Decoding Cyber Threats

A Practical Guide to Using Attack Trees

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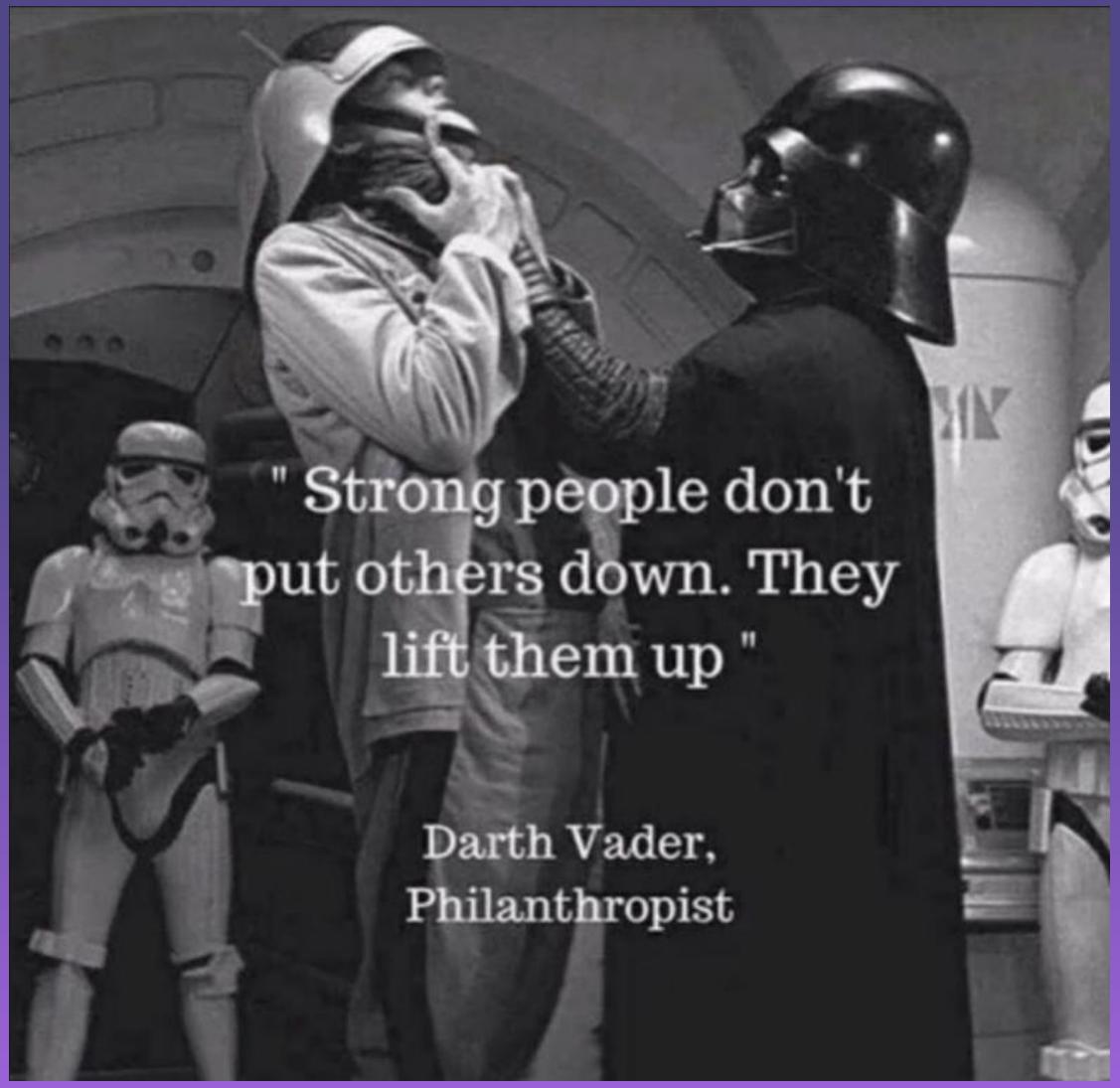
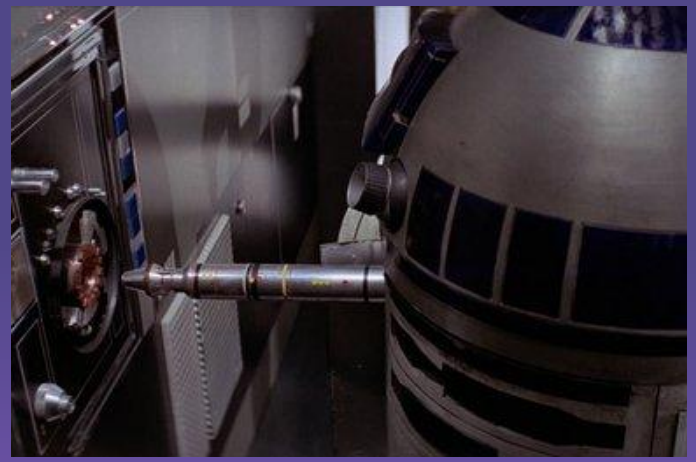
28 January 2025

CTI & Decision-Making



Ever been in this situation?



Identifying Systemic Vulnerabilities

Responding to an Incident

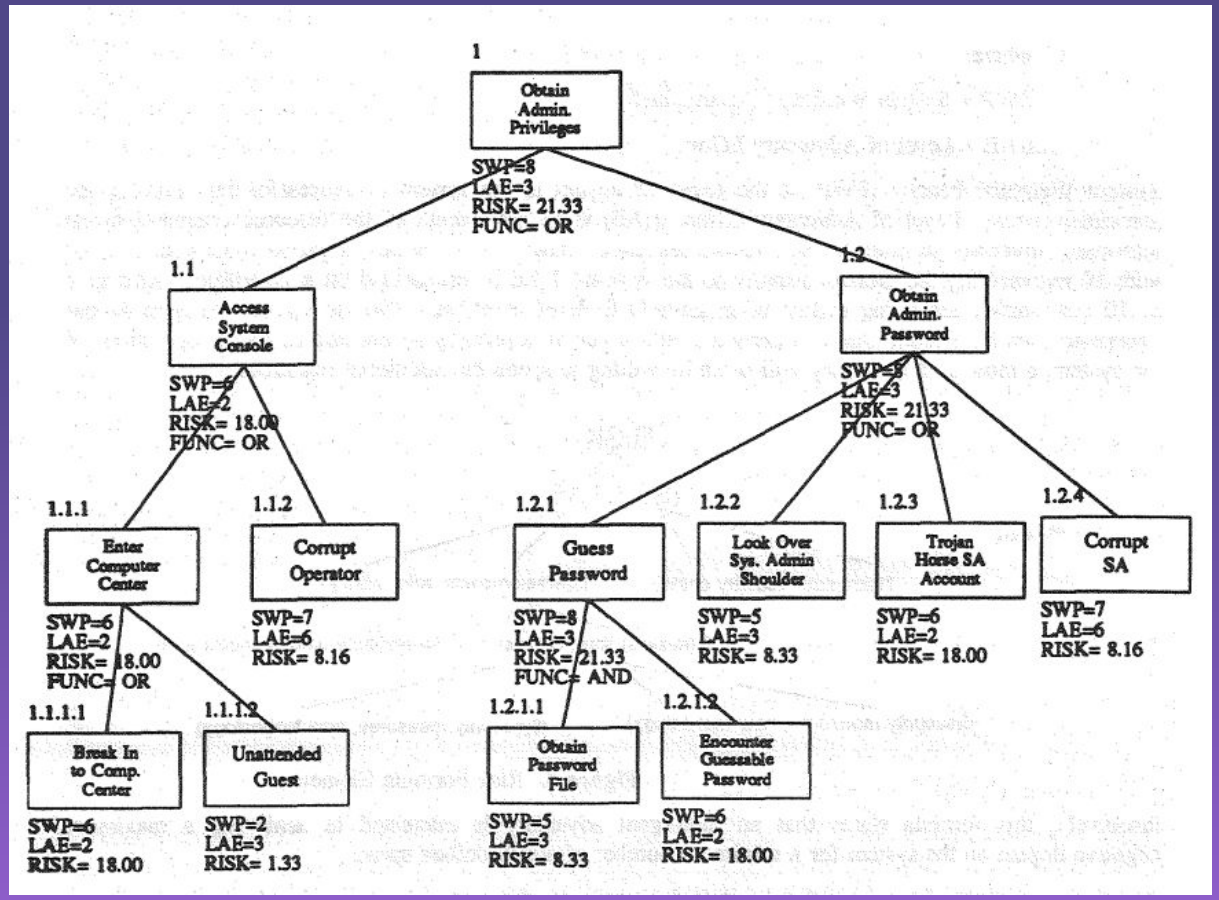
Prioritizing Security Investment

Sometimes while protecting your business, you need to make rapid decisions

Why Attack Trees

Why were Attack Trees created in the first place?

