKT Threat Actor



Muddy Water



Liminal Panda



sophisticated opponents

deep knowledge of
telecom networks and equipment

well-funded

difficult to detect

interested in information exfiltration & control, not damage

deep understanding of weak points

want to maintain long-term persistency

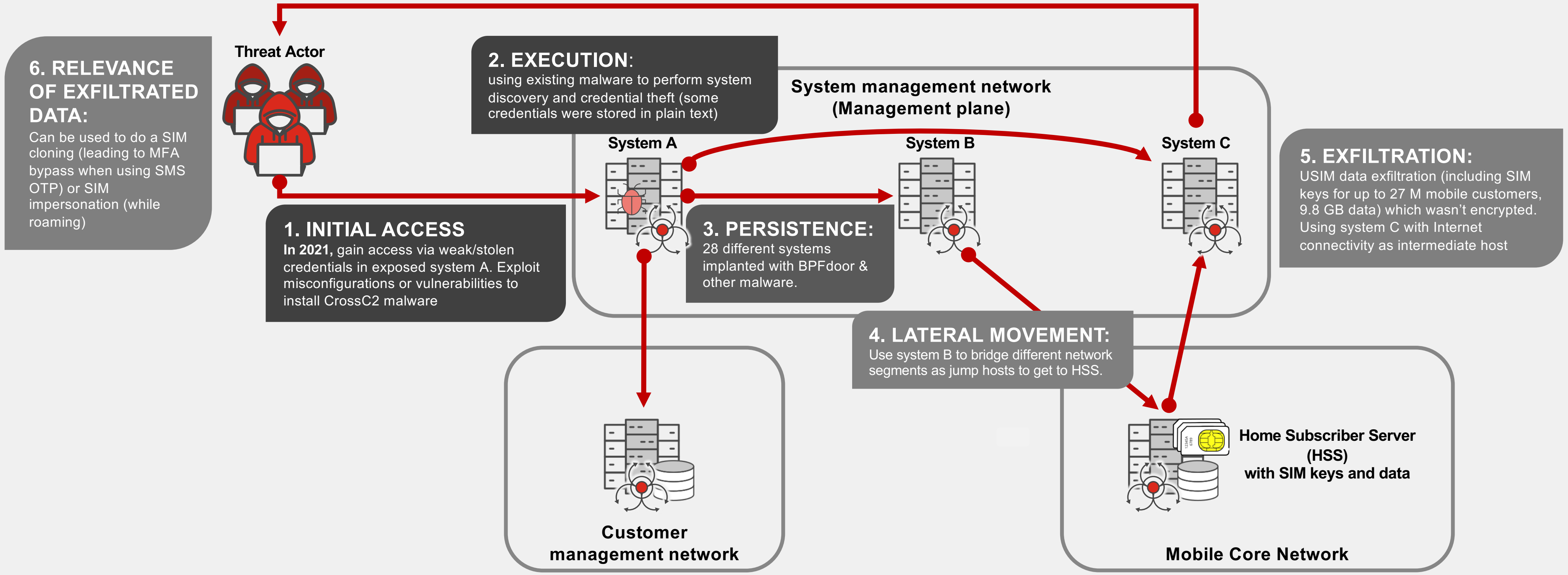
Financial

Espionage

Sabotage

Control

SK Telecom Attack – Simplified Overview



1. INITIAL ACCESS

In 2021, gain access via weak/stolen credentials in exposed system A. Exploit misconfigurations or vulnerabilities to install CrossC2 malware

2. EXECUTION:

using existing malware to perform system discovery and credential theft (some credentials were stored in plain text)

3. PERSISTENCE:

28 different systems implanted with BPFdoor & other malware.

4. LATERAL MOVEMENT:

Use system B to bridge different network segments as jump hosts to get to HSS.

5. EXFILTRATION:

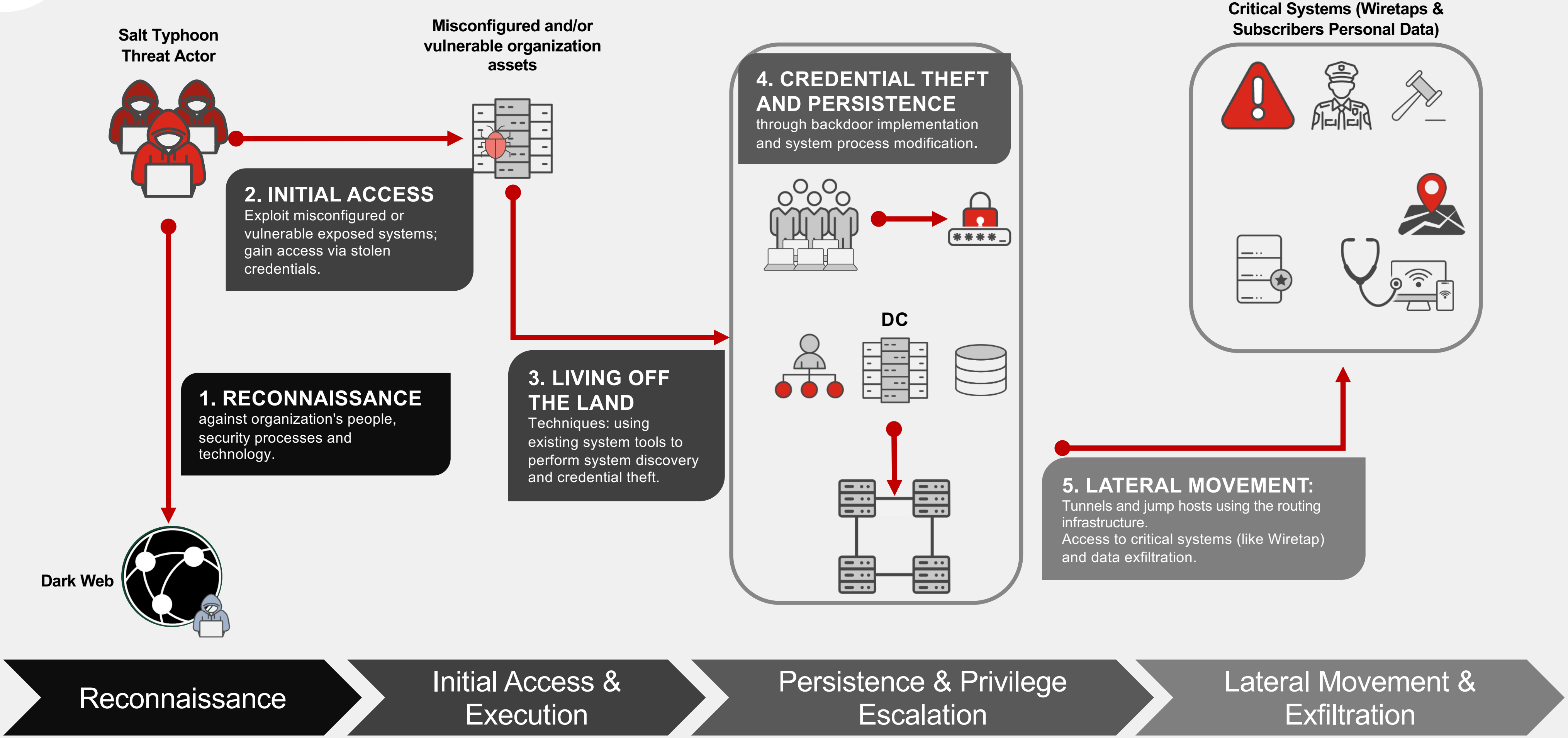
USIM data exfiltration (including SIM keys for up to 27 M mobile customers, 9.8 GB data) which wasn't encrypted. Using system C with Internet connectivity as intermediate host

