How does Endpoint Detection use the MITRE ATT&CK Framework?

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Finding metrics to evaluate security systems has been historically challenging.

MITRE ATT&CK Coverage

Check Point offers the widest coverage of the MITRE ATT&CK matrix

65% more MITRE ATT&CK coverage than average out-of-the-box SIEMs

Stellar Cyber Launches MITRE ATT&CK Coverage Analyzer for Partners and Customers

CrowdStrike Achieves 99% Detection Coverage in First-Ever MITRE ATT&CK Evaluations for Security Service Providers

SentinelOne leads in the latest MITRE ATT&CK Evaluation with 100% prevention

MITRE ATT&CK Coverage: Vectra AI provides over 90%

Carbon Black Delivers MITRE ATT&CK™ Coverage with Zero Delayed Detections & Zero Tainted Detections

SafeBreach Enhances ATT&CK Coverage with Industry Scenarios Focused on Top-16 MITRE TTPs

Rapid7 Delivers Complete Kill Chain Coverage

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MITRE ATT&CK Coverage

There is a risk for misinterpretation with the ATT&CK coverage metric.

CrowdStrike Achieves 99% Detection Coverage in First-Ever MITRE ATT&CK Evaluations for Security Service Providers

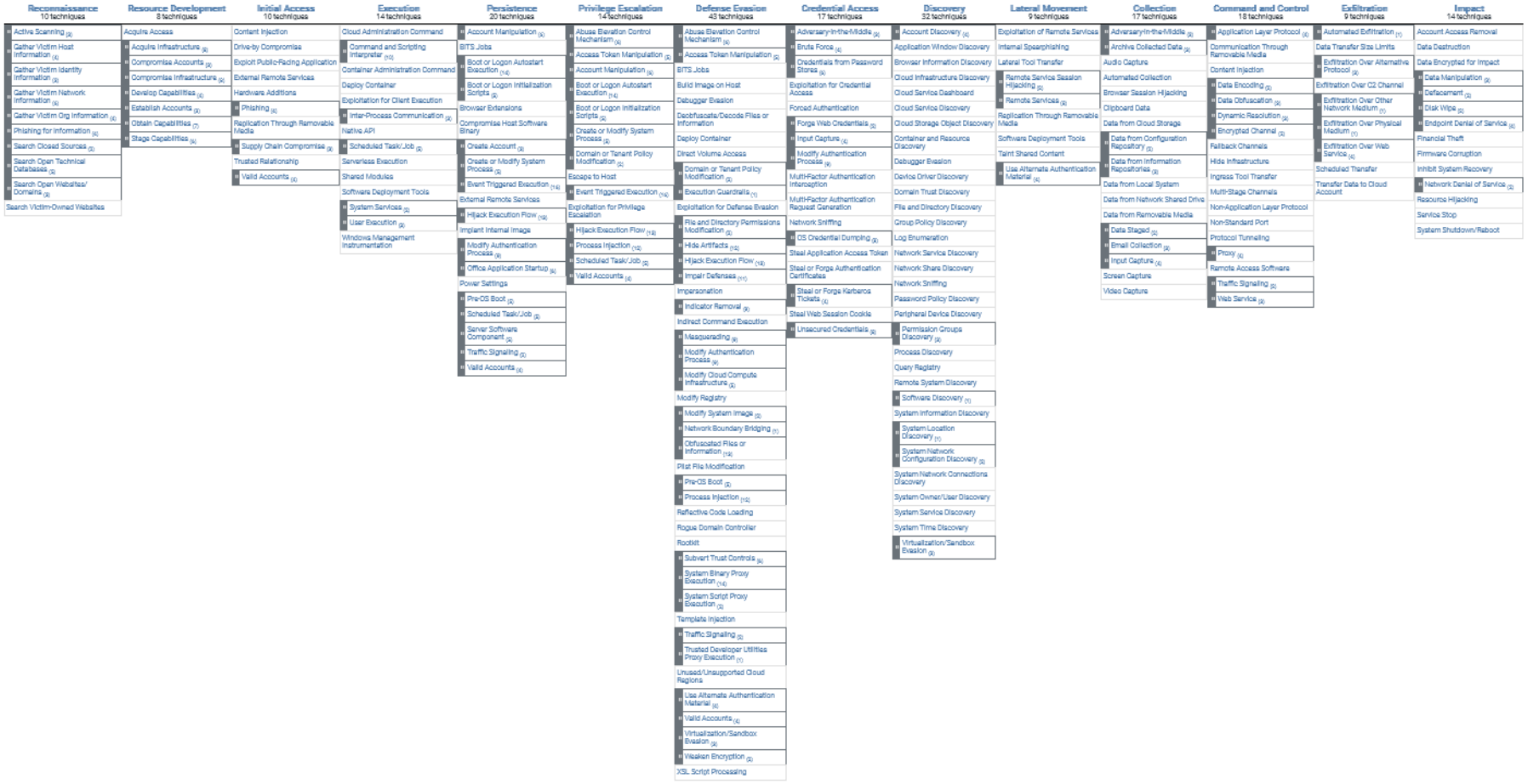
"99% Coverage = 99% Secure"

Should customers rely on ATT&CK coverage to choose a security system for their enterprise?

MITRE ATT&CK Coverage

Is ATT&CK coverage a suitable metric to evaluate endpoint detection systems?