- Visualize Attack Scenarios
- Threat Modeling
- Decision-Making



Jonathan Weiss, 1982

We love history

1982
Conceptualized as threat trees by Jonathan Weiss, Bell laboratories

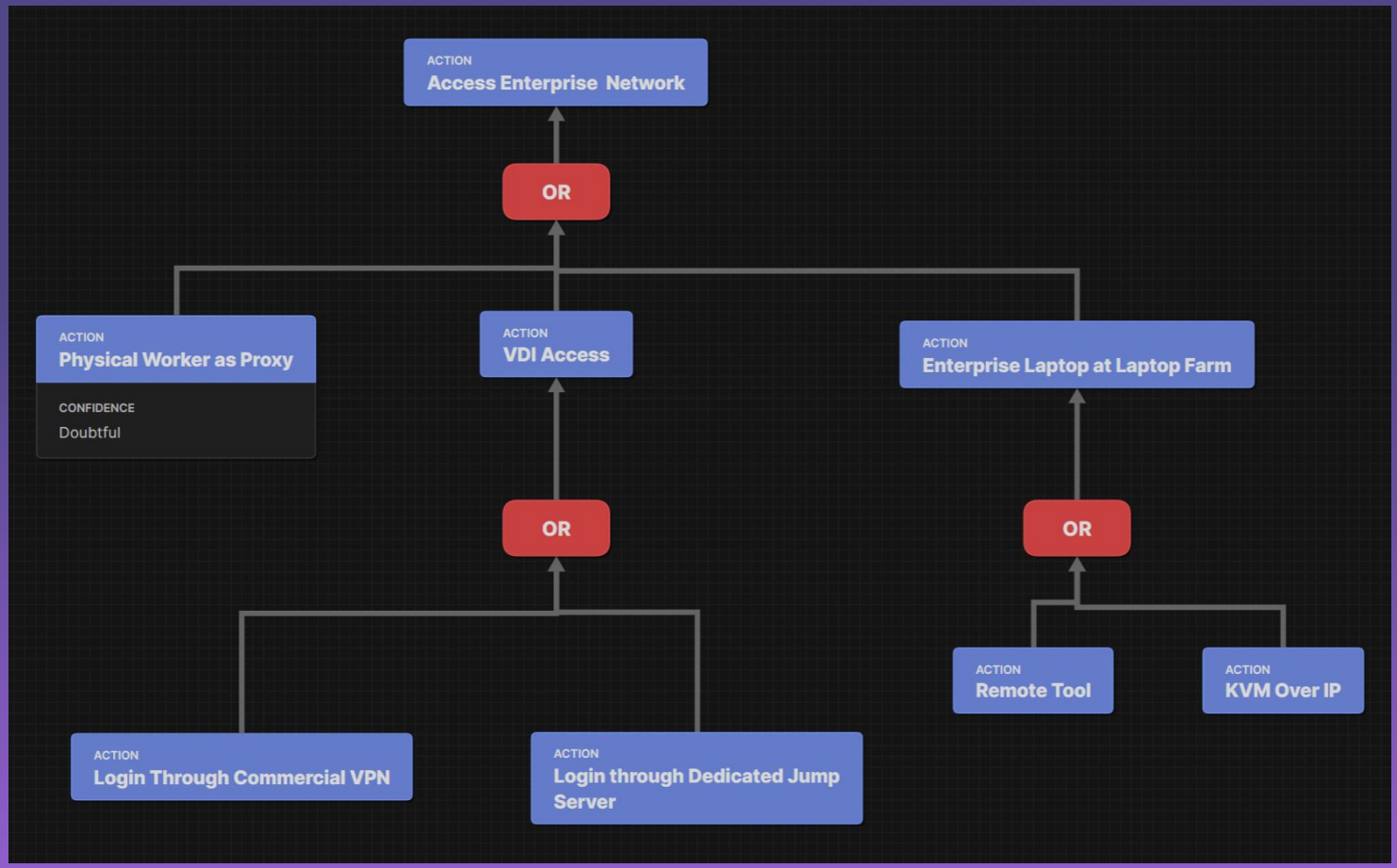
1999
Bruce Schneier publishes attack tree concepts

2013
Diamond Model of Intrusion incorporates attack tree attributes

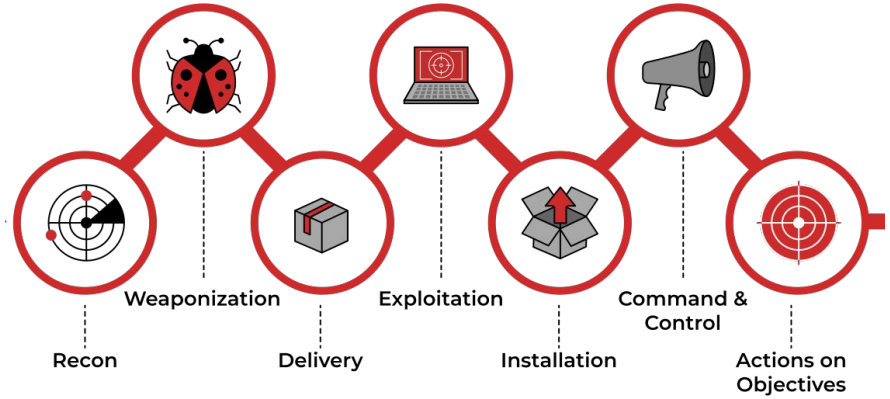
2025
Two nerds at CTI conference

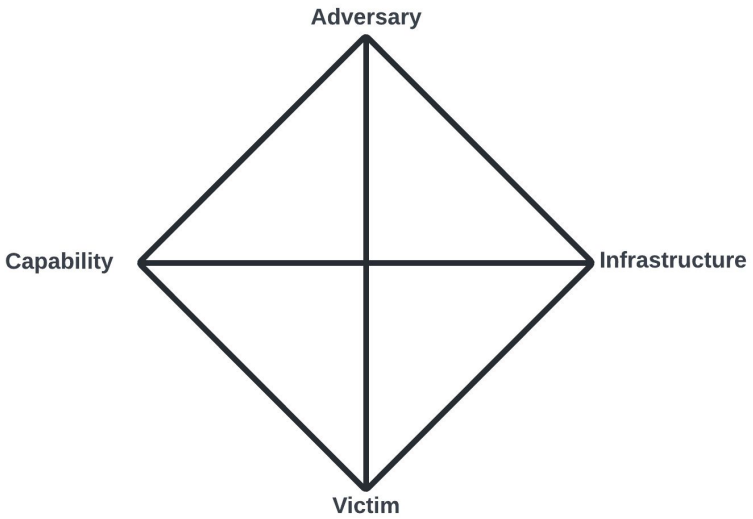
Why do they look the way they do?

- Tree Structure
- Nodes & Leaves
- Relationships



A decade of CTI taxonomies and frameworks





MITRE ATT&CK™

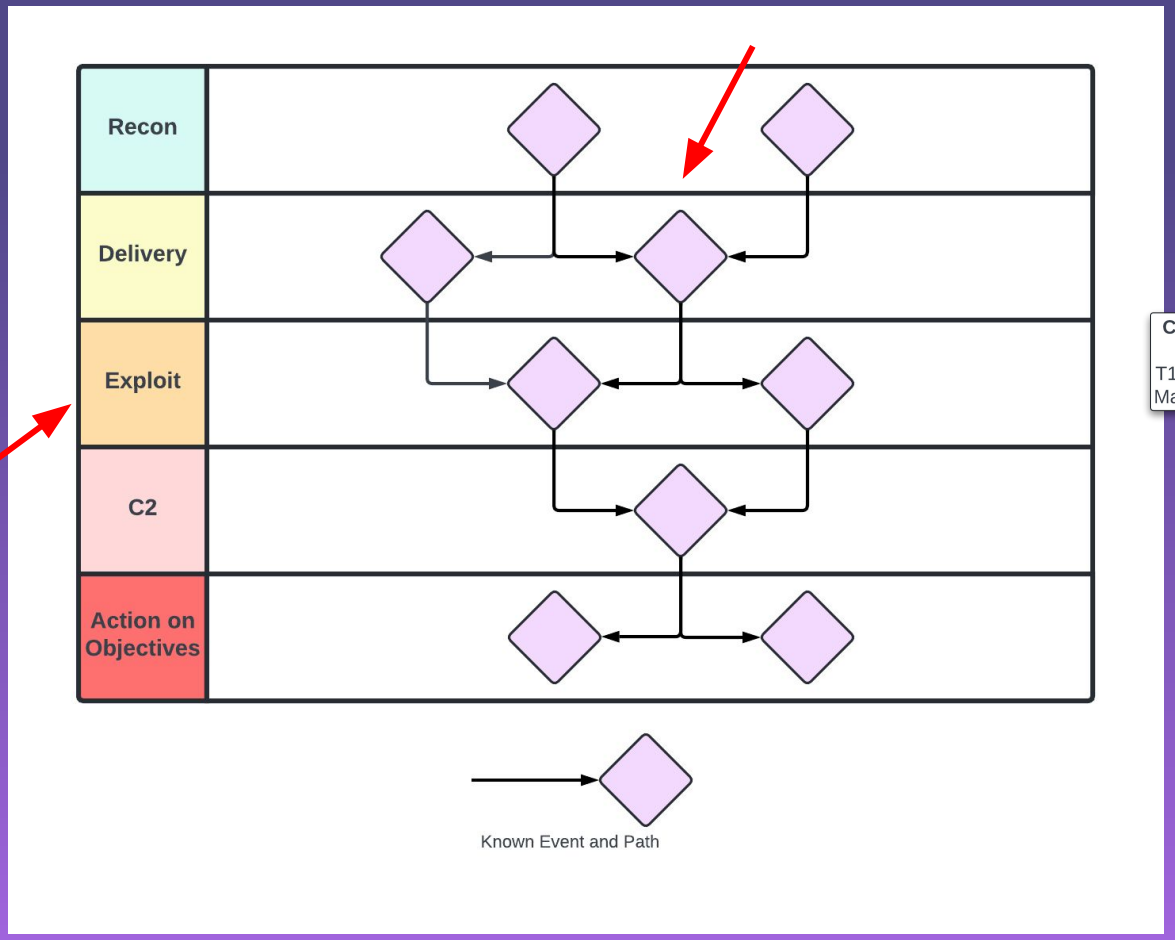
https://apps.dtic.mil/sti/tr/pdf/ADA586960.pdf