6. RELEVANCE OF EXFILTRATED DATA:

Can be used to do a SIM cloning (leading to MFA bypass when using SMS OTP) or SIM impersonation (while roaming)

Reconnaissance → Initial Access & Execution → Persistence & Privilege Escalation → Lateral Movement & Exfiltration

SALT Typhoon Attack – Simplified Overview



Salt Typhoon Threat Actor

Misconfigured and/or vulnerable organization assets

2. INITIAL ACCESS
Exploit misconfigured or vulnerable exposed systems; gain access via stolen credentials.

1. RECONNAISSANCE
against organization's people, security processes and technology.

Dark Web

3. LIVING OFF THE LAND
Techniques: using existing system tools to perform system discovery and credential theft.

4. CREDENTIAL THEFT AND PERSISTENCE
through backdoor implementation and system process modification.

DC

Critical Systems (Wiretaps & Subscribers Personal Data)

5. LATERAL MOVEMENT:
Tunnels and jump hosts using the routing infrastructure.
Access to critical systems (like Wiretap) and data exfiltration.

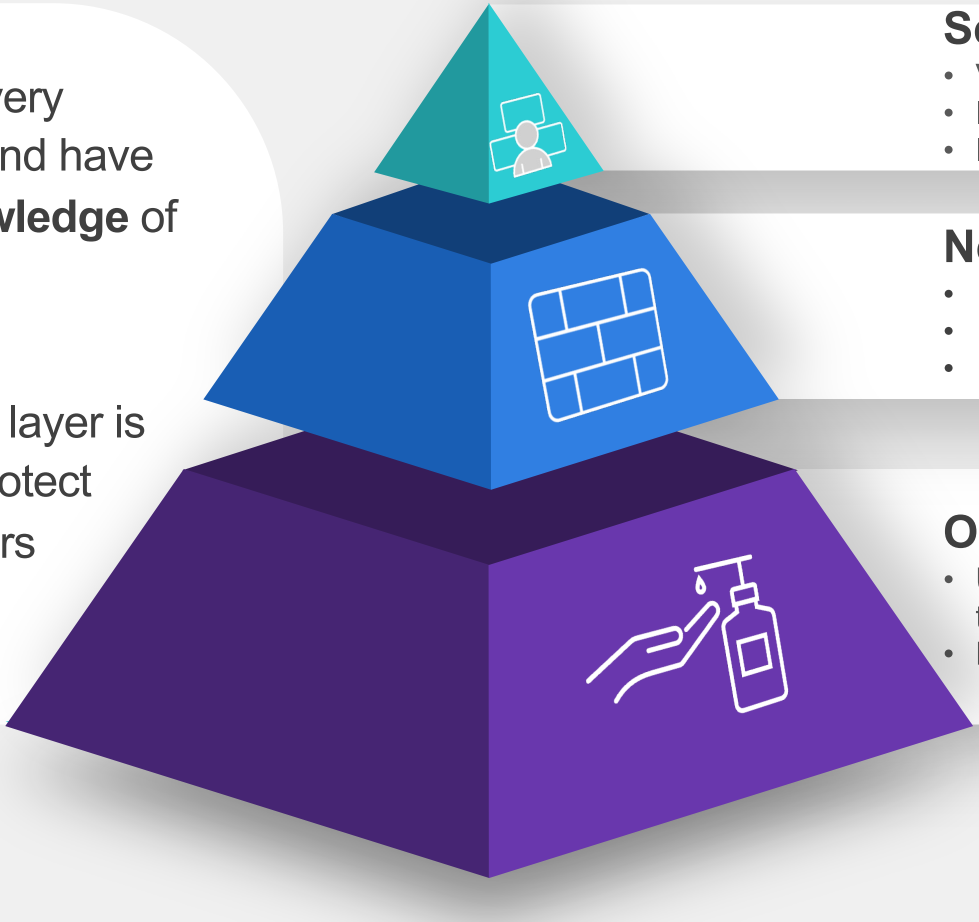
Reconnaissance → Initial Access & Execution → Persistence & Privilege Escalation → Lateral Movement & Exfiltration

How to Prevent APT Attacks (e.g. Salt Typhoon)

Layered approach

Opponents are very **sophisticated** and have **very good knowledge** of the network and equipment