MITRE ATT&CK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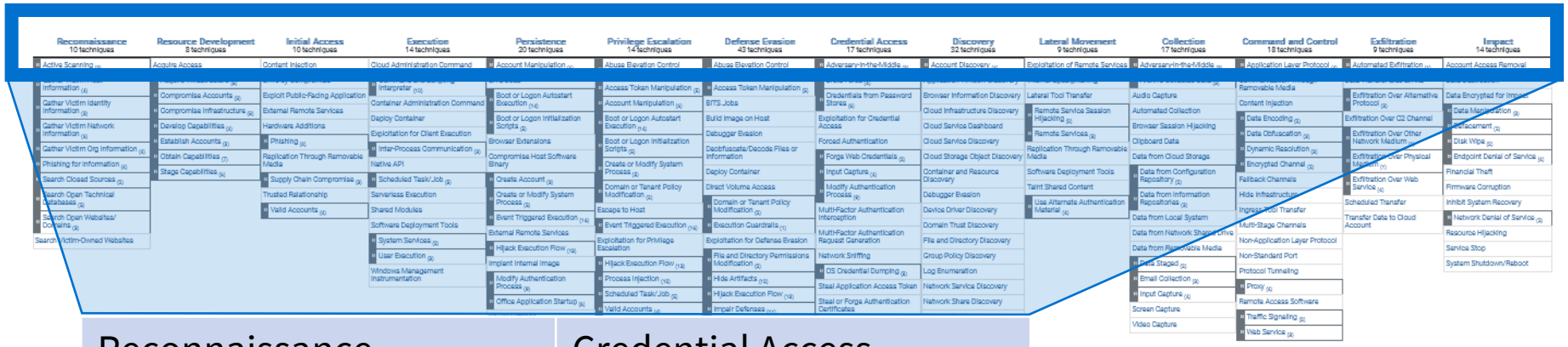
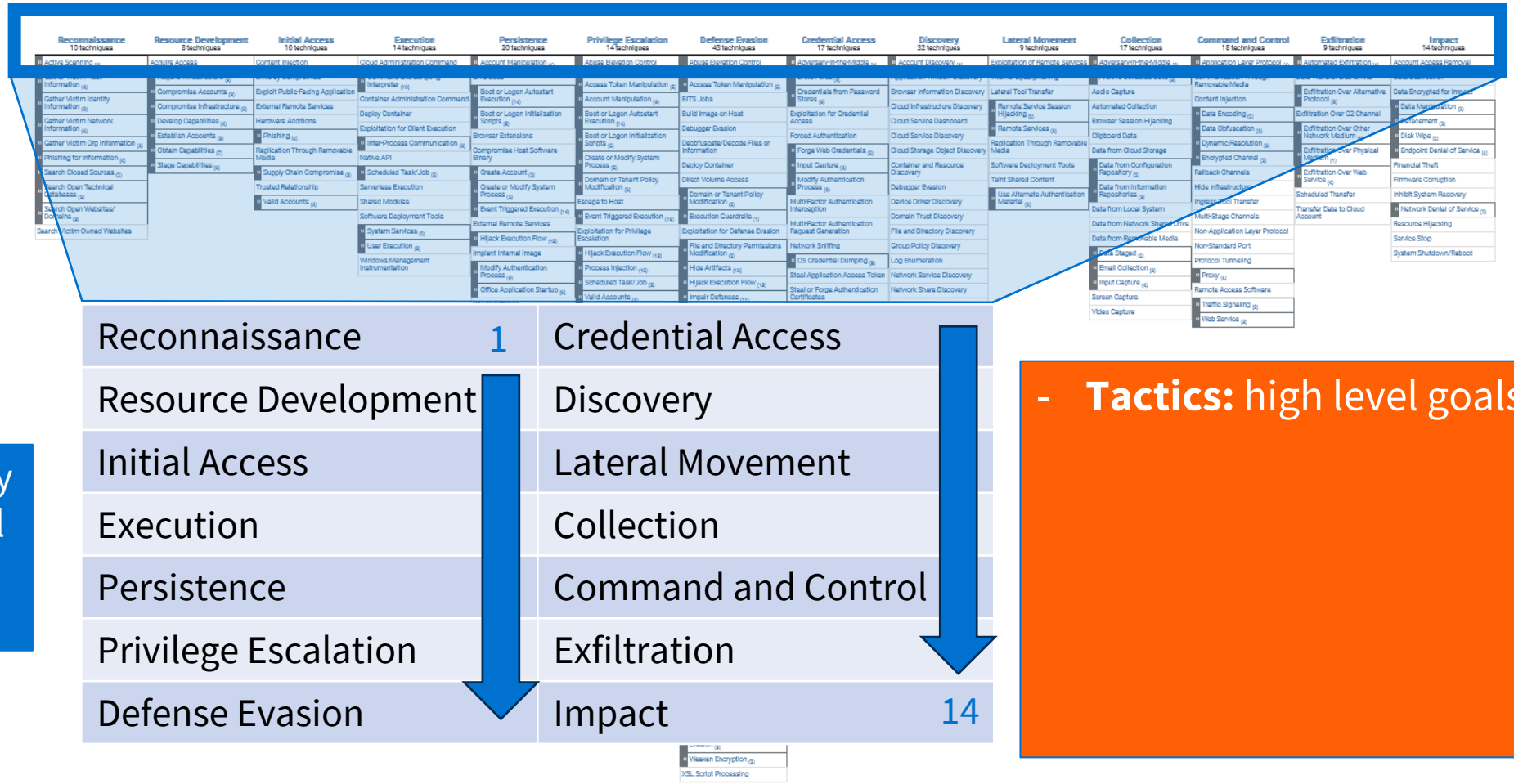
MITRE ATT&CK



Reconnaissance	Credential Access
Resource Development	Discovery
Initial Access	Lateral Movement
Execution	Collection
Persistence	Command and Control
Privilege Escalation	Exfiltration
Defense Evasion	Impact

