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14. ABSTRACT

By applying a comprehensive 5G Threat Framework to specific use cases and architectures, we can quantify risks and prioritize mitigations to ensure 5G can revolutionize with minimum compromise. Five-G Hierarchy of Threats (FiGHT) Philosophy:

§ A threat model that documents adversary behaviors relevant to 5G

§ Leverages concepts from ATT&CK but is a separate framework

15. SUBJECT TERMS

Modeling and Simulation; Computer Security, 5G; resilience; cybersecurity; FiGHT; adversary behavior

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MITRE FiGHT™
Ensuring a Secure & Resilient 5G

June 16, 2023

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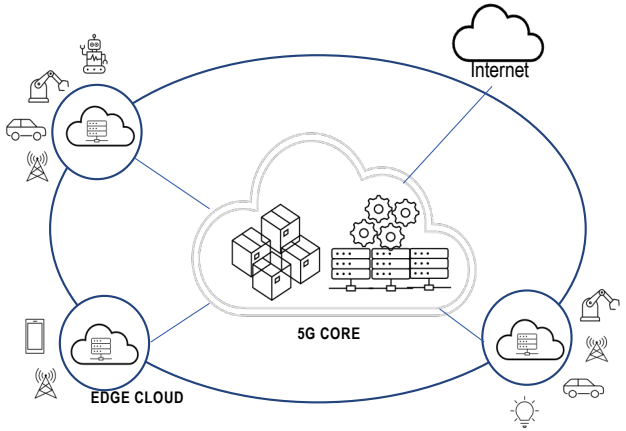
5G Security: Perspective and Needs

5G is the most secure cellular system to date. However, security vulnerabilities remain.

- Decoupling of software and hardware/platform requires new and additional security measures
- Auxiliary technologies from the Internet are brought into 5G and their threats inherited
- Complexity of deployments (cloud, physical, hybrid) poses a configuration/responsibility challenge
- Supply Chain risk is increasing. Use of COTS* and Open-source s/w is ubiquitous
- Standards (e.g. 3GPP) leave some controls optional



By applying a comprehensive 5G Threat Framework to specific use cases and architectures, we can quantify risks and prioritize mitigations to ensure 5G can revolutionize with minimum compromise

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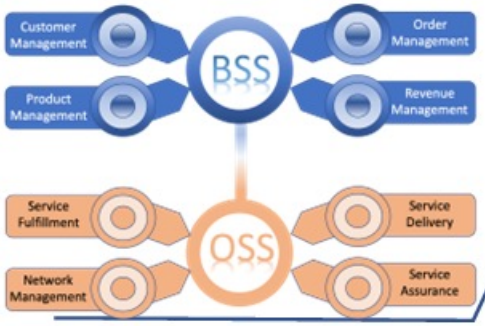
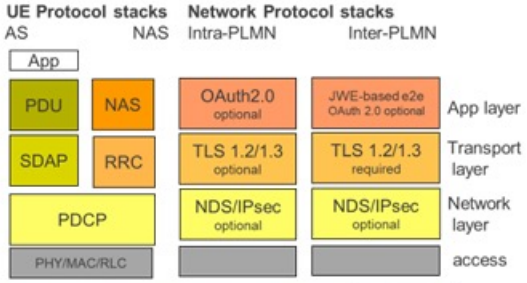
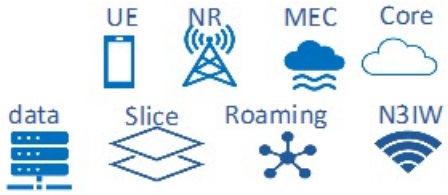
*Commercial off the Shelf, including hardware, software, Operating Systems, Infrastructure, etc.