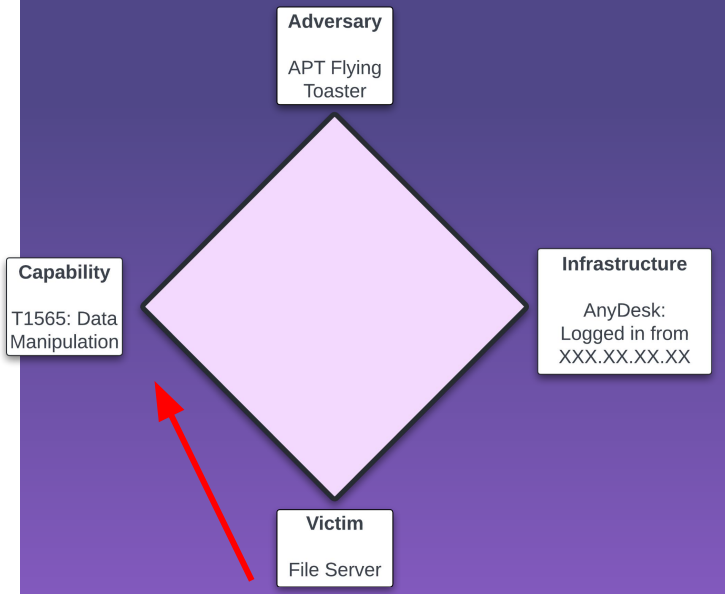
2011 **2013** **2014**

Combining everything conceptually

Diamond Model:
Structured documentation of attacker procedures and activity threading

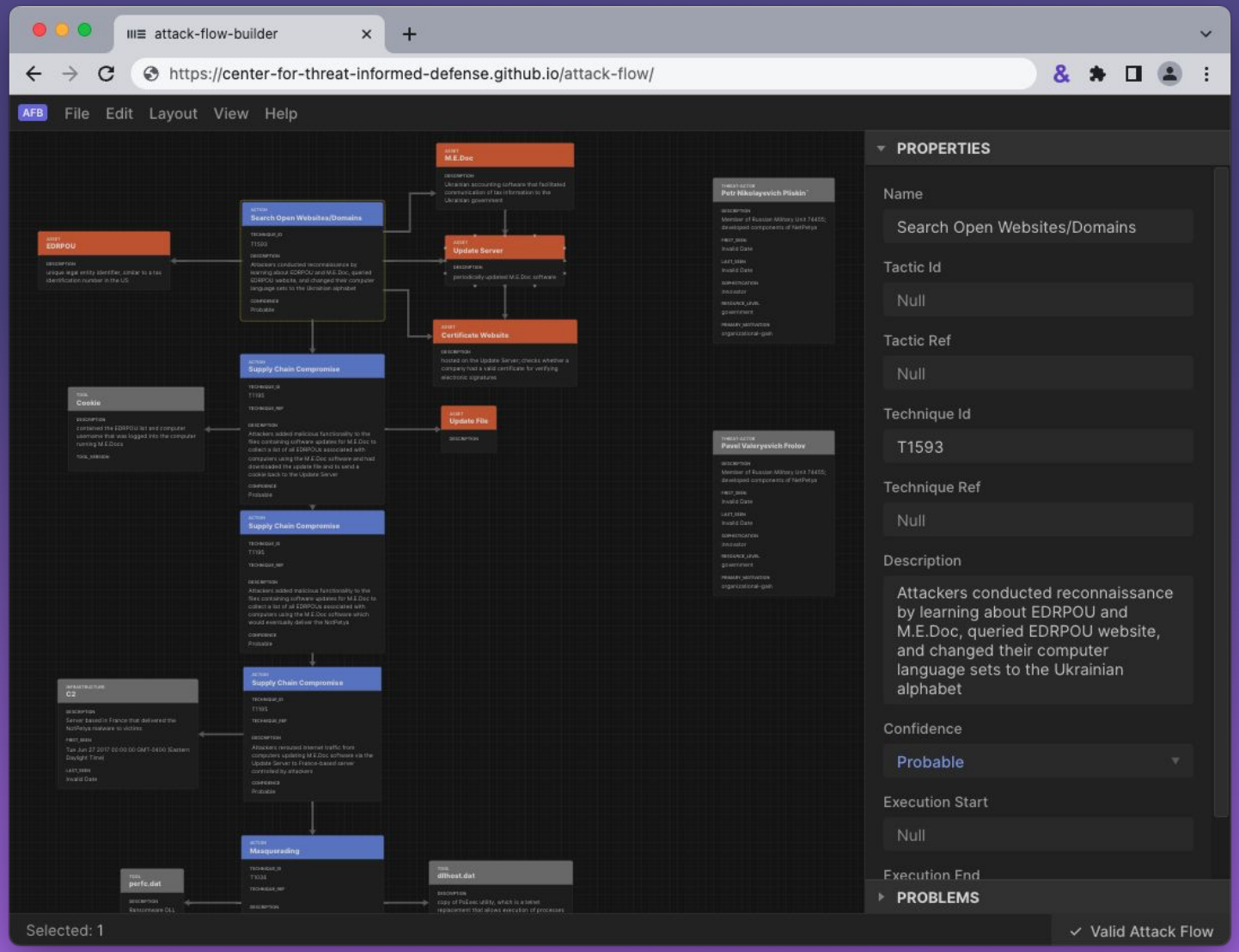
Kill Chain: Truncated attacker sequence





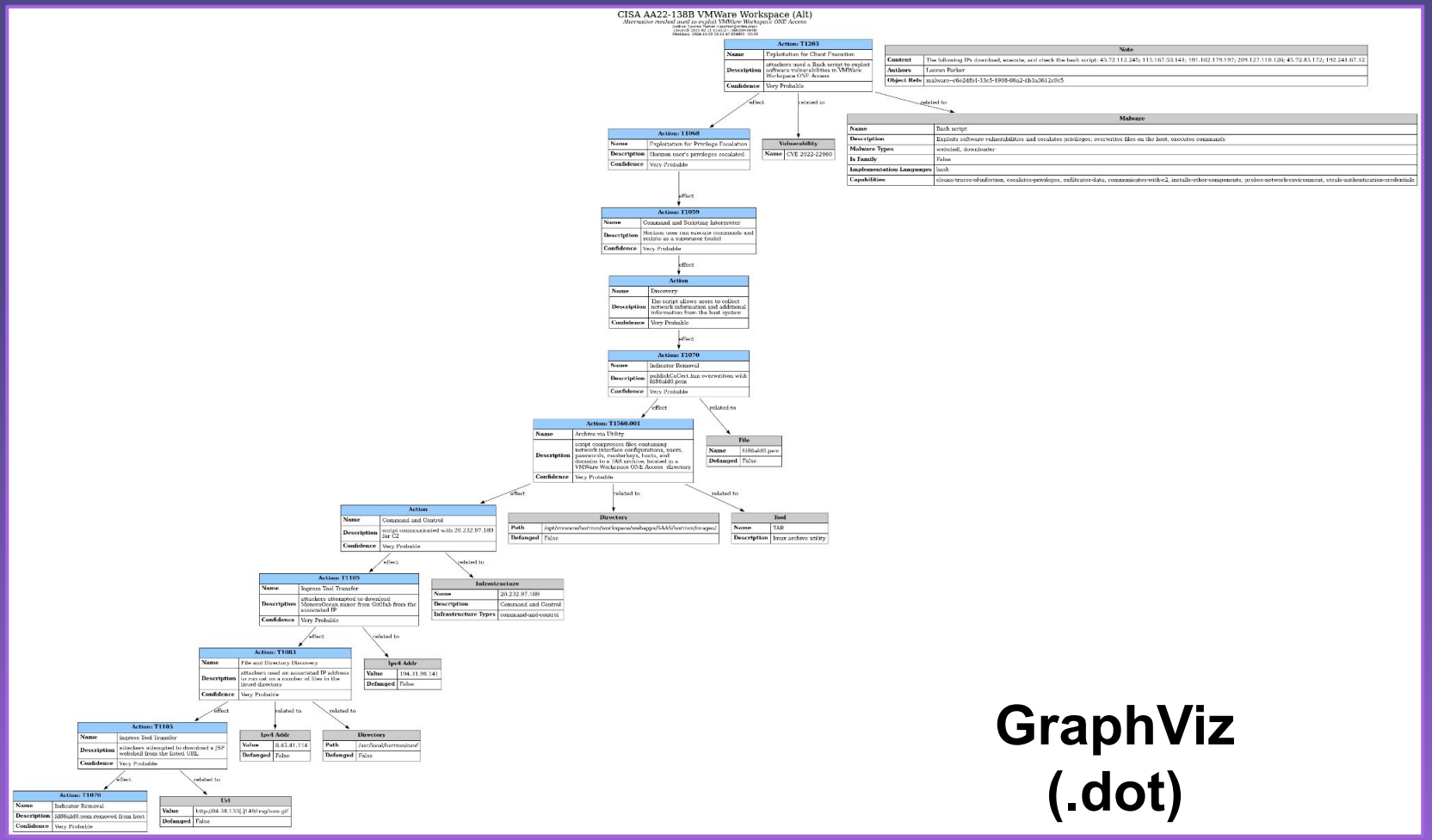
MITRE ATT&CK: Standardized tactics & techniques