- **Tactics:** high level goals

MITRE ATT&CK

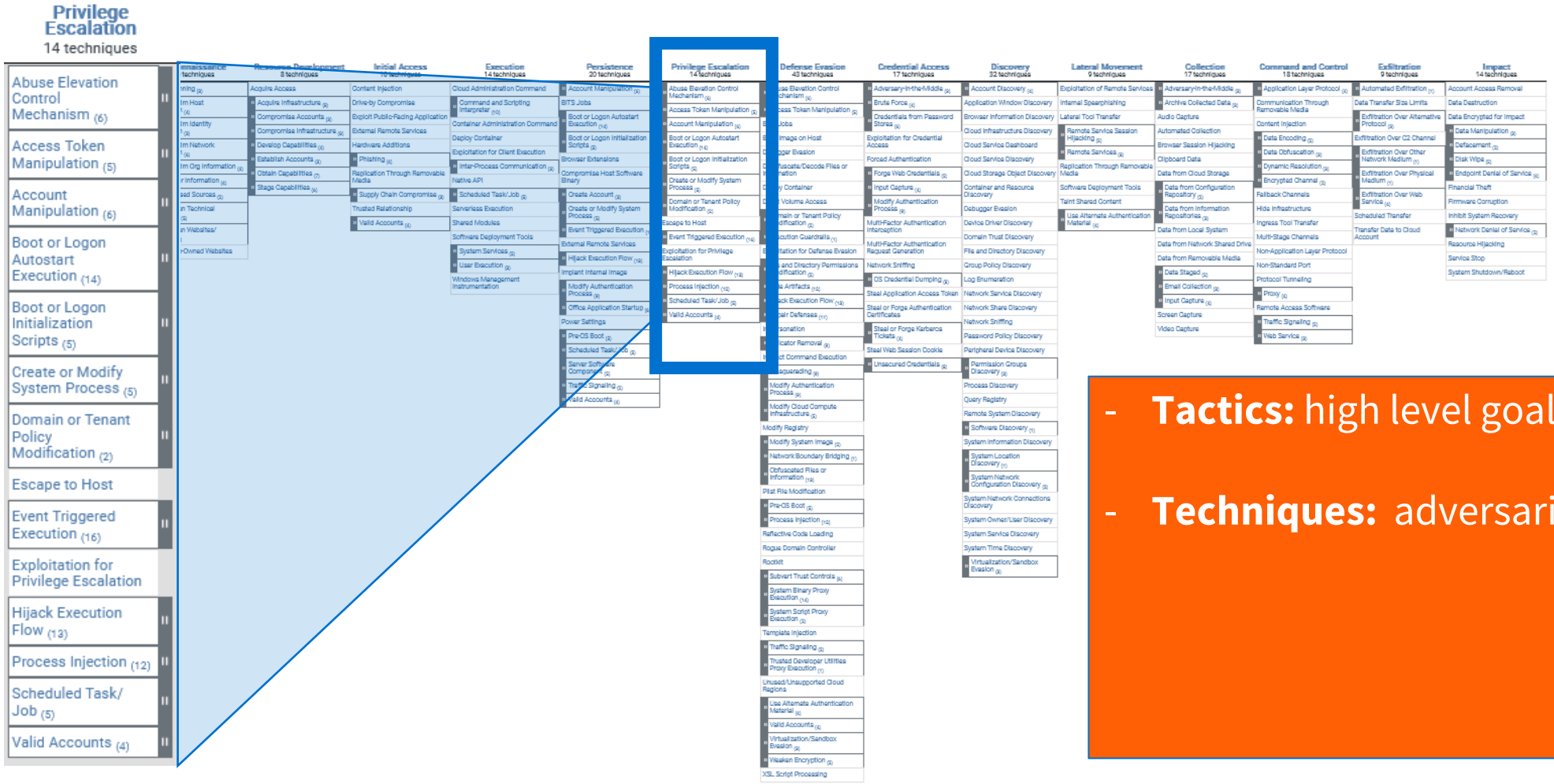


Reconnaissance	1	Credential Access	
Resource Development		Discovery	
Initial Access		Lateral Movement	
Execution		Collection	
Persistence		Command and Control	
Privilege Escalation		Exfiltration	
Defense Evasion		Impact	14