5G Complexity: A system of many systems







Complexity is the enemy of security

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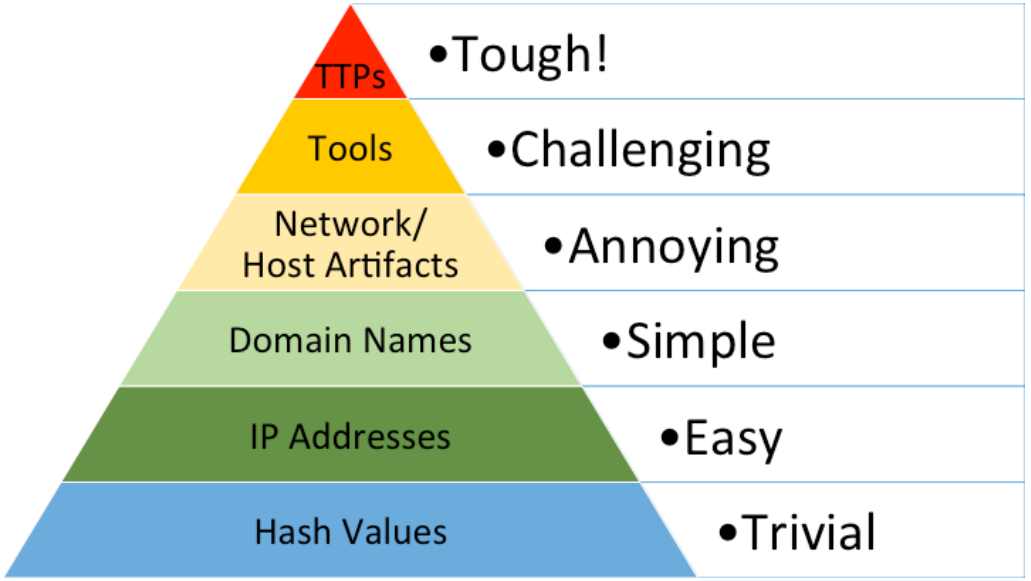
Motivations for a 5G Threat Based Framework

What can the adversary do against your critical assets?

- 5G system well defined: environment bounds adversary operations
- Understanding resulting adversary behavior can inform cyber defense

What can you do against the adversary?

- Reduce the attack surface through various mitigations
- Techniques for hunting and removing adversaries from the network



The Pyramid of Pain by David J Bianco

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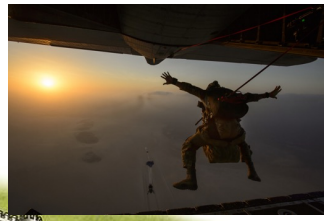
Cybersecurity should be *threat-informed*

Knowledge of my adversary can help me answer…

What do I know about my own strengths and weaknesses?
What do I know about my adversary's capabilities and intent?



Reference: [Engineering-as-a-Moat]

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MITRE | Five-G Hierarchy of Threats

FiGHT™ is a threat-based framework to assess the confidentiality, integrity, and availability of our 5G networks, as well as the systems and applications using them.

FiGHT™ leverages concepts from existing security frameworks and builds upon them, incorporating predictive and lab-proven threats to critical 5G assets.