Combining everything practically

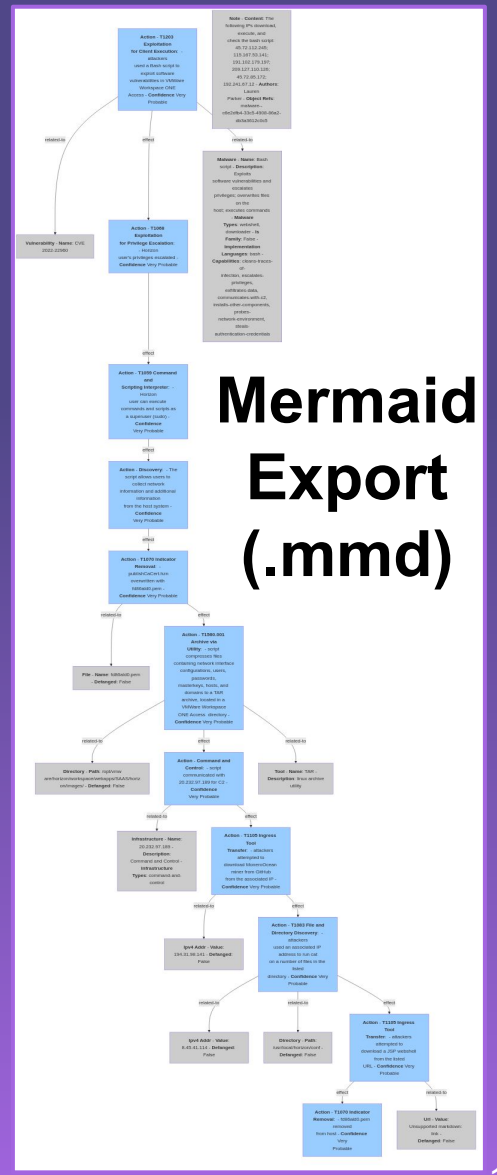


Attack Flow
Center for Threat Informed Defense
(direct link to builder)

Exporting into ‘official’ Attack Tree format



GraphViz (.dot)



Mermaid Export (.mmd)

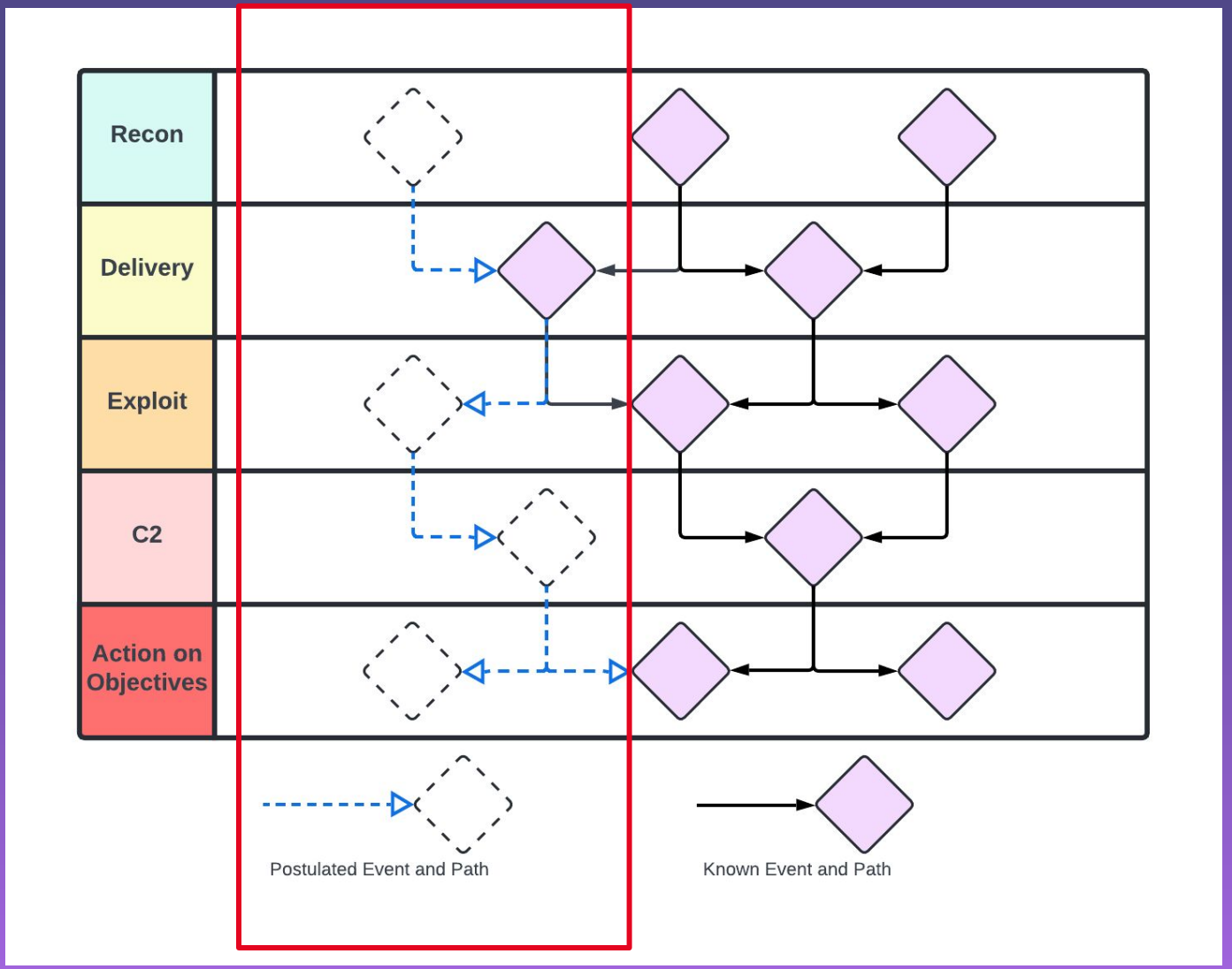
Everything JSON, making integration easier