Approximately chronological order during an attack

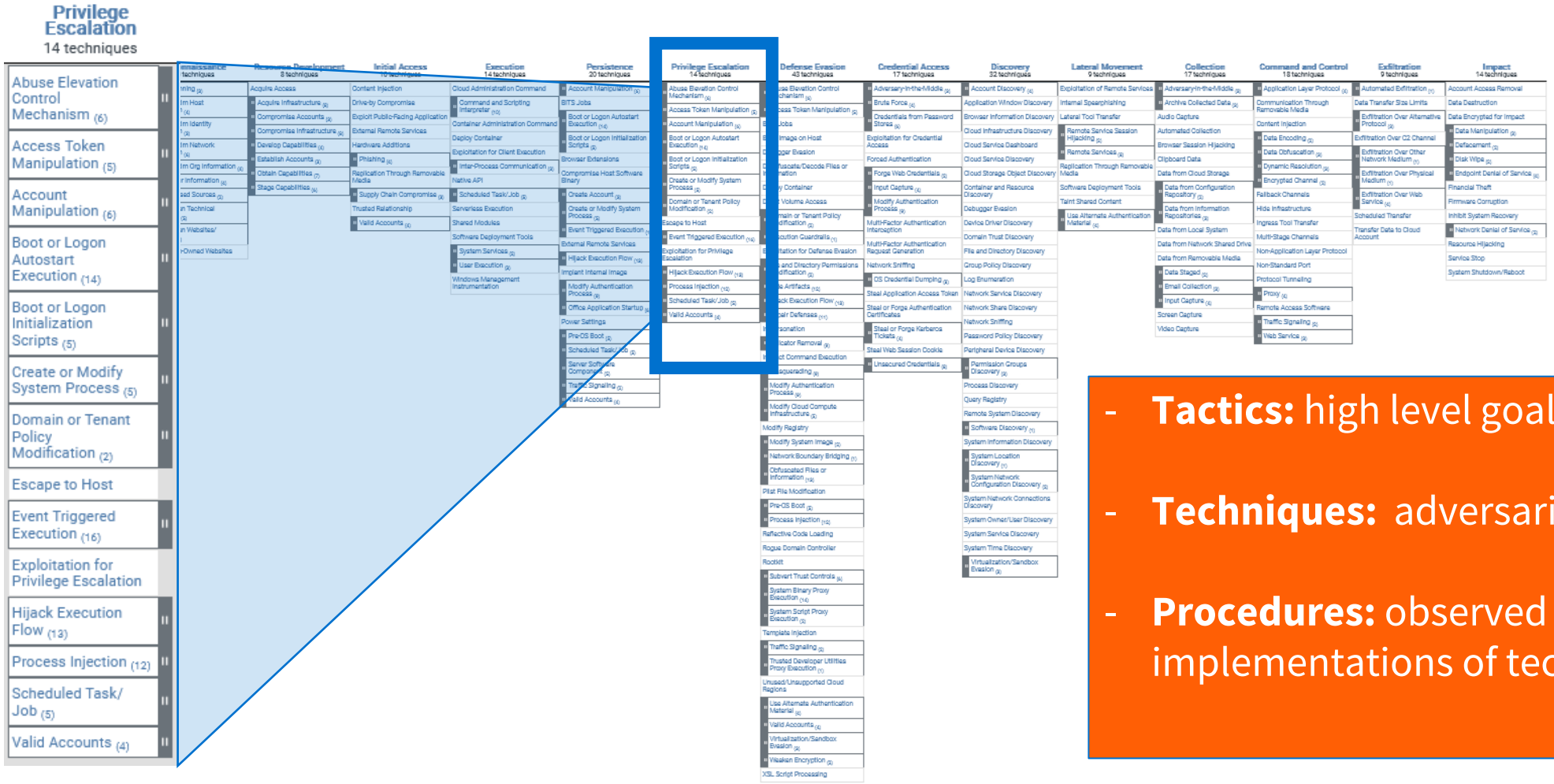
- **Tactics:** high level goals

MITRE ATT&CK



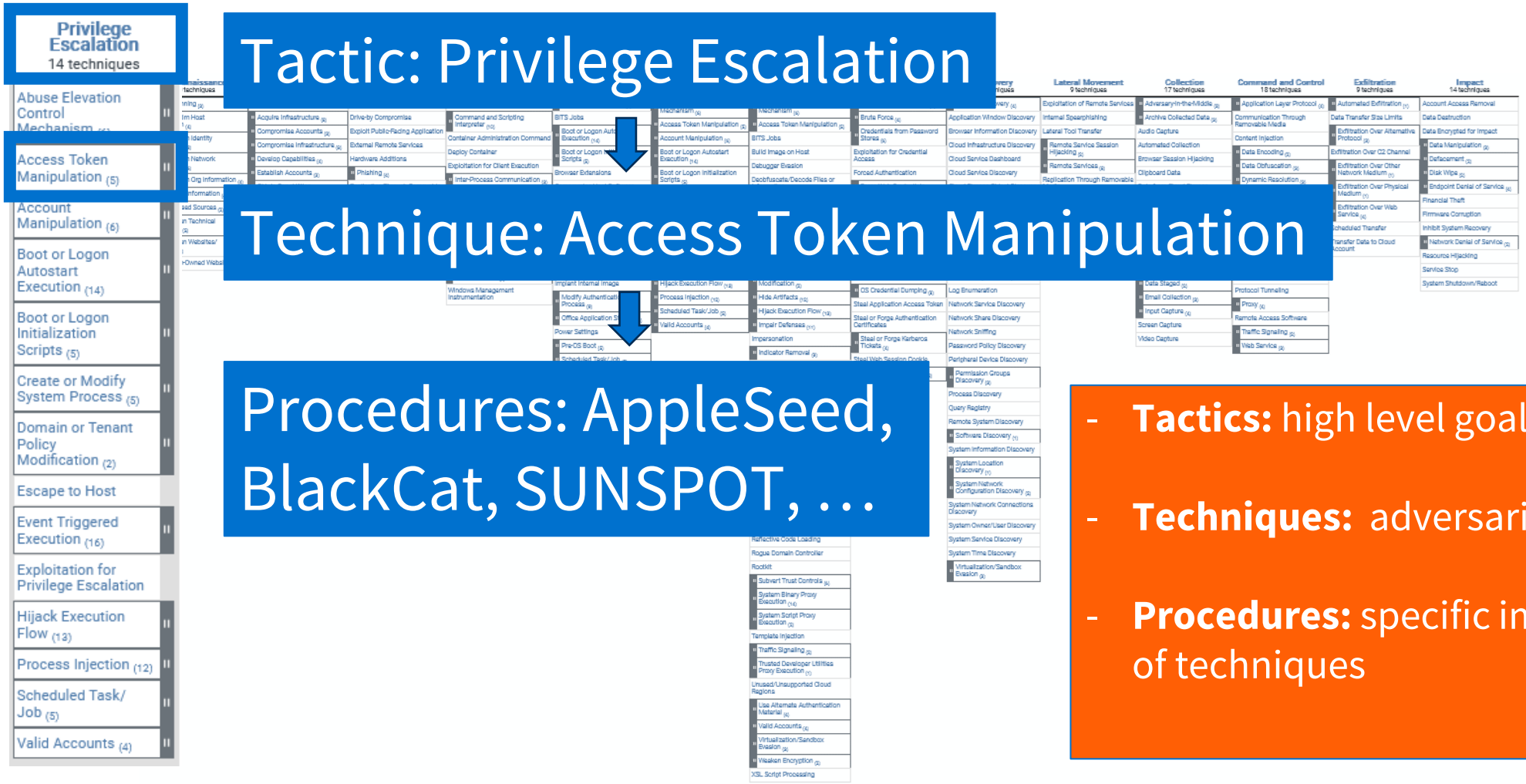
- **Tactics:** high level goals
- **Techniques:** adversarial actions

MITRE ATT&CK



- **Tactics:** high level goals
- **Techniques:** adversarial actions
- **Procedures:** observed implementations of techniques

MITRE ATT&CK



- **Tactics:** high level goals
- **Techniques:** adversarial actions
- **Procedures:** specific implementation of techniques

Endpoint Detection

Carbon Black

```
process_name:wevtutil.exe
and process_cmdline:cl*
and -process_cmdline:clicktorun*
and -process_cmdline:AnyConnect\.evtx*
```

T1070 (Indicator Removal)
Defense Evasion

Splunk

```
(Processes.process_name="RDPWInst.exe"
  OR Processes.original_file_name= "RDPWInst.exe")
AND Processes.process IN ("* -i*", "* -s*",
    "* -o*", "* -w*", "* -r*")
```

T1021 (Remote Services)
Defense Evasion

Elastic

```
event.category : (network or network_traffic)
and network.transport:tcp
and (destination.port: 26
     or (event.dataset:zeek.smtp
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T1048 (Exfilt. Over Alt. Prtcl)
Command & Control,
Exfiltration

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Vendor tagged techniques and tactics

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Rules → Exist on the Procedural level of ATT&CK!

Vendor tagged techniques and tactics

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90% coverage of ATT&CK

==

At least 1 detection rule for 90% of ATT&CK techniques

Rules → Exist on the Procedural level of ATT&CK!

Vendor tagged techniques and tactics

Endpoint Detection

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process_name:wevtutil.exe
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```

```
    or (event.dataset:zeek.smtp
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```

Technique coverage doesn't tell us about how many procedural level threats we can detect!