Risk Management

Identification

Assessments
Analysis & Prioritization

Acquisition planning

Security automation

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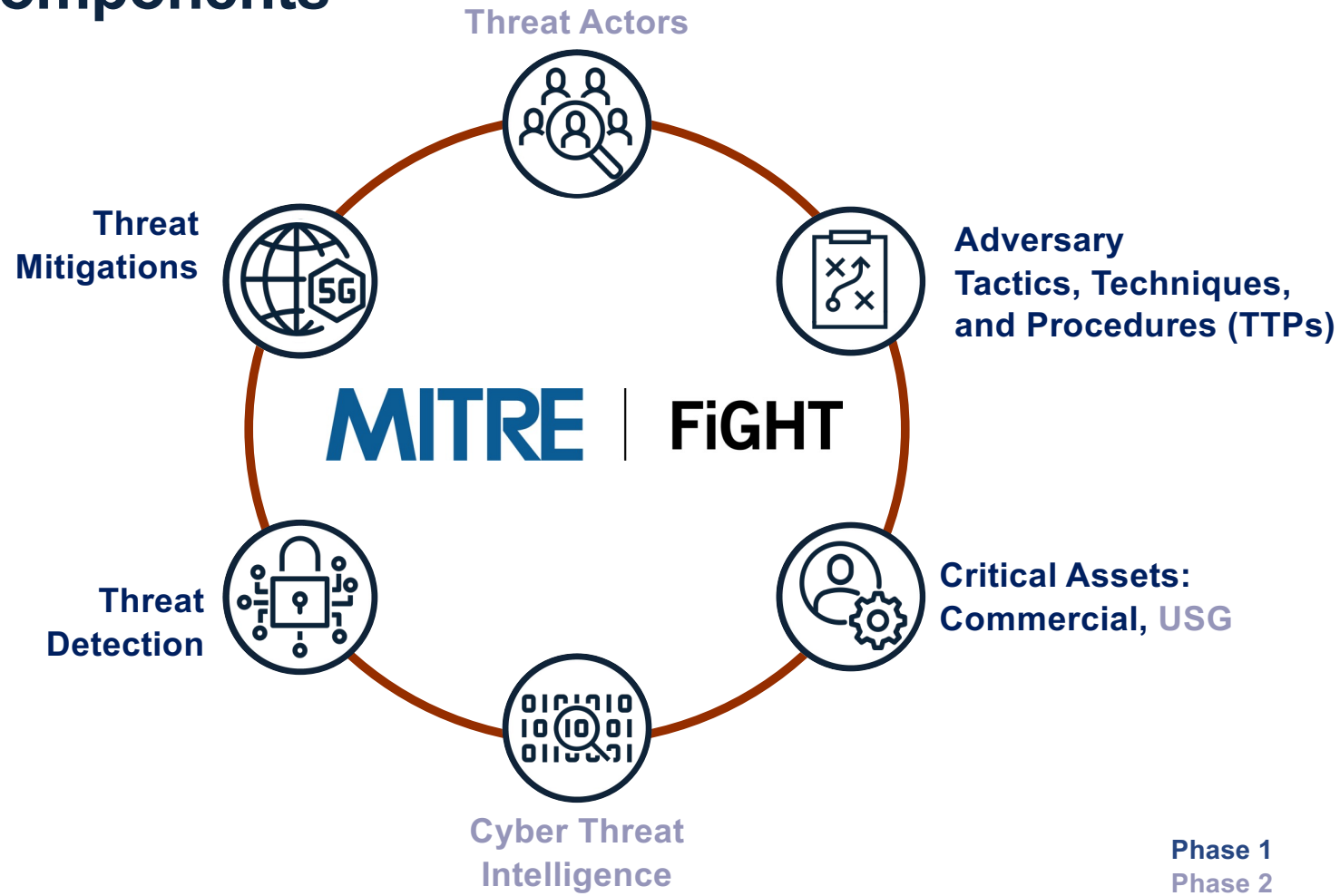
FiGHT™ Components



Phase 1
Phase 2

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FiGHT™ Philosophy

- **A threat model that documents adversary behaviors relevant to 5G**
- **Leverages concepts from ATT&CK but is a separate framework**
- **Sources:**
  - Empirical Observation - adversary behaviors from contributed threat intel.
  - Proof of Concept - adversary behaviors successfully demonstrated in a laboratory setting
  - Predictive - conceptual adversary behaviors not yet demonstrated in a laboratory setting or in the wild
- **Fitting behaviors into a threat model is iterative journey/subject to discussion**