A single security layer is not enough to protect the network, users and subscribers



Security Operations (SecOps)

- Visibility/detection (beyond NW & user protection)
- Incident response/mitigation & reporting
- Integration: One platform

Network, data & user protection

- Eliminate unnecessary attack vectors
- Detect threats
- Stop threats

Operator's security hygiene

- Users, teams, roles, credentials, vendor selection, trust zones, hardening, patching, procedures, …
- Hygiene is the basis for all other security layers

Operator’s Security Hygiene

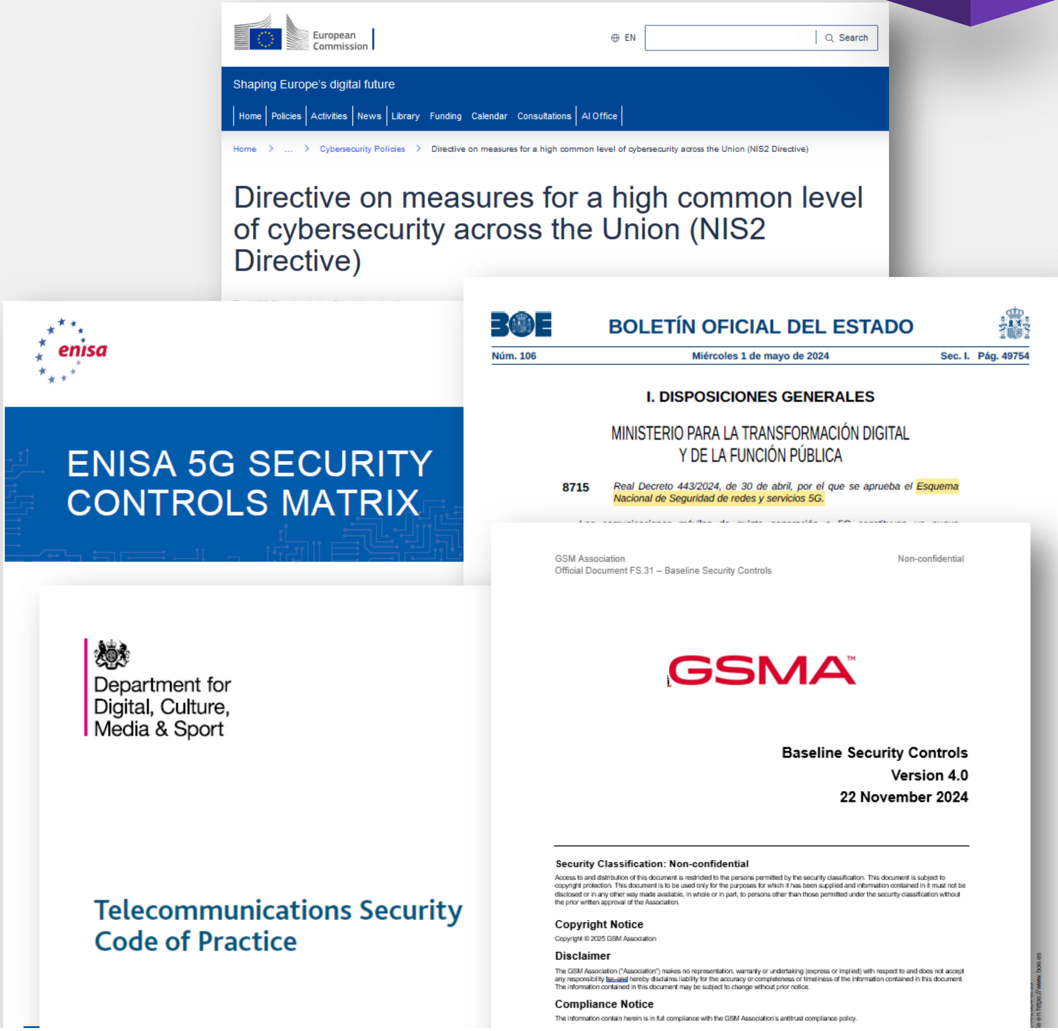
Regulation places this responsibility under the operator

Hygiene is key

- Without hygiene, nothing that is done in the other points works

Some obvious recommendations

- **Physical security**
- Select **reliable vendors** (who take security seriously)
- **Patch & harden** nodes (ASAP)
- Good **network design** (separate trust zones, avoid unnecessary exposure, …)
- Good **password management** (strong passwords, no password reuse, no default passwords, …)
- **Security procedures** (define roles and privileges, revoke credentials when employees leave, ...)



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Directive on measures for a high common level of cybersecurity across the Union (NIS2 Directive)

enisa

ENISA 5G SECURITY CONTROLS MATRIX

BOE BOLETÍN OFICIAL DEL ESTADO

Núm. 106 Miércoles 1 de mayo de 2024 Sec. I. Pág. 49754

I. DISPOSICIONES GENERALES

MINISTERIO PARA LA TRANSFORMACIÓN DIGITAL
Y DE LA FUNCIÓN PÚBLICA

8715 *Real Decreto 443/2024, de 30 de abril, por el que se aprueba el Esquema Nacional de Seguridad de redes y servicios 5G.*