90% coverage of ATT&CK

==

At least 1 detection rule for 90% of ATT&CK techniques

Rules → Exist on the Procedural level of ATT&CK!

Vendor tagged techniques and tactics

How is MITRE ATT&CK integrated with real-world endpoint detection products?

Dataset

	Carbon Black	Splunk	Elastic	Sigma
Type of Ruleset	commercial, proprietary	commercial, open-source	commercial, open-source	crowdsourced
# ATT&CK Tagged Rules	867	911	473	2195
Metadata Field				
Name of Attack	✓	✓	✓	✓
Description	✓	✓	✓	✓
ATT&CK Technique(s)	✓	✓	✓	✓
Confidence	✓	✓		
Risk Score		✓	✓	
Severity Score	✓		✓	

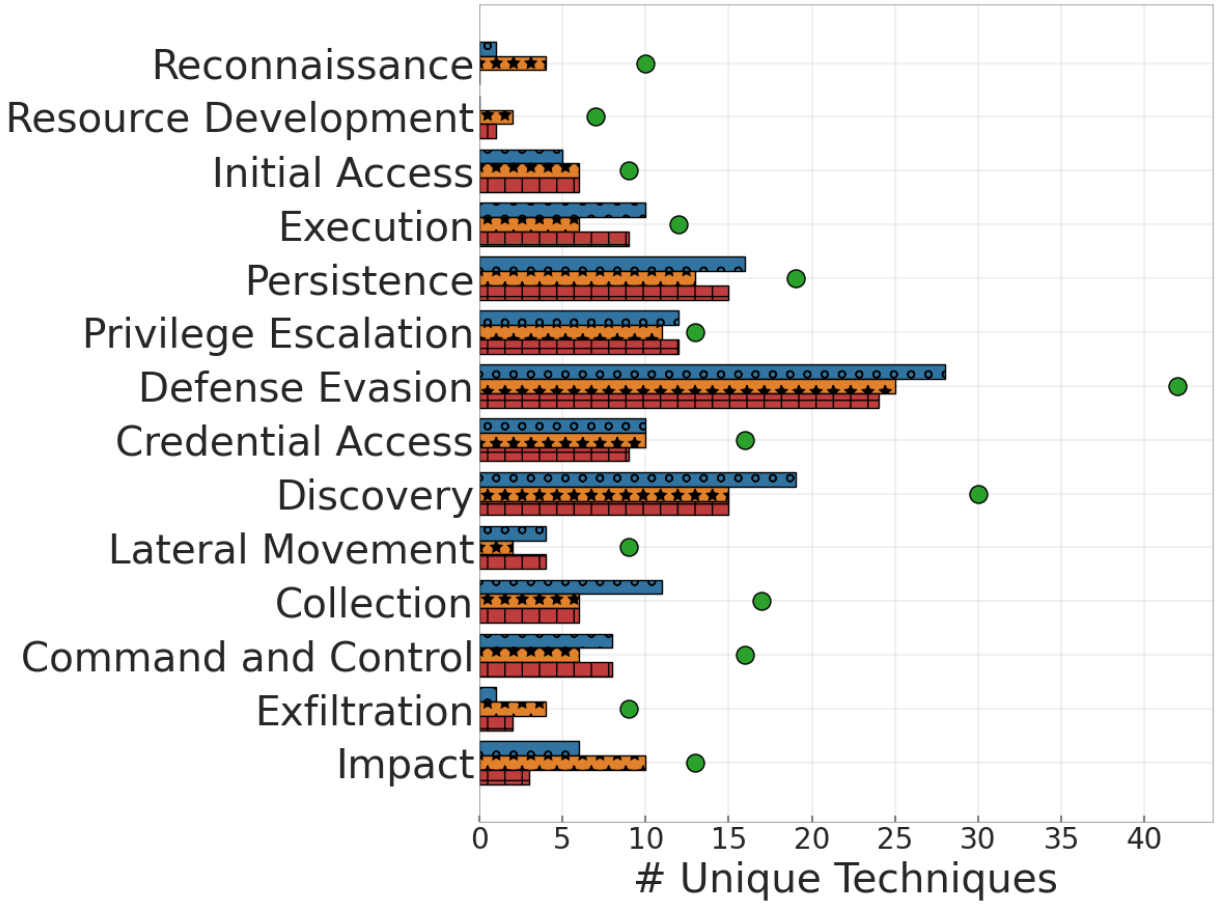
Research Questions