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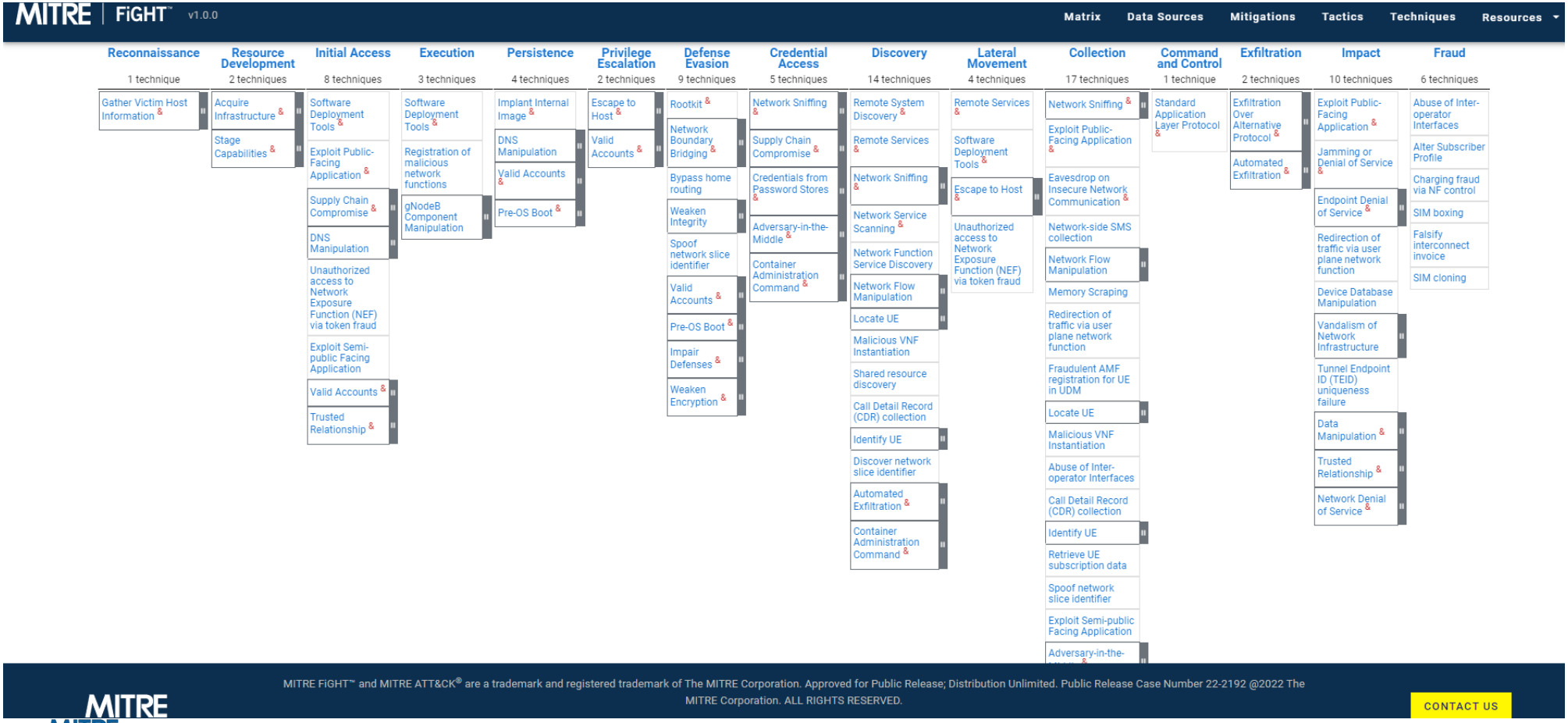
FiGHT™ Matrix