Department for
Digital, Culture,
Media & Sport

Telecommunications Security
Code of Practice

GSM Association
Official Document FS.31 – Baseline Security Controls

Non-confidential

GSMA™

Baseline Security Controls
Version 4.0
22 November 2024

Security Classification: Non-confidential

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Secure Administrative Users

Management Plane Protection

1 Isolate the management plane

- Network infrastructure as **segmented** into security zones

2 Secure access to the management plane

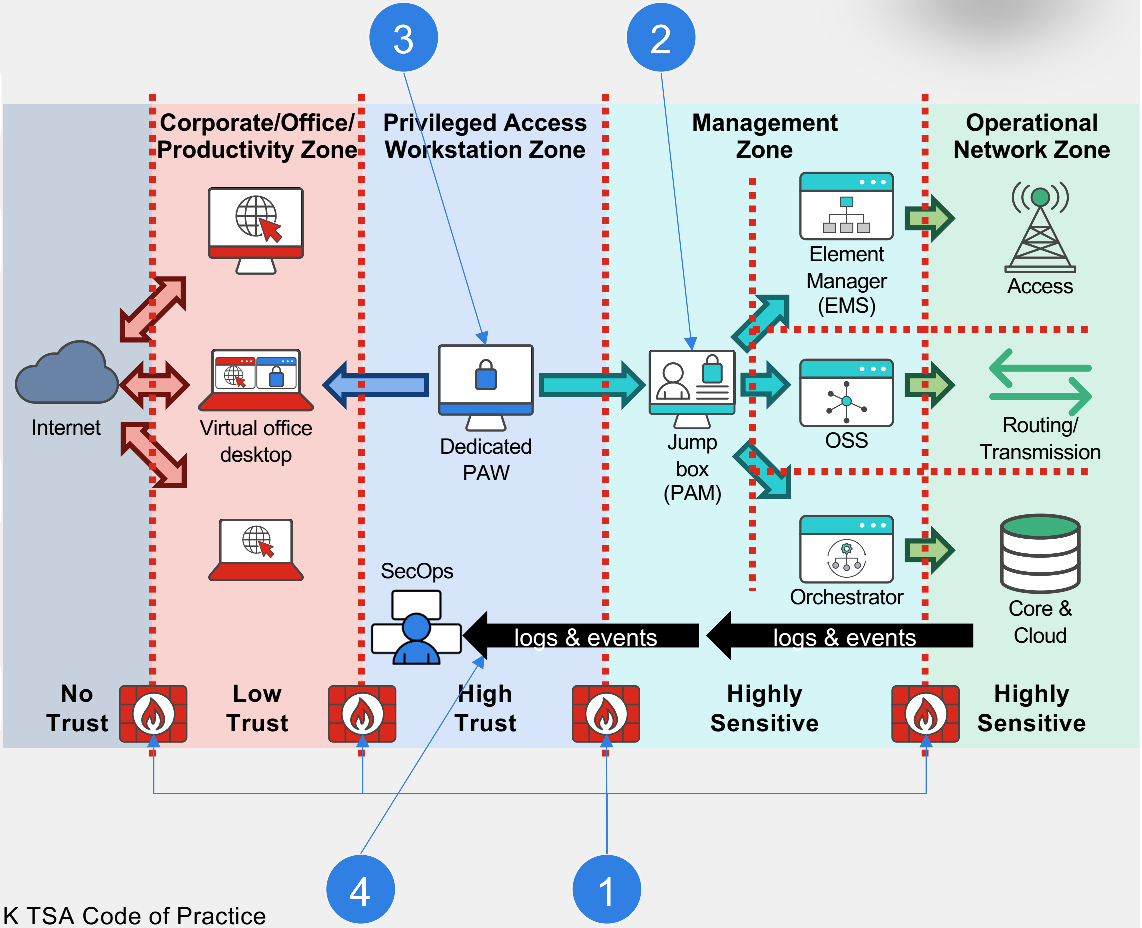
- Jump host or Privilege Access Management (**PAM**) to access management zone with **ZTNA**
- Strong credentials policies, Multi-factor authentication (**MFA**), Role-Based Access Control (**RBAC**)

3 Dedicated, secure workstation

- A Privileged Access Workstation (**PAW**) that can make changes to security critical functions
- Remote Browser Isolation (**RBI**) to secure the PAW

4 Read-only access

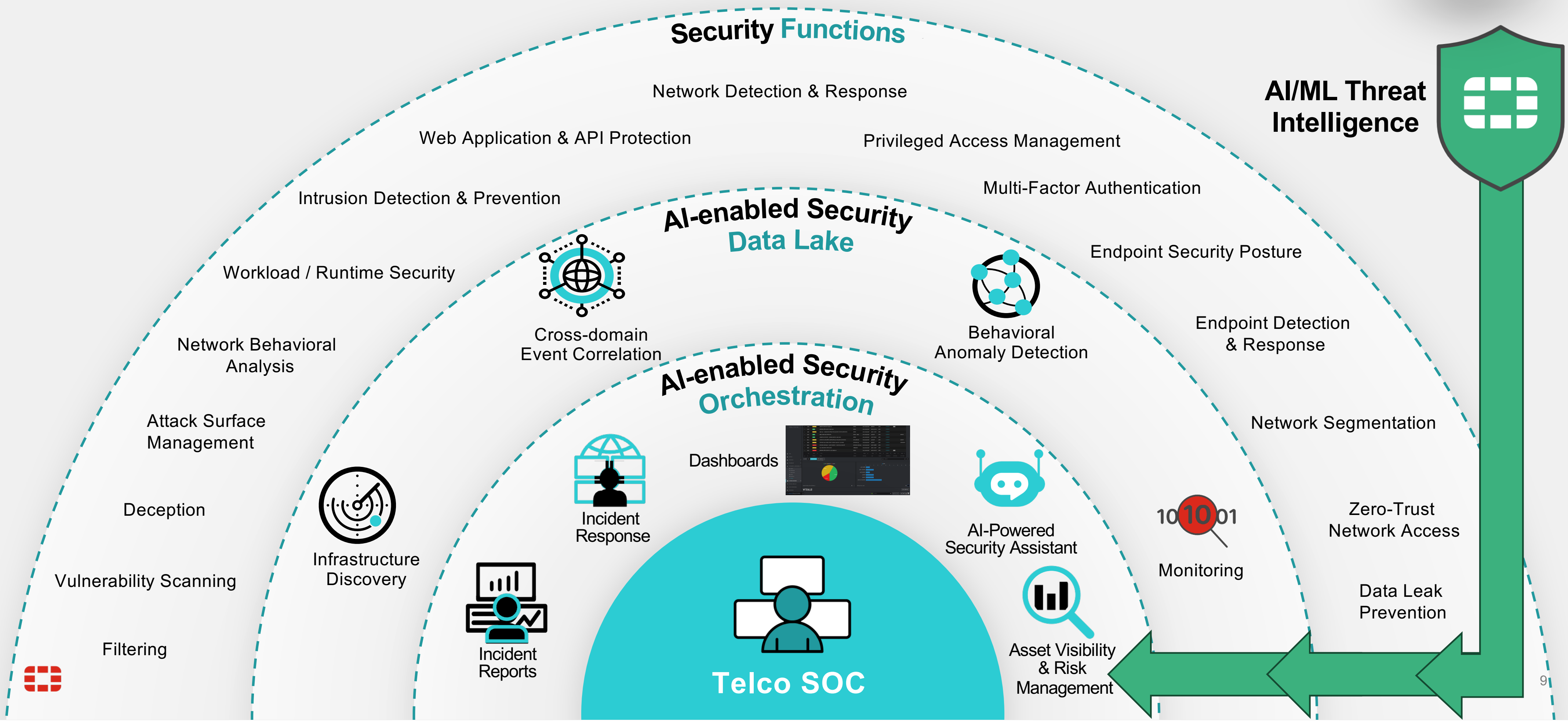
- Push logs and security events from network equipment to the lower trust zones. Process them in a **SecOps platform**