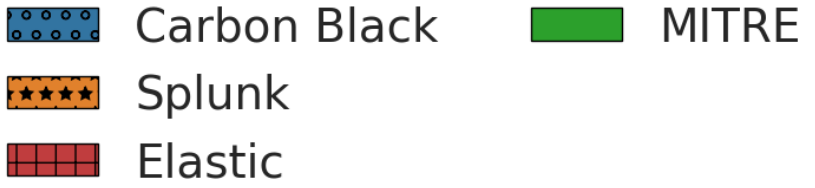
1. **How do products use ATT&CK?**

2. Why don’t products detect all of ATT&CK?

3. How consistently do products apply ATT&CK?

Technique Coverage under each Tactic

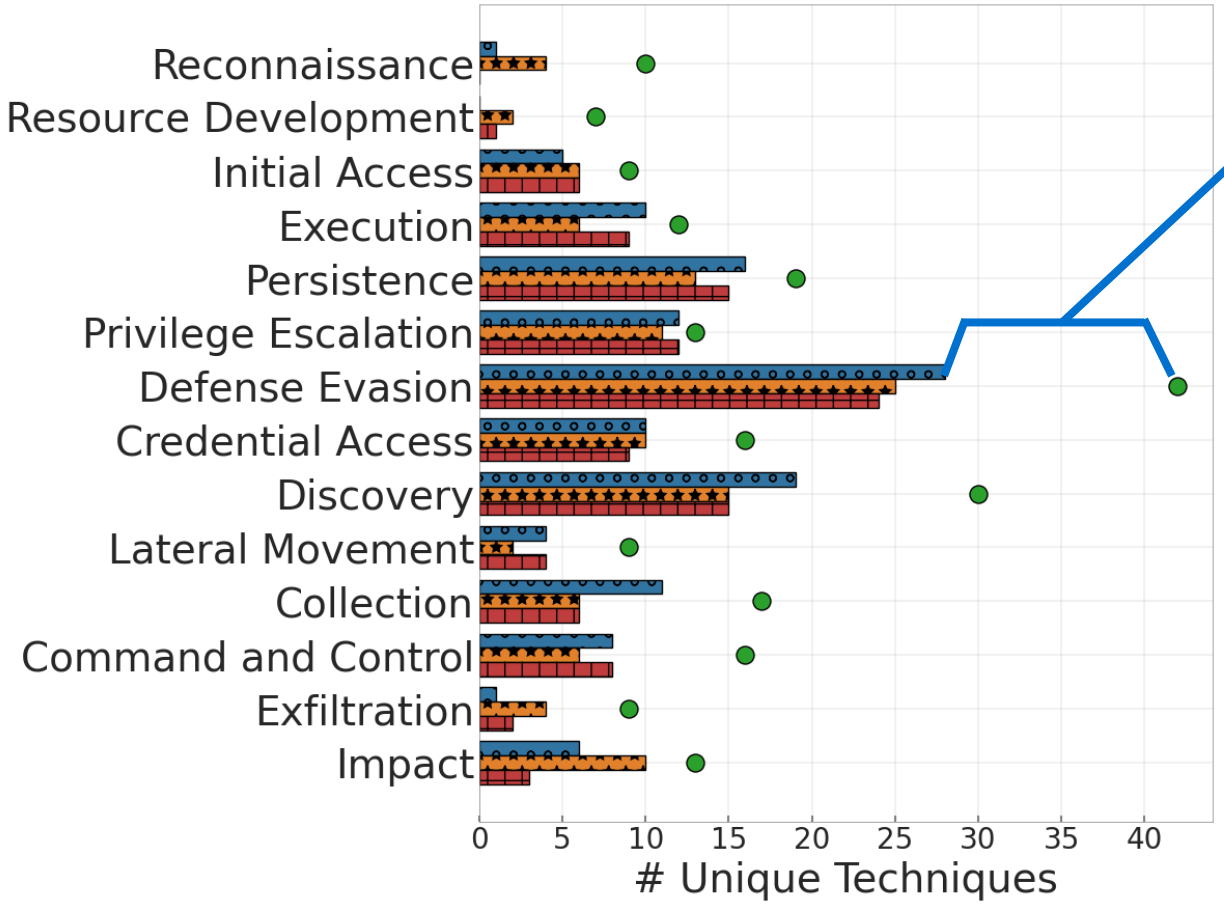




Findings:

- Products prioritize the same tactics and techniques.
- Coverage across all products combined is far from 100%.

Technique Coverage under each Tactic



Number of techniques under a tactic not covered by each product

Carbon Black
Splunk
Elastic
MITRE

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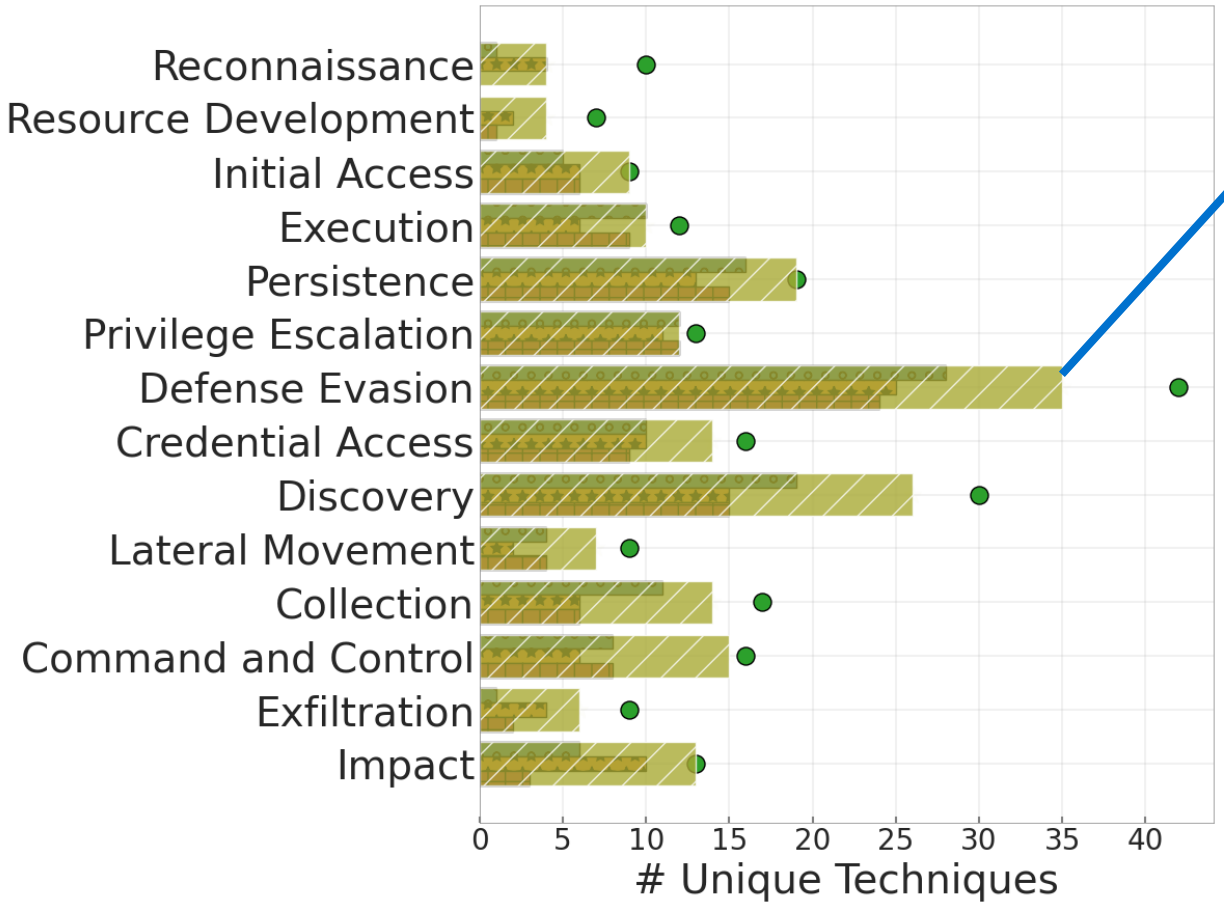
Technique Coverage under each Tactic