Launched Sept. 2022

https://fight.mitre.org



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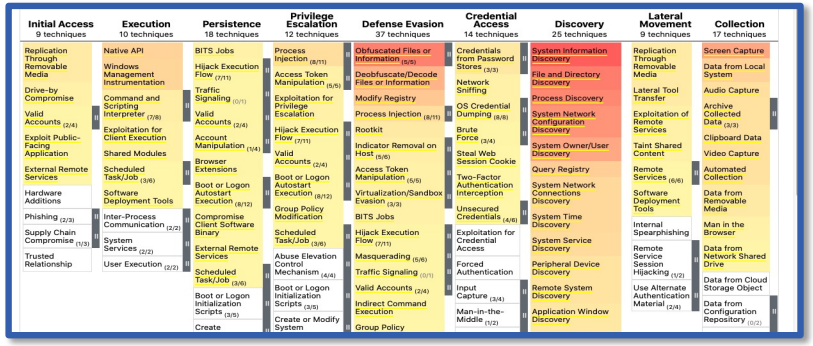
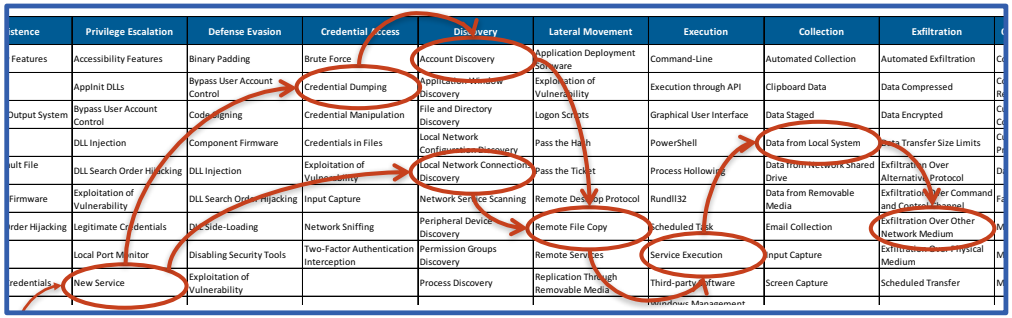
FiGHT™ can be operationalized

See The Threat



Emulate Adversaries



Develop Analytics

```
#Parse log file for failed login attempts
   failed_attempts=$(grep "authentication failure"
/var/log/auth.log)
# Write failed attempts to log file
  if [ -n "$failed_attempts" ]; then
        echo "$failed_attempts" >> "$log_file"
  fi
```

Assess Your Defenses

FiGHT™ can be used to perform threat-informed defense in risk management and operations.