Based on UK TSA Code of Practice

Fortinet Telco SecOps Platform

Functional View



Security Functions

Network Detection & Response

Web Application & API Protection

Privileged Access Management

Intrusion Detection & Prevention

Multi-Factor Authentication

Workload / Runtime Security

Endpoint Security Posture

Network Behavioral Analysis

Endpoint Detection & Response

Attack Surface Management

Network Segmentation

Deception

Zero-Trust Network Access

Vulnerability Scanning

Data Leak Prevention

Filtering

AI-enabled Security Data Lake

Cross-domain Event Correlation

Behavioral Anomaly Detection

Infrastructure Discovery

Monitoring

AI-enabled Security Orchestration

Dashboards

Incident Response

AI-Powered Security Assistant

Incident Reports

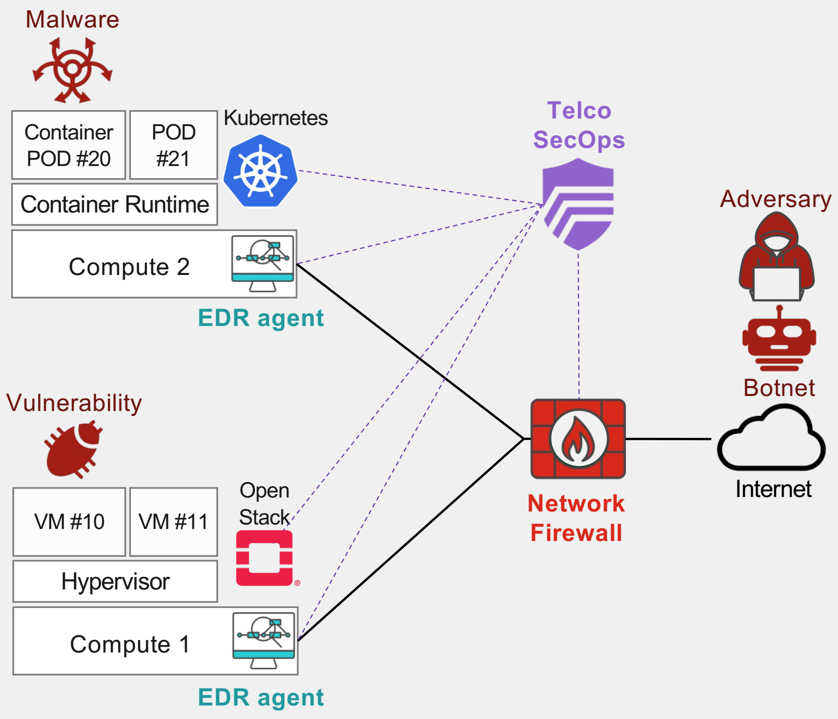
Asset Visibility & Risk Management

Telco SOC

AI/ML Threat Intelligence

Firewall + EDR + SecOps

Multi-Layer Telco Security



Network Firewall (NW Security)

- Sees in-flight packets
- Complete visibility of the network traffic
- Can detect and block external attacks, C&C channel, DDoS attacks, …

EDR Agents (Host Security)

- Sees files, memory, network sockets, … in the compute node where it is installed
- Can detect and block ransomware file encryption, execution of malware, …

Telco Security Operations

- Sees events from all network (logs, traces, …)
- Correlates the events between domains
- Performs behavioral analysis
- Acts upon detected threats