Number of techniques under a tactic covered by all products combined

Carbon Black
Splunk
Elastic
MITRE
Union

Findings:

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Impact of Risk/Severity/Confidence on Coverage

Metric	Filter	Carbon Black	Splunk	Elastic
Baseline	No Filter	55%	52%	48%
Risk	>= Med.	/	43%	42%
	>= High	/	25%	26%
Severity	>= Med.	52%	/	42%
	>= High	46%	/	26%
Confidence	>= Med.	/	51%	/
	>= High	/	46%	/

Findings:

- When filtering out low and medium severity/risk rules, ATT&CK technique coverage is halved for both Splunk and Elastic.

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Research Questions

1. How do products use ATT&CK?

2. **Why don’t products detect all of ATT&CK?**

3. How consistently do products apply ATT&CK?

Qualitative Analysis of Unimplemented Techniques

Three coders independently analyze **53 techniques that were not implemented in any of the three commercial products.**

Findings:

- Many techniques are difficult (if not impossible) to implement as effective detection rules.

Label	Techniques	Example
Ineffective Detection Method	21 (39.6%)	T1480
Targeting Non-Host Infrastructure	13 (24.5%)	T1584
Client-specific	9 (17.0%)	T1528
Vague Detection Method	9 (17.0%)	T1602
Targeting Third Parties	8 (15.1%)	T1591
Provenance-based Detection	4 (7.5%)	T1578
Involving Low-level Behavior	3 (5.7%)	T1200
Involving Removable Media	3 (5.7%)	T1025
Involving Human Factors	1 (1.9%)	T1598
Reason Unknown	2 (3.8%)	T1217
Total Unique Techniques	53	

Top Reasons for Unimplemented Techniques

Explanation	# Techniques	Example
Ineffective Detection Method	21 (39.6%)	T1480 (Execution Guardrails): MITRE ATT&CK explicitly mentions that this behavior is difficult to detect.
Targeting Non-Host Infrastructure	13 (24.5%)	T1584 (Compromise Infrastructure): Suggested active Internet scanning of remote infrastructure is not suitable for endpoint detection.
Client-specific	9 (17.0%)	T1528 (Steal Application Access Token): Detection requires knowledge of customer-specific services or parameters.

Research Questions

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2. Why don’t products detect all of ATT&CK?

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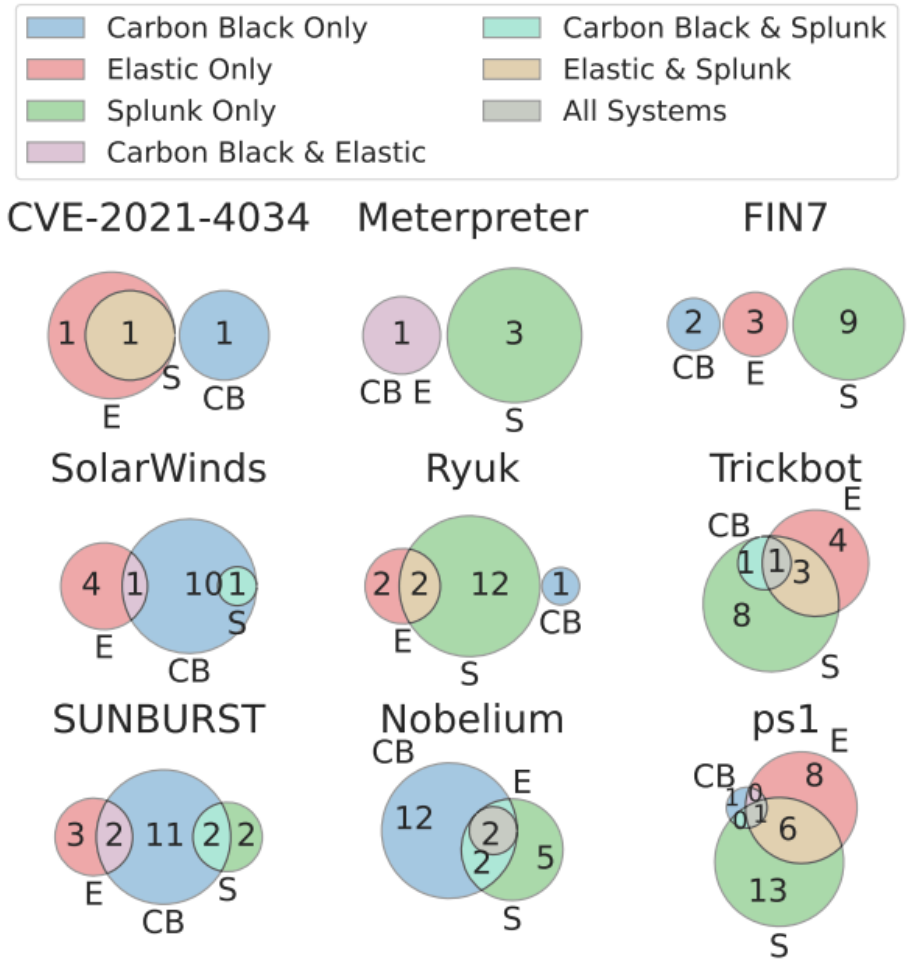
Technique Consistency for the Same Malicious Entities