Prioritizing Defensive Courses of Actions

‘Postulating’ TTPs

Known Unknowns

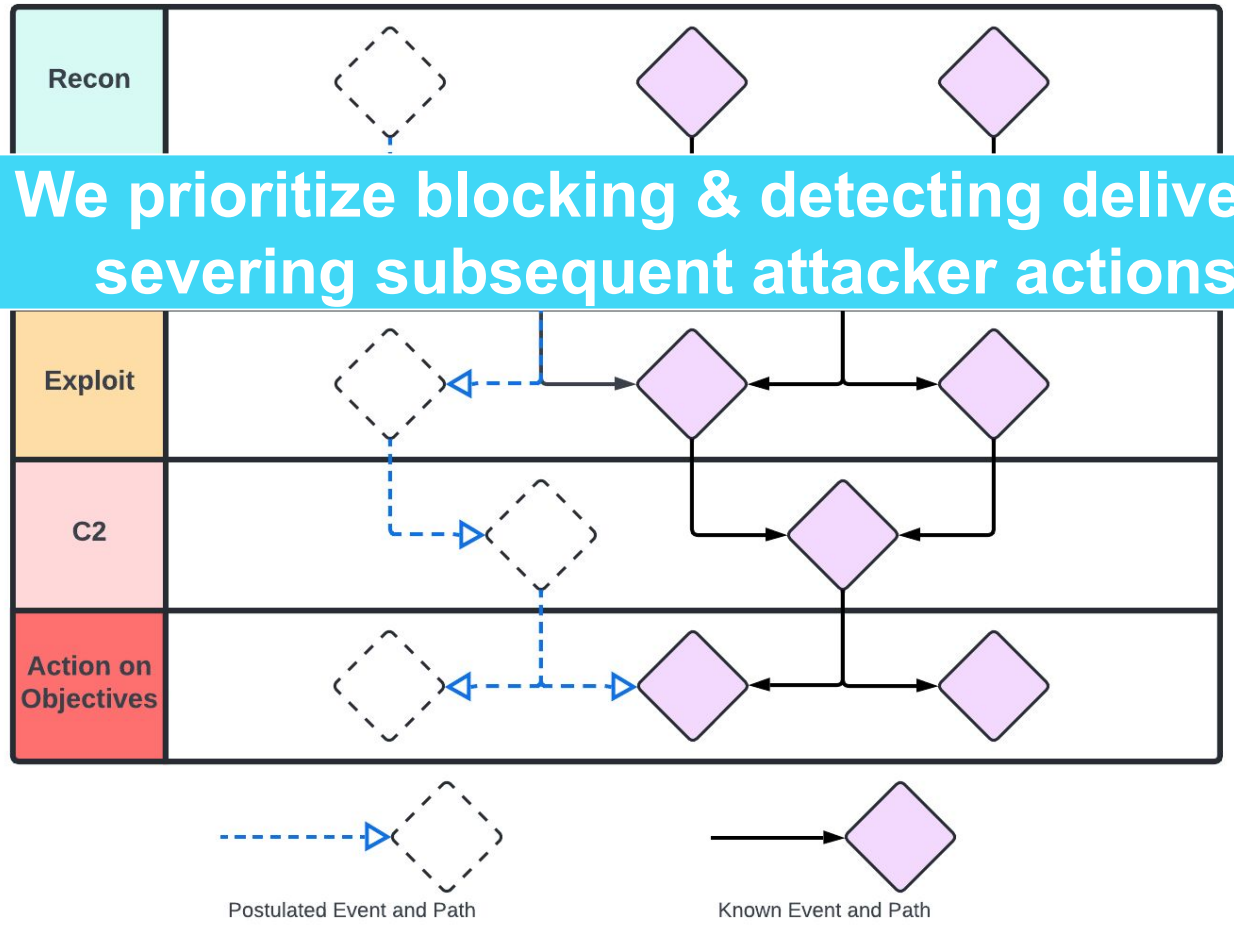
Bonus: Testing for Unknown Unknown



Known Knowns

Conscious decision-making on ‘cutting ties’

COA: We prioritize blocking & detecting delivery-TTPs, severing subsequent attacker actions



Prioritization through actionability

Source: https://top-attack-techniques.mitre-engenuity.org/

Frequency of which an attacker uses a specific ATT&CK technique **over time**

Prevalence

+

Specific technique where many other techniques **converge** or **diverge**

Choke Point

+

Opportunity for defender to **detect** or **mitigate** against ATT&CK technique

Actionability

=

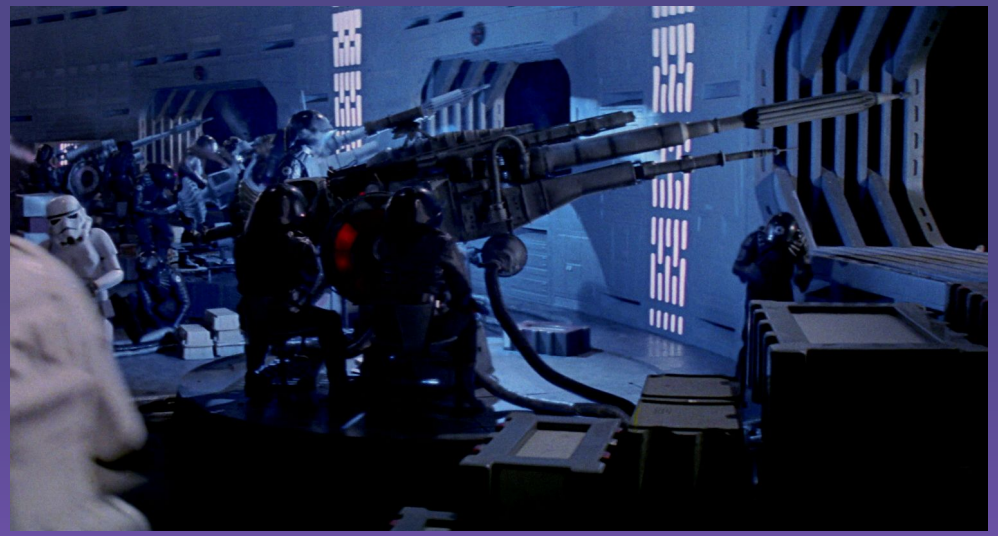
Significant (Top) Techniques

This is not the Excel file you are looking for

Technique (ID)	Technique (Name)	Num. TID	Num. TID After	Num. CAR	Num. Sigma	Num. ES SIEM	Num. Splunk	Num. CIS Controls	Num. 800-53 (r5)
T1053	Scheduled Task/Job	7	5	0	11	19	28	10	15
T1059	Command and Scripting Interpreter	10	15	1	51	64	57	22	24
T1562	Impair Defenses	1	1	3	74	39	45	8	16
T1055	Process Injection	3	6	0	23	13	26	9	12
T1036	Masquerading	1	1	1	27	16	27	7	12
T1218	Signed Binary Proxy Execution	1	1	0	94	18	70	14	18
T1574	Hijack Execution Flow	4	3	1	22	1	4	17	19
T1047	Windows Management Instrumentation	3	12	3	40	5	14	7	18
T1543	Create or Modify System Process	2	2	0	9	28	16	12	21
T1112	Modify Registry	1	1	8	62	5	25	1	2
T1021	Remote Services	4	5	1	3	34	24	7	12
T1105	Ingress Tool Transfer	5	3	4	47	9	23	2	8
T1204	User Execution	4	4	0	8	7	15	10	13
T1027	Obfuscated Files or Information	2	1	0	83	7	8	5	6
T1003	OS Credential Dumping	1	5	0	23	34	36	19	22
T1078	Valid Accounts	6	5	0	42	40	51	11	23

Source: https://top-attack-techniques.mitre-engenuity.org/

Stakeholder and business operations engagement



Defender Considerations

Business Operation Considerations

Will applying detection or preventative course of actions disrupt business operations?

What Does a Practical Attack Tree Example Look Like?

Sometimes you have a lot of time, sometimes you don’t

Preliminary Assessment

Deliberate Assessment

In-depth Assessment

Start with orientation

What do we think we know about this threat

What do we think we know about ourselves

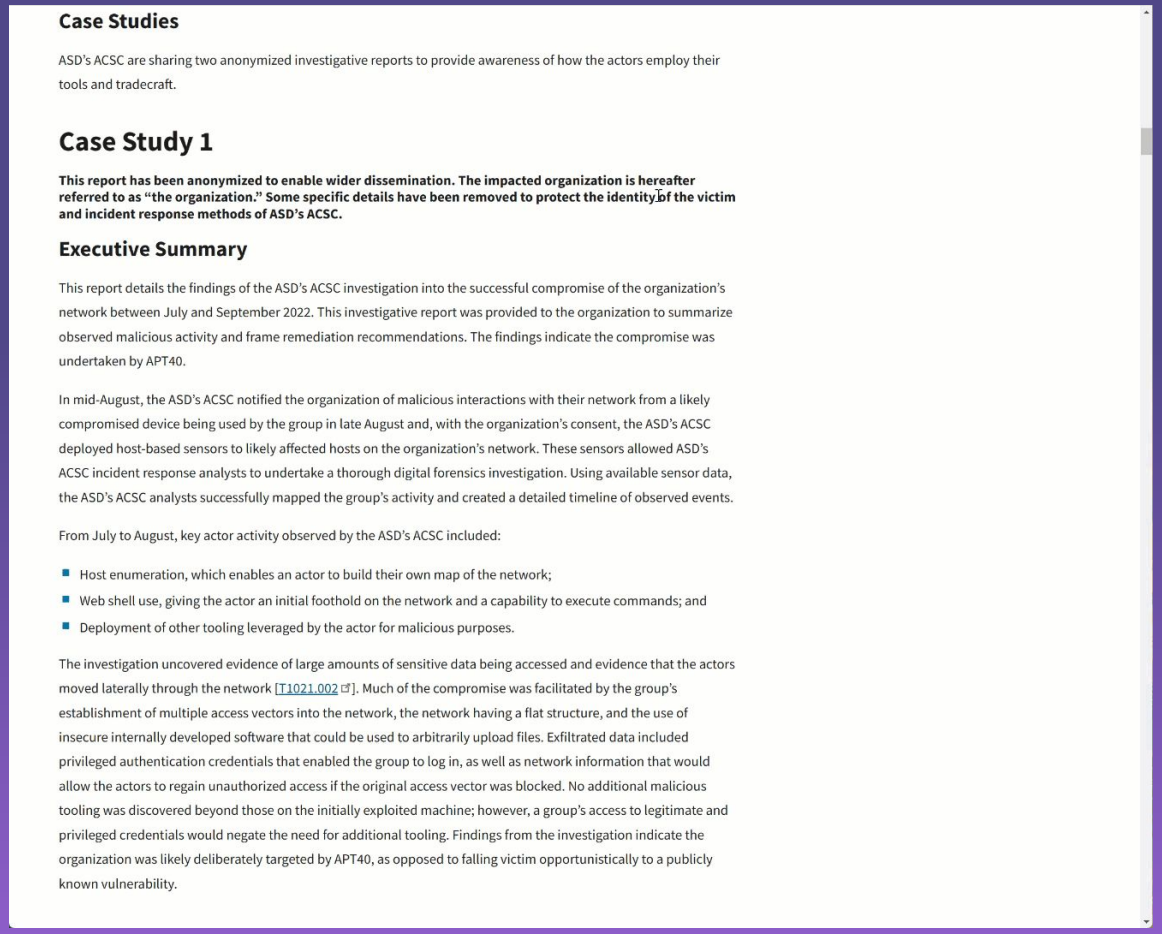
What do we think we don’t know about this threat

What do we think we don’t know about ourselves

Where do you create the Attack Tree?