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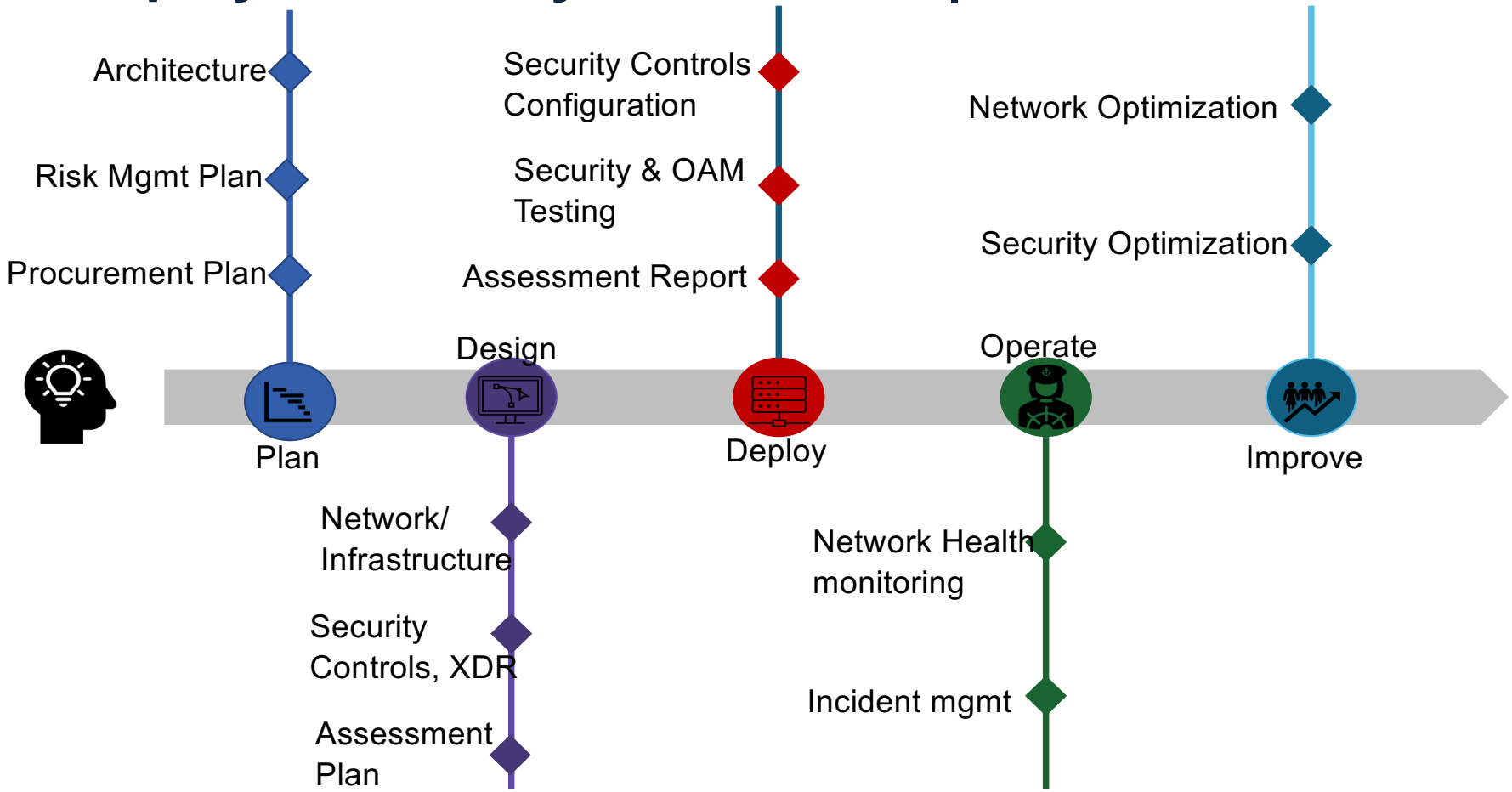
5G Deployment life cycle: FiGHT™ | ATT&CK® informed