When Telco Vendors Don’t Accept Agents

Cannot run an EDR on their server

1 If you cannot check inside, use deception

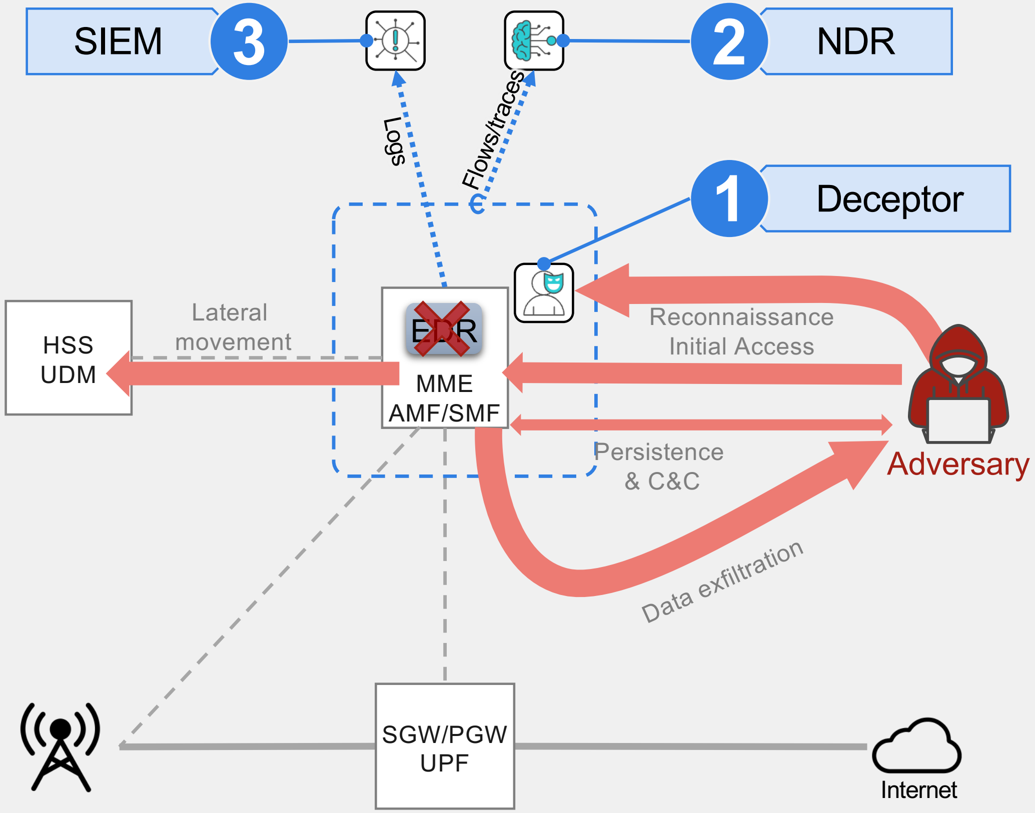
- Credible decoys in the network to deceive the attacker
  - Place lures and breadcrumbs to attract the attacker (e.g., announce it in the DNS or NRF as a test node)
  - Learn from the attack and the techniques used
- **FortiDeceptor**

2 If you cannot check inside, check its traffic

- Tap on the traffic that is coming in and out of the nodes (Specially the management plane)
  - Analyze traffic for unexpected protocols or parameters
  - Analyze the behavior for anomalies using AI/ML
- **FortiNDR**

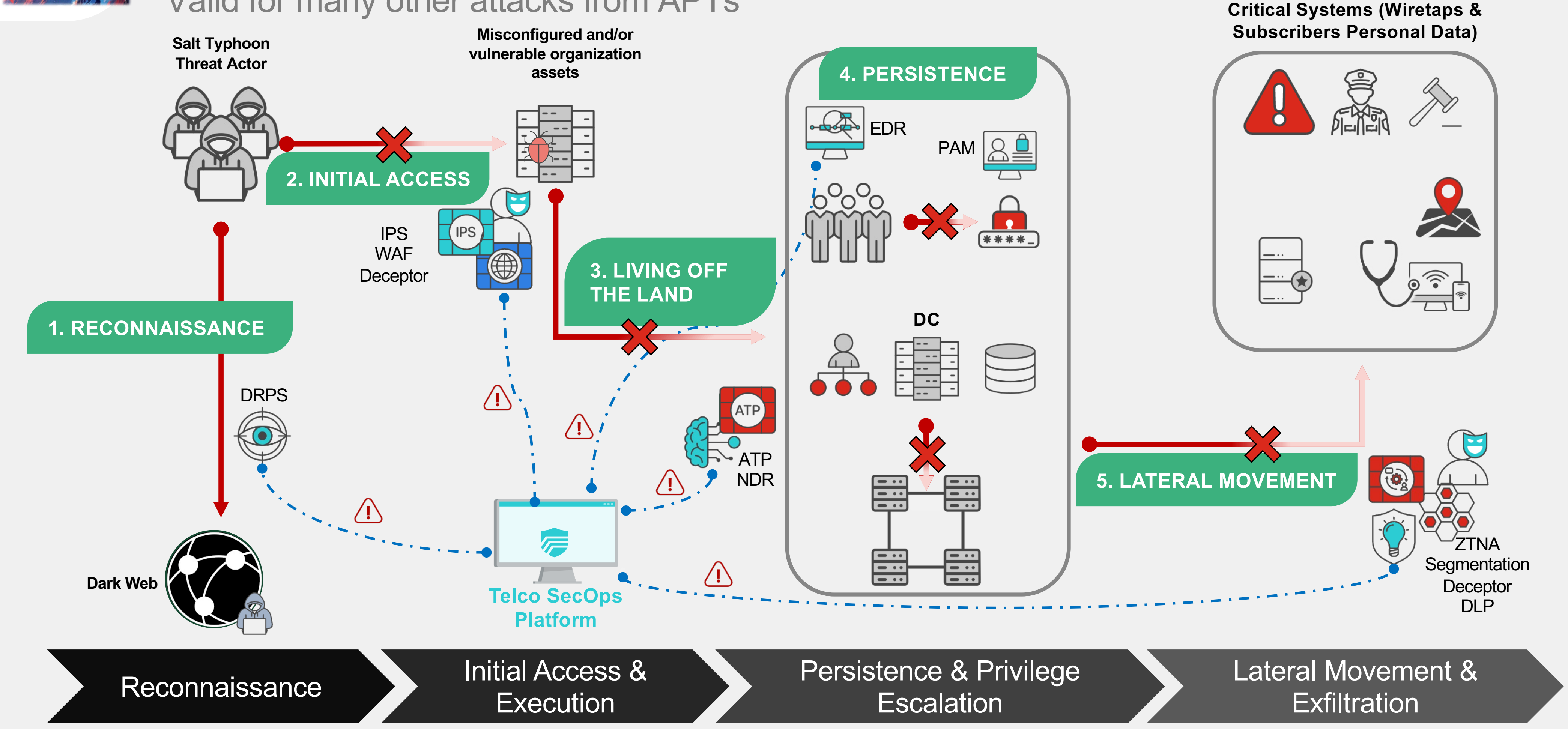
3 If you cannot check inside, check its logs

- These nodes generate logs continuously
  - Analyze them for security events, anomalies, and abnormal behavior using AI/ML
- **FortiSIEM**



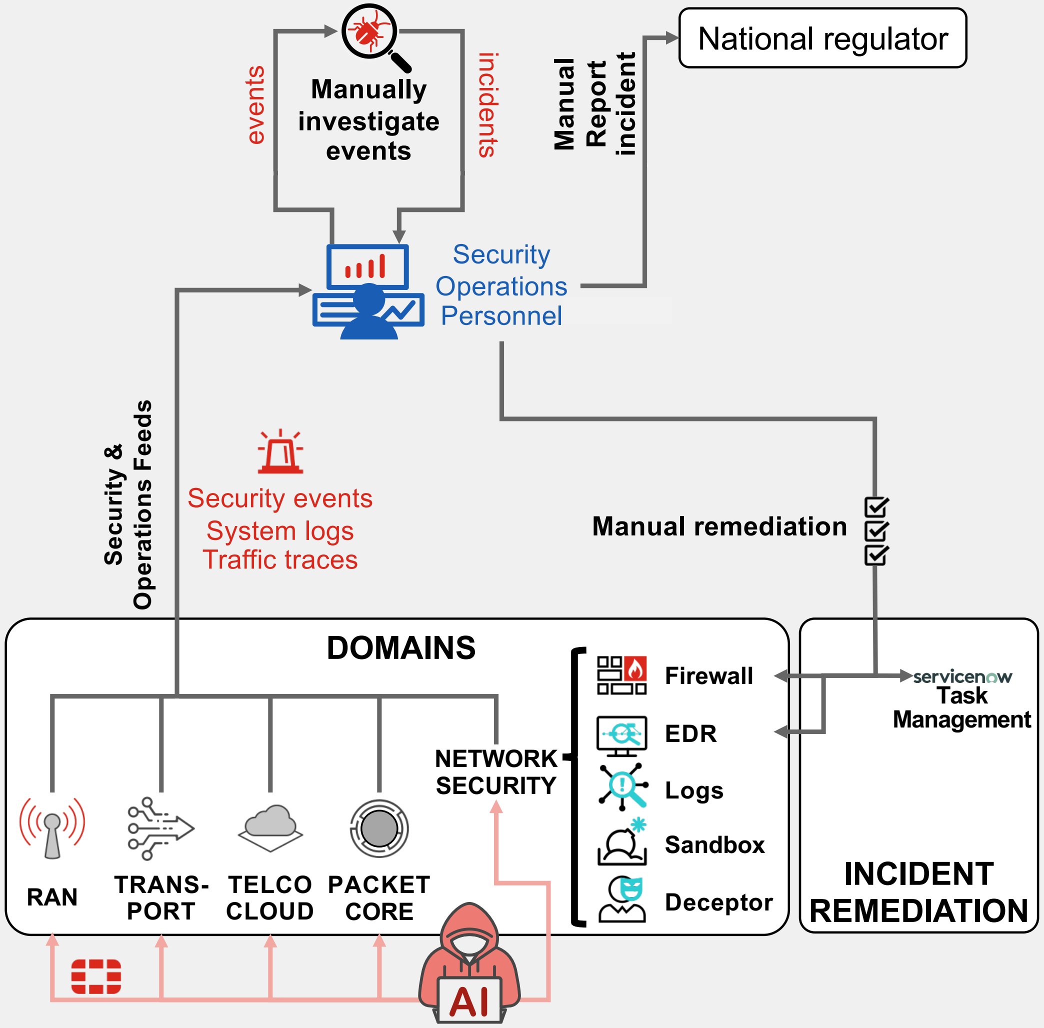
Salt Typhoon Attack with Telco SecOps Platform

Valid for many other attacks from APTs



Traditional Security Operations

A slow, manual process that does not meet the new regulatory timeframes



events

Manually investigate events

incidents

Manual Report incident

National regulator

Security Operations Personnel

Security & Operations Feeds

Security events
System logs
Traffic traces

Manual remediation

DOMAINS

RAN

TRANS-PORT

TELCO CLOUD

PACKET CORE

NETWORK SECURITY

Firewall

EDR

Logs

Sandbox

Deceptor

servicenow Task Management

INCIDENT REMEDIATION

Regulation

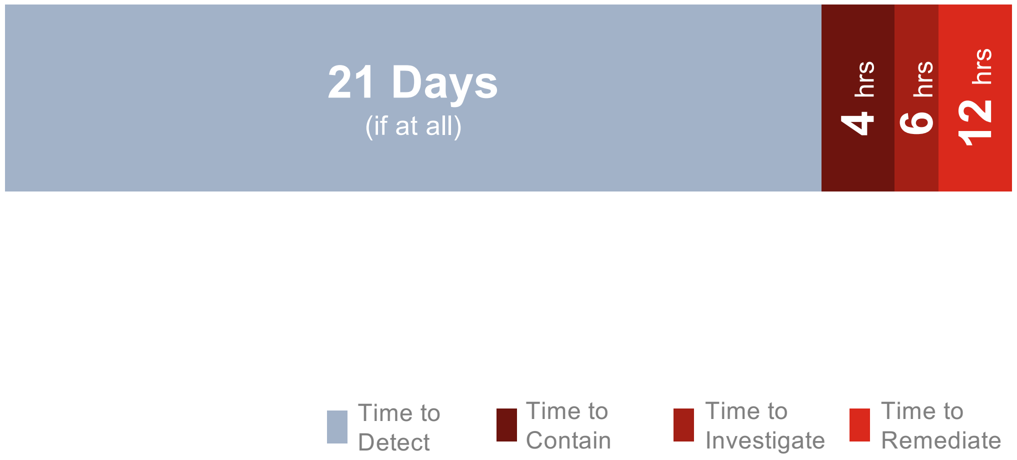
NIS2:
- Initial incident report to national CSIRT within 72h
- Final incident report to national CSIRT within 1 month

SEC:
- Per-incident report to SEC within 4 days

CISA:
- Remediate known exploited vulnerabilities within 14 days
- Remediate critical vulnerabilities within 15 days

Before

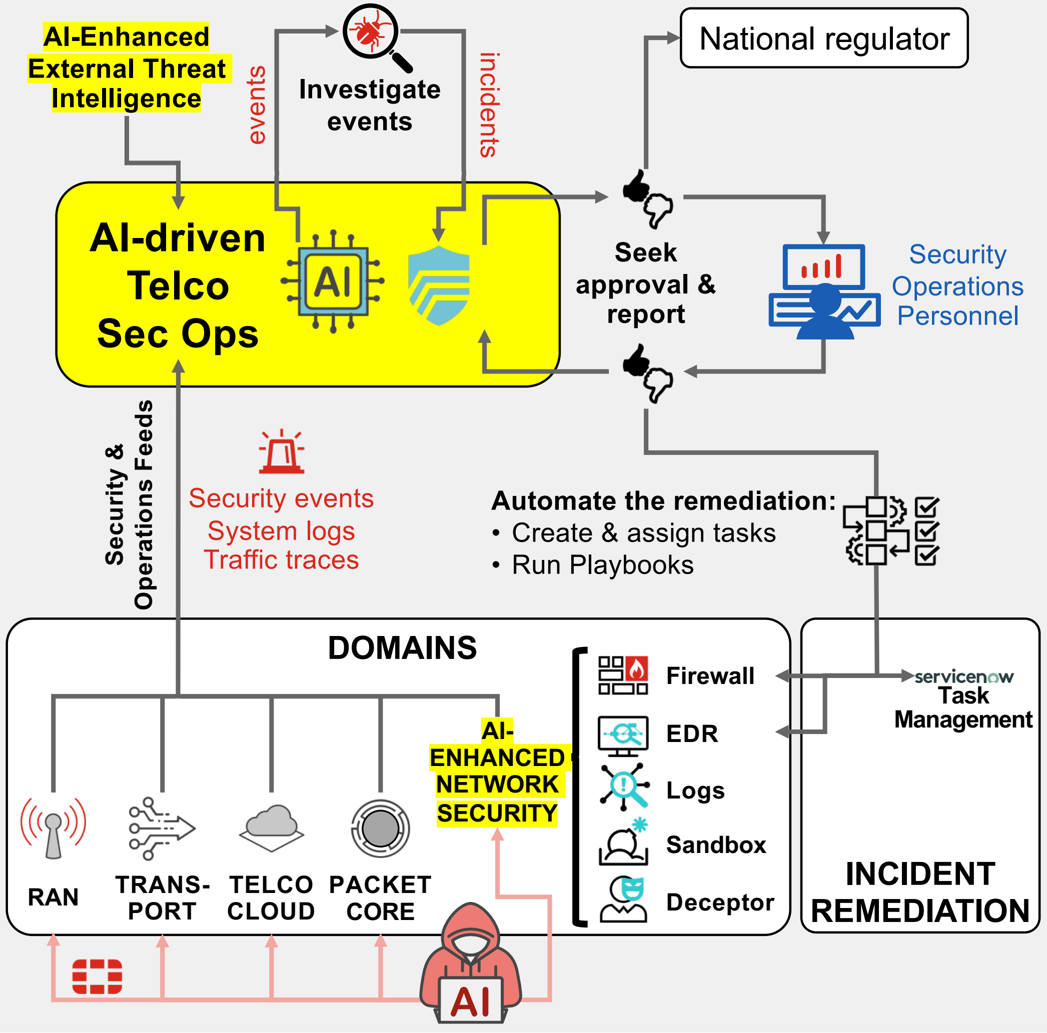
Manual incident response and reporting



Source: Enterprise Strategy Group, a division of Tech Target, Inc.

AI-Driven Security for Service Providers

Use AI to cope with complexity, sophistication and wealth of data



AI-Enhanced External Threat Intelligence

events

Investigate events

incidents

National regulator

AI-driven Telco Sec Ops

Seek approval & report

Security Operations Personnel

Security & Operations Feeds

Security events
System logs
Traffic traces

Automate the remediation:
- Create & assign tasks
- Run Playbooks

DOMAINS

RAN

TRANS-PORT

TELCO CLOUD

PACKET CORE

AI-ENHANCED NETWORK SECURITY

Firewall

EDR

Logs

Sandbox

Deceptor

servicenow Task Management

INCIDENT REMEDIATION

AI

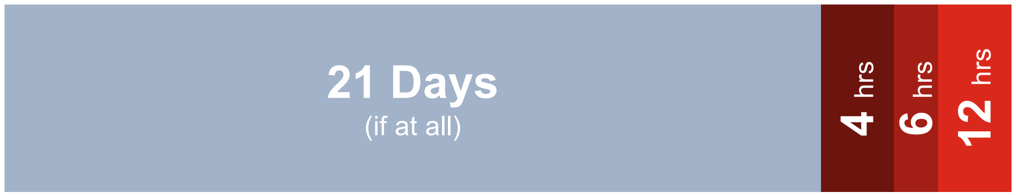
Regulation

NIS2:
- Initial incident report to national CSIRT within 72h
- Final incident report to national CSIRT within 1 month

SEC:
- Per-incident report to SEC within 4 days
- Annual report on cybersecurity risk management, strategy, and governance.

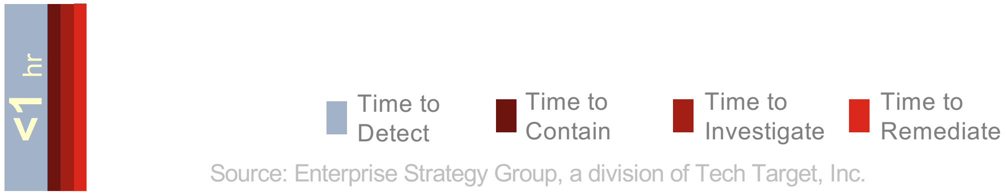
Before

Manual incident response and reporting



After

AI-driven Telco Sec Ops



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