- Whiteboard or physical paper
- Attack Flow
- Any charting app (LucidChart, Visio, Draw.IO)

Rough TTP mapping to establish graph



Case Studies

ASD's ACSC are sharing two anonymized investigative reports to provide awareness of how the actors employ their tools and tradecraft.

Case Study 1

This report has been anonymized to enable wider dissemination. The impacted organization is hereafter referred to as "the organization." Some specific details have been removed to protect the identity of the victim and incident response methods of ASD's ACSC.

Executive Summary

This report details the findings of the ASD's ACSC investigation into the successful compromise of the organization's network between July and September 2022. This investigative report was provided to the organization to summarize observed malicious activity and frame remediation recommendations. The findings indicate the compromise was undertaken by APT40.

In mid-August, the ASD's ACSC notified the organization of malicious interactions with their network from a likely compromised device being used by the group in late August and, with the organization's consent, the ASD's ACSC deployed host-based sensors to likely affected hosts on the organization's network. These sensors allowed ASD's ACSC incident response analysts to undertake a thorough digital forensics investigation. Using available sensor data, the ASD's ACSC analysts successfully mapped the group's activity and created a detailed timeline of observed events.

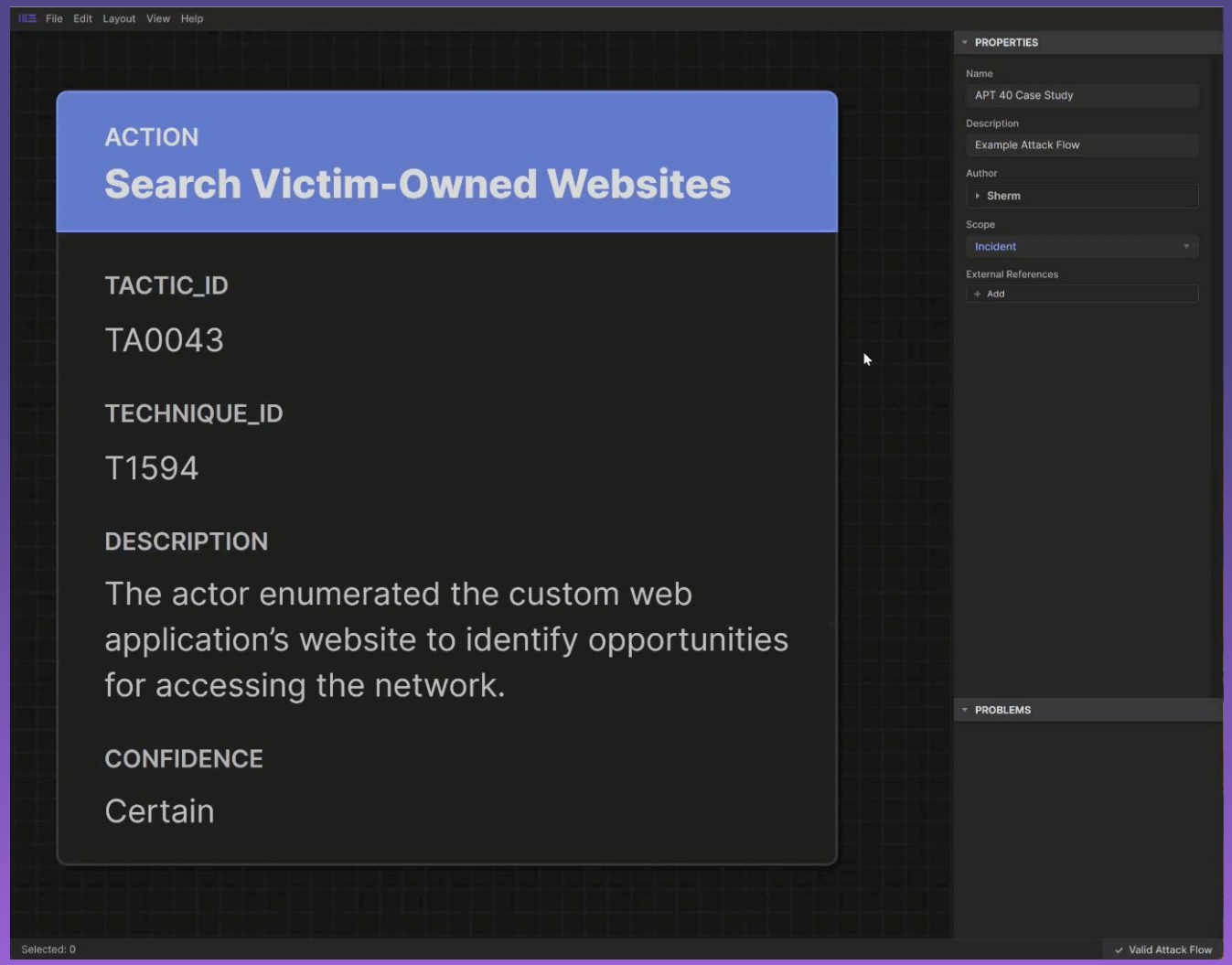
From July to August, key actor activity observed by the ASD's ACSC included:

- Host enumeration, which enables an actor to build their own map of the network;
- Web shell use, giving the actor an initial foothold on the network and a capability to execute commands; and
- Deployment of other tooling leveraged by the actor for malicious purposes.

The investigation uncovered evidence of large amounts of sensitive data being accessed and evidence that the actors moved laterally through the network [T1021.002]. Much of the compromise was facilitated by the group's establishment of multiple access vectors into the network, the network having a flat structure, and the use of insecure internally developed software that could be used to arbitrarily upload files. Exfiltrated data included privileged authentication credentials that enabled the group to log in, as well as network information that would allow the actors to regain unauthorized access if the original access vector was blocked. No additional malicious tooling was discovered beyond those on the initially exploited machine; however, a group's access to legitimate and privileged credentials would negate the need for additional tooling. Findings from the investigation indicate the organization was likely deliberately targeted by APT40, as opposed to falling victim opportunistically to a publicly known vulnerability.

Source: https://www.cisa.gov/news-events/cybersecurity-advisories/aa24-190a

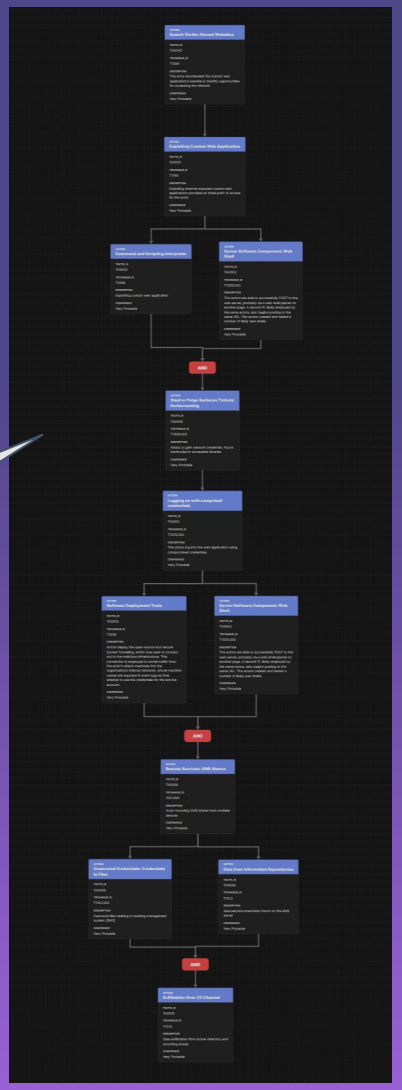
Continue adding research & extend graph



Source: https://www.cisa.gov/news-events/cybersecurity-advisories/aa24-190a

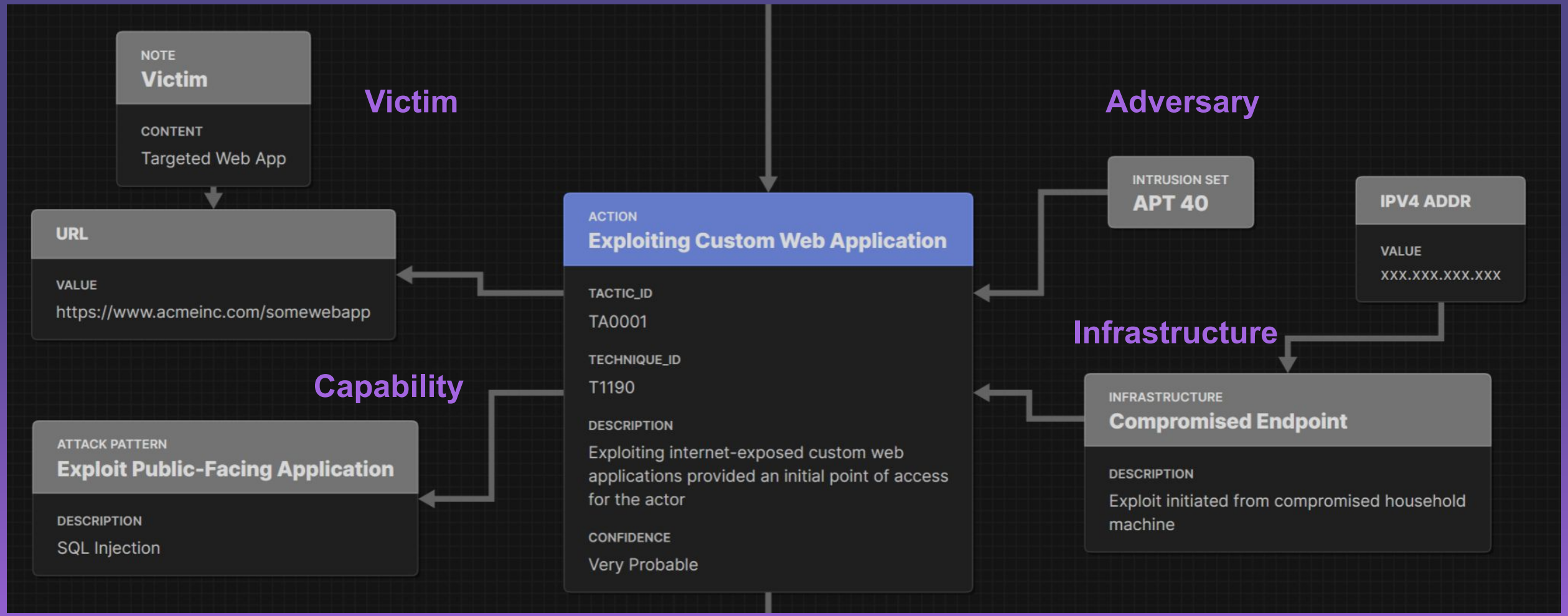
It doesn’t take long before it is useful

Time Taken:
~ 30 minutes

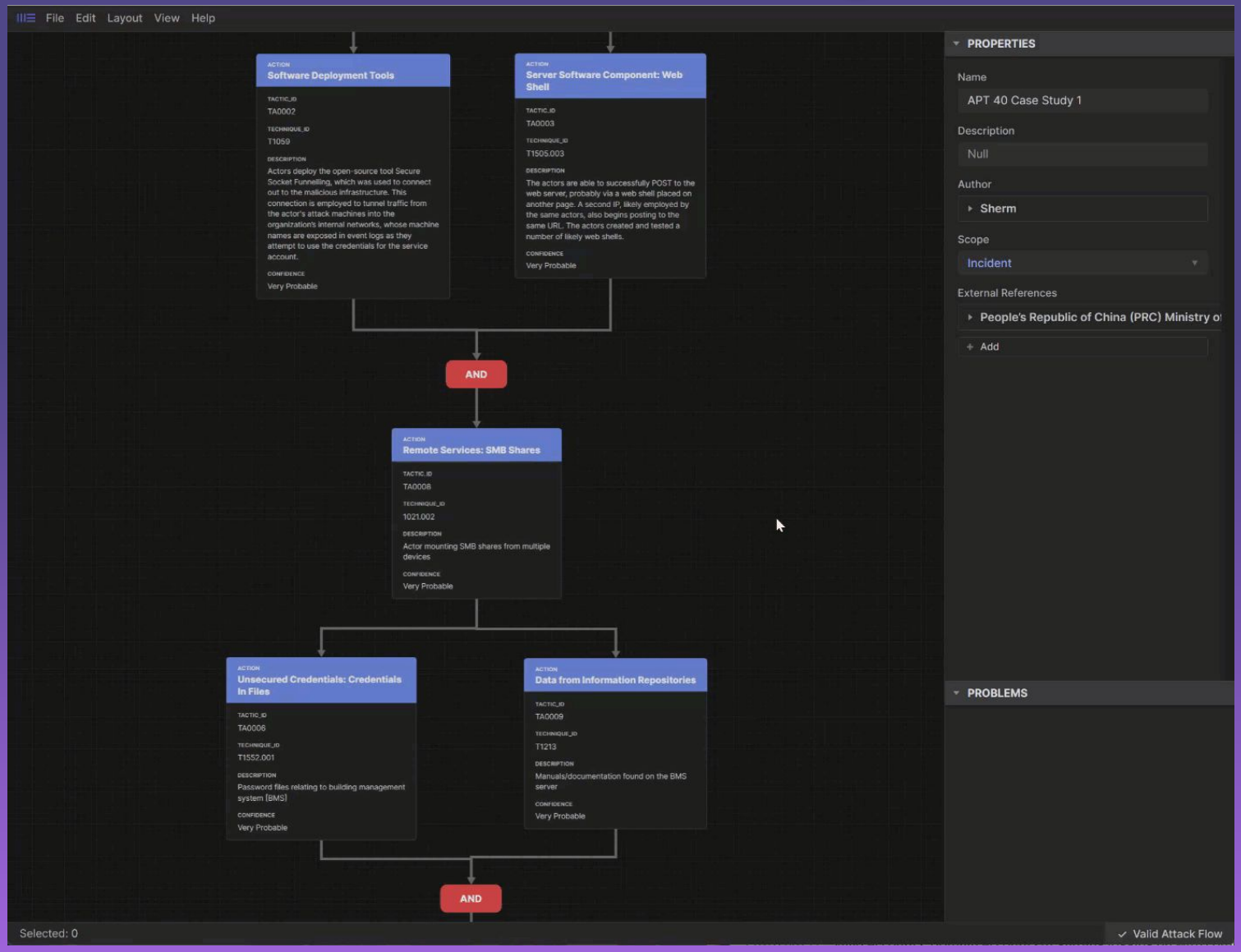


Source:
https://www.cisa.gov/news-events/cybersecurity-advisories/aa24-190a

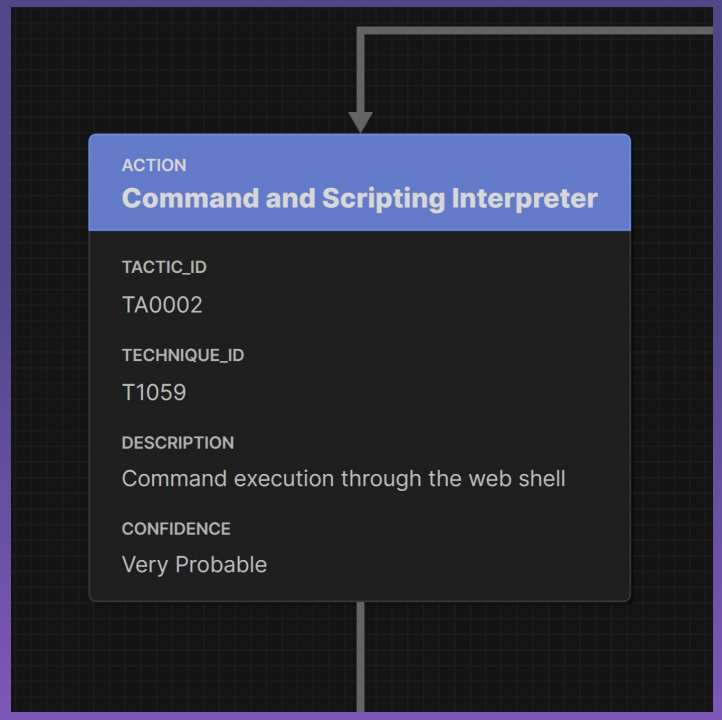
Dive deeper into specific components

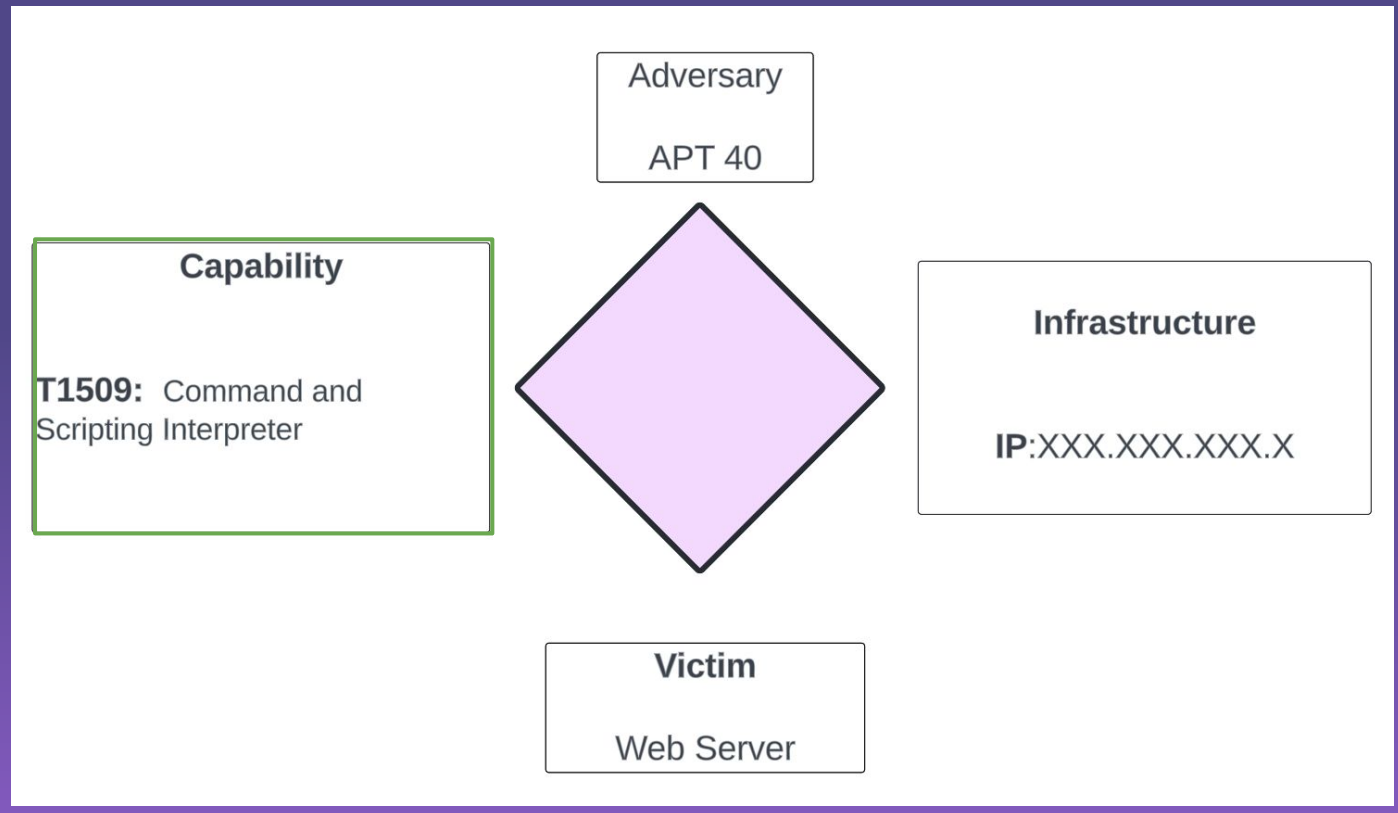


Postulation & adding events



Prioritization assessment





Prevalence & choke points

Execution (TA0002)	
Windows Management Instrumentation [T1047]	Command and Scripting Interpreter: Python [T1059.006]
Scheduled Task/Job: At [T1053.002]	Command and Scripting Interpreter: JavaScript [T1059.007]
Scheduled Task/Job: Scheduled Task [T1053.005]	Native API [T1106]
Command and Scripting Interpreter [T1059]	Inter-Process Communication [T1559]
Command and Scripting Interpreter: Windows Command Shell [T1059.003]	System Services: Service Execution [T1569.002]
Command and Scripting Interpreter: PowerShell [T1059.001]	Exploitation for Client Execution [T1203]
Command and Scripting Interpreter: Visual Basic [T1059.005]	User Execution: Malicious File [T1204.002]
Command and Scripting Interpreter: Unix Shell [T1059.004]	Command and Scripting Interpreter: Apple Script [T1059.002]
Scheduled Task/Job: Cron [T1053.003]	Software Deplo[illegible]nt Tools [T1072]

D	F	G	H	I	J	K	L
	Choke Point						
Technique (Name)	Num. TID Before	Num. TID Afte	Choke Point S	Be	Before	After Uti	After Utilit
Scheduled Task/Job	7	3	0.6	0.7	0.7	0.3	0.5
Command and Scripting Interpreter	10	15	1	1	1	1.5	1
Impair Defenses	1	1	0.1	0.1	0.1	0.1	0.1
Process Injection	3	6	0.45	0.3	0.3	0.6	0.6
Masquerading	1	1	0.1				
Signed Binary Proxy Execution	1	1					
Hijack Execution Flow	4	3					

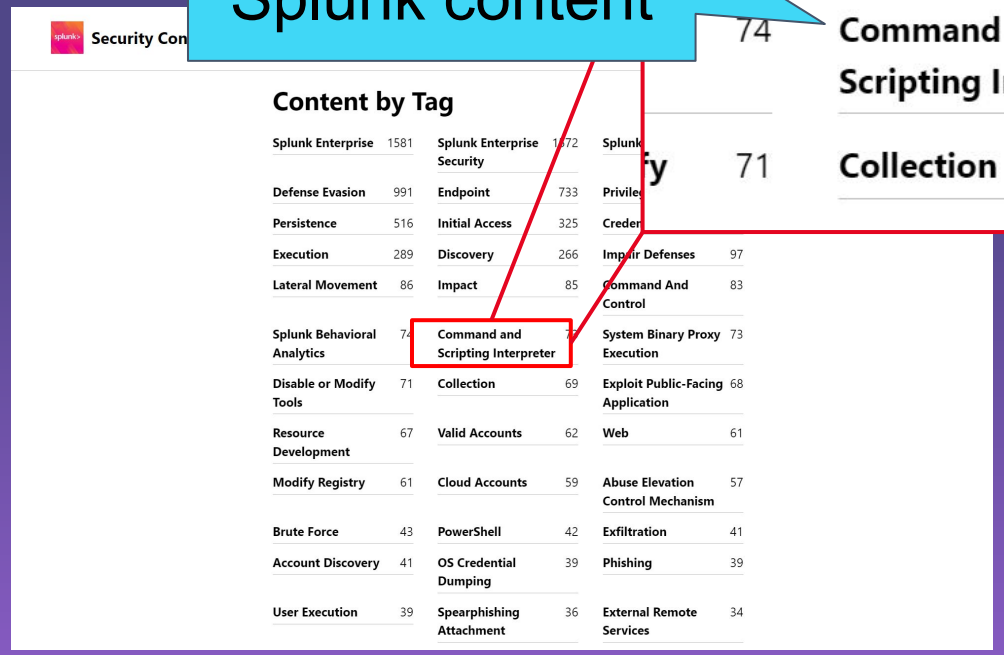
Super prevalent example

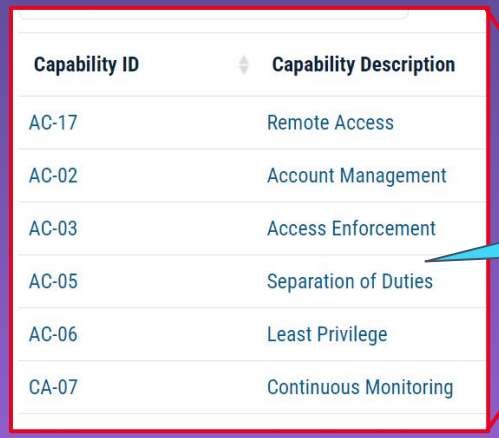
Force choke target

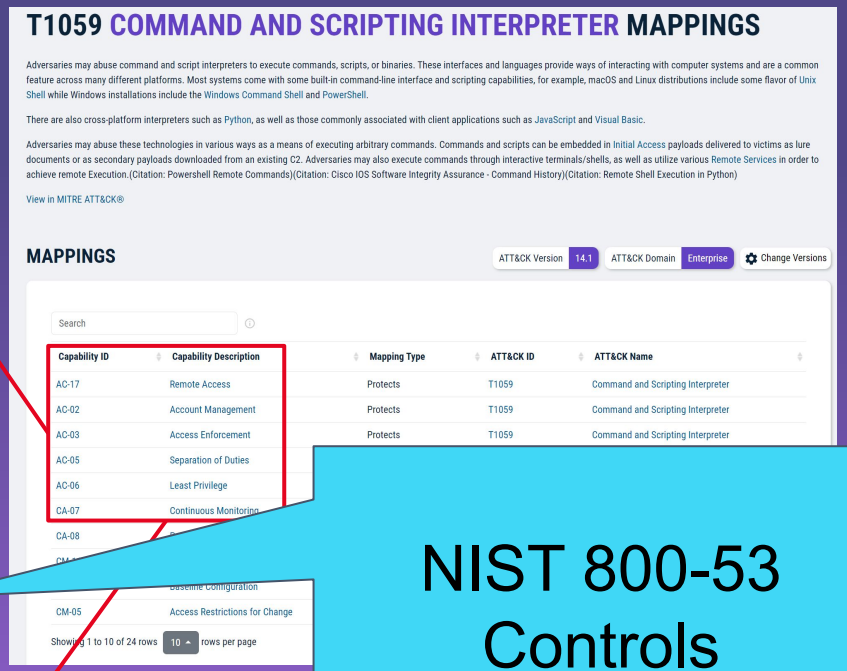
Sources: https://top-attack-techniques.mitre-engenuity.org/ & https://www.cisa.gov/news-events/cybersecurity-advisories/aa24-190a

Actionability assessment

Amount of readily available Splunk content







NIST 800-53 Controls

Source: https://research.splunk.com/tags/#external-remote-services & https://center-for-threat-informed-defense.github.io/mappings-explorer

Defensive capability & business ops. considerations

Volt Typhoon uses at least the following LOTL tools and commands for system information, network service, group, and