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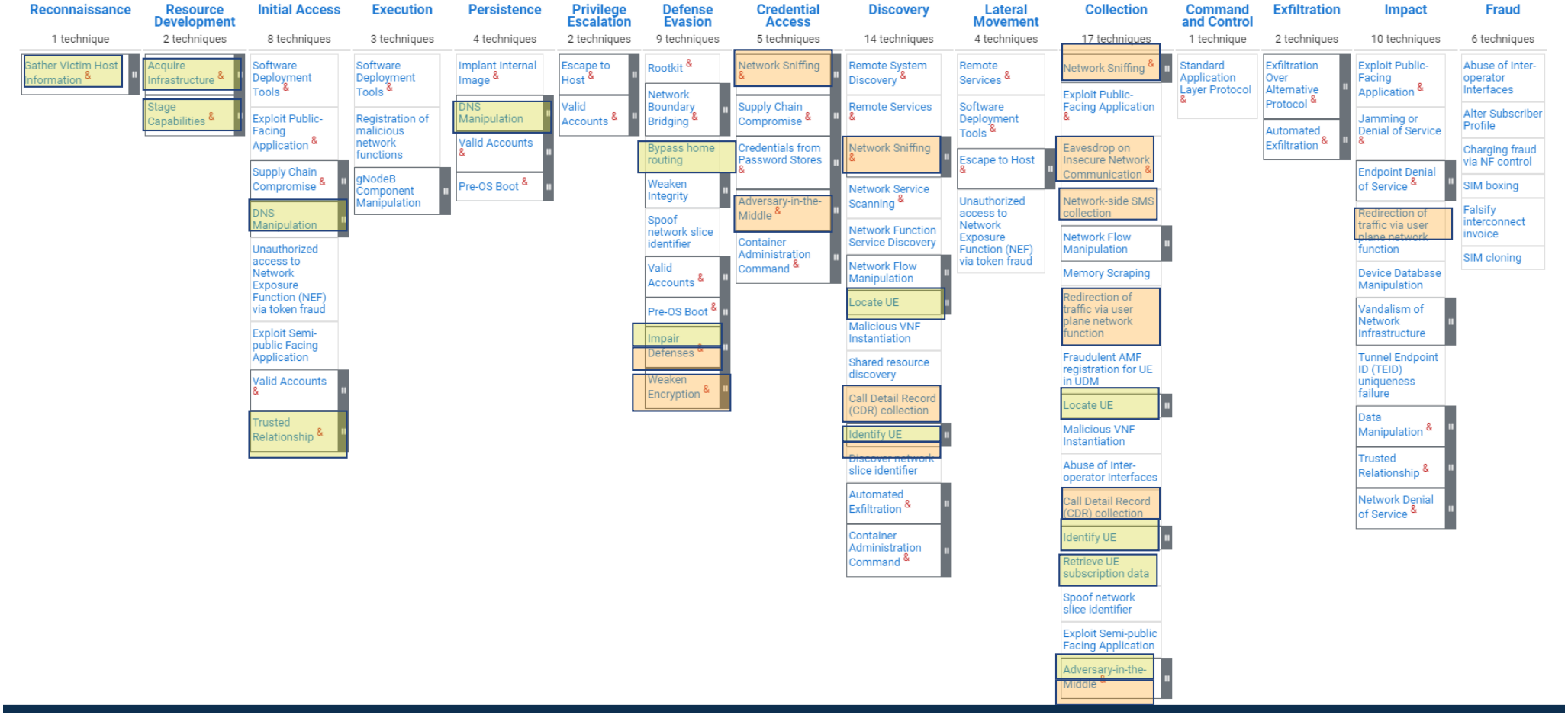
Threats relevant to untrusted commercial deployments
Adversary Goal 1: identify and locate UE; Goal 2: intercept UE communications

Example



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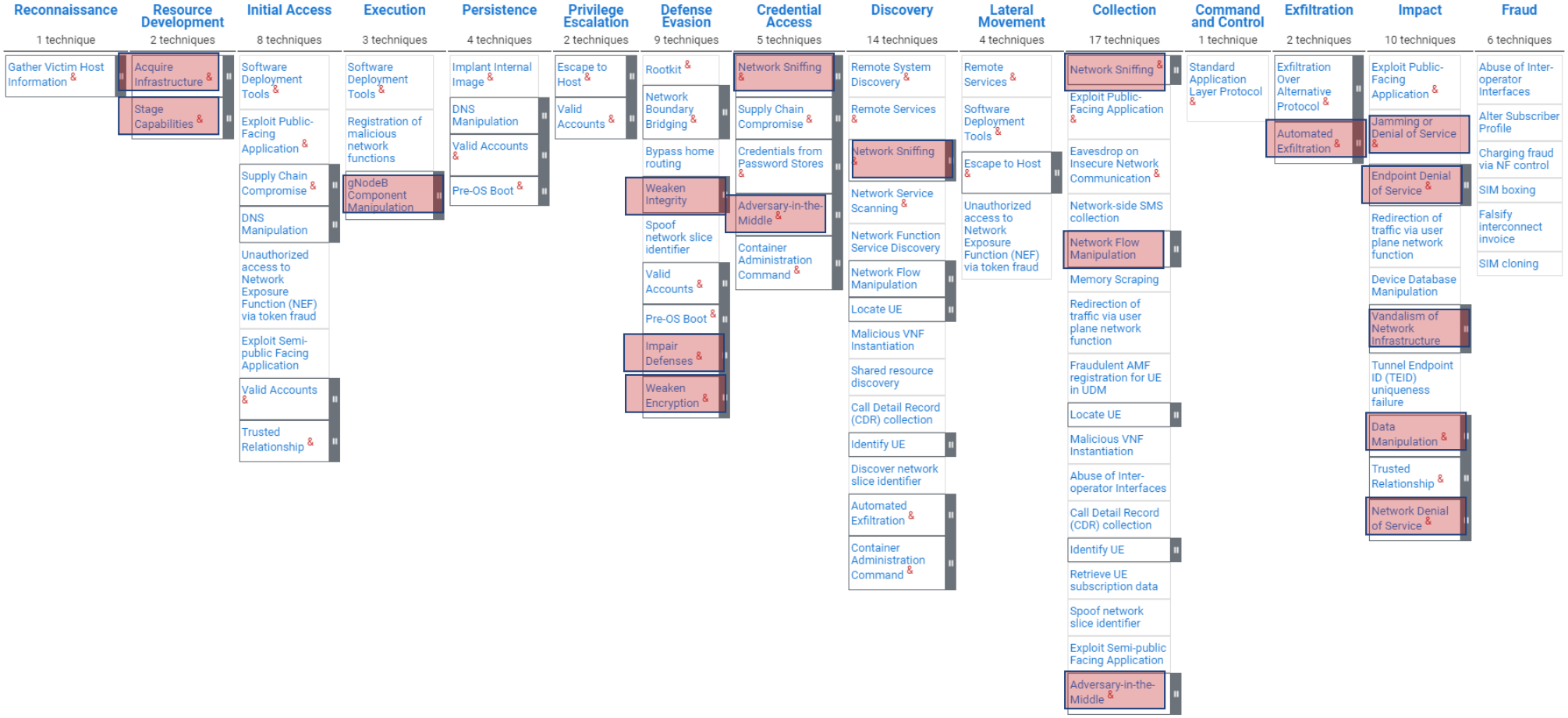
Threats relevant tactical deployments

Adversary goal: intercept or disrupt communications

Example



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FiGHT Tooling

Tools	Tool Use	Status
FiGHT Pipeline	Creation and editing of the threat model	90% complete
FiGHT Navigator	Visual application of the threat model for scenarios building	80% complete
STIX & TAXII	Intelligence sharing STIX – model TAXII – communication method	70% complete Not started
FiGHT Workbench	User-side editing of the threat model	Not started
FiGHT Flow	Visual modeling of adversary emulation over time	Not started
CALDERA	Automated adversary emulation for red team assessment	Not started

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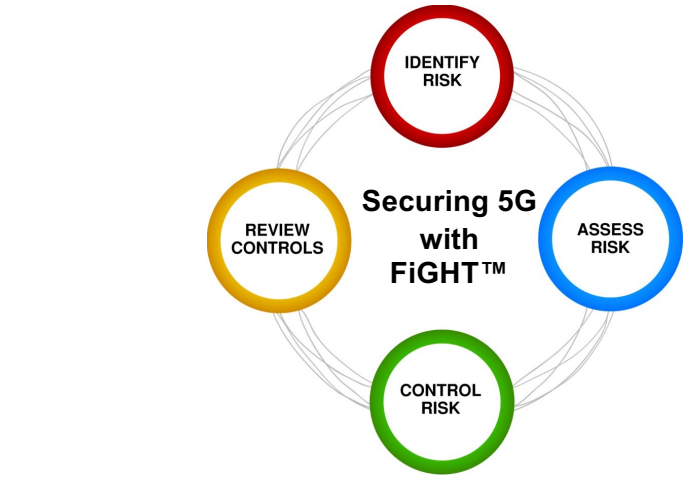
FiGHT summary - DOD

Ensure that the DOD can design, deploy and manage secure tactical networks, and operate through commercial 5G networks whenever and wherever



Achievements:

- Developed and published threat-based framework https://fight.mitre.org
- Continually modernize/extend capability
- Collaborate with vendors, community (e.g., GSMA)

Goals:

- Lab testing of techniques
- Support/collaborate with government sponsors and operators

Impact:

- Enables to operationalize security hardening detection and mitigation techniques --- to protect DOD assets and communication from adversary activity

Tactical

Untrusted

DOD Enterprise

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