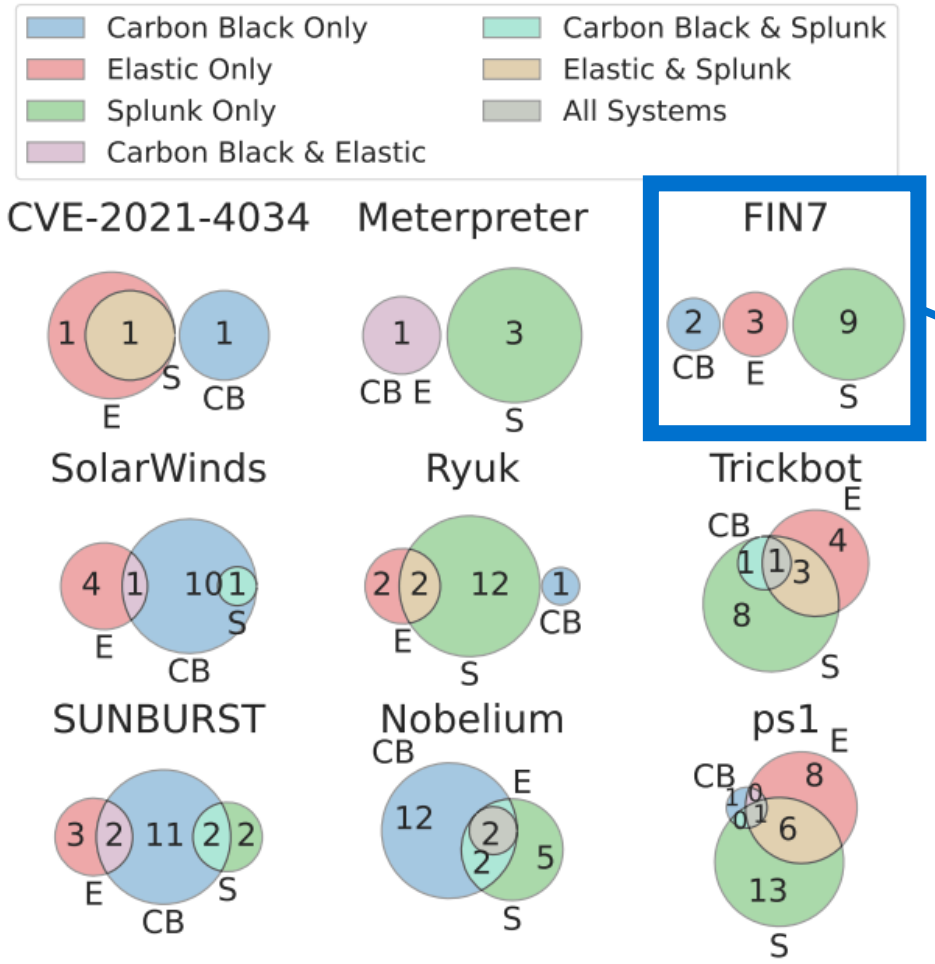


Identify rules are created to address a common malicious entity.

Findings:

- Even when products try to detect the same threat, they rarely use the same ATT&CK techniques to describe it!

Technique Consistency for the Same Malicious Entities



Identify rules are created to address a common malicious entity.

Discrete sets of techniques!

Findings:

- Even when products try to detect the same threat, they rarely use the same ATT&CK techniques to describe it!

Case Studies of Inconsistent Techniques

Named pipe impersonation– associated with **Meterpreter**

```
event.type == “start”
and process.pe.original_file_name in (“Cmd.exe”,
      “Powershell.EXE”)
and process.args : “echo”
and process.args : “>”
and process.args : “\\\\.\\pipe\\*”
```

Elastic: T1134 (Access Token Manipulation)

```
Processes.process_name= “cmd.exe”
OR Processes.original_file_name= Cmd.exe
OR Processes.process= *%comspec%*
(Processes.process=*echo* AND
Processes.process=*pipe*)
```

Splunk: T1059 (Command and Scripting Interpreter), T1543 (Create or Modify System Process)

cmd.exe /c echo 4 sgryt3436 > \\ .\ pipe \5 erg53

Both rules would fire!

Findings:

- Ambiguity and overlap between techniques at the procedural level leads to disagreement.

Disagreement in Tactics

Potentially malicious DNS activity with nslookup – associated with **FIN7** and **SUNBURST**

event.category:process
and **event.type**:start
and **process.name**:nslookup.exe
and **process.args**:
(-querytype= or* –qt=* *or* –q=* *or* type=*)

Elastic: Command and Control

Process.process_name = "nslookup.exe"
Process.process = "*-querytype=*" *OR*
Process.process = "*-qt=*" *OR*
Process.process = "*-q=*" *OR*
Process.process = "*-type=*" *OR*
Process.process = "*-retry=*"

Splunk: Exfiltration

Nslookup.exe –querytype=A usenix.org

Both rules would fire!

Findings:

- Security analysts may attribute the same system log activity to completely different motivations depending on which product they are using!

Takeaways

1. How do products use ATT&CK?

   Products prioritize similar tactics and techniques, but do not reach 100% technique coverage even if combined.

2. Why don’t products detect all of ATT&CK?

   A fraction of techniques are inherently difficult to detect!

3. How consistently do products apply ATT&CK?

   Products disagree on ATT&CK techniques for similar rules due to ambiguities and overlaps within ATT&CK itself.

Discussion with Stakeholders

- Vendors are aware of the tension between ATT&CK coverage metrics and effective detections.

- MITRE confirmed the importance of investigating the details of low-level detection behaviors.

- Practitioners from a cyber risk assessment company highlighted that the security community is not aligned about how tactics and techniques happen at an endpoint.

Recommendations

- MITRE: provide more extensive guidelines on how to interpret ATT&CK.
  - Formalize relationships between overlapping or connected techniques.
  - Ongoing efforts: Improved ATT&CK Evaluations, Summiting the Pyramid.

- Practitioners: take steps to support other methods of rule evaluation.
  - Systematize exchange of rule performance information across organizations.
  - Develop alternate heuristics to evaluate rules independent of environment.

Thank you!

How does Endpoint Detection use the MITRE ATT&CK Framework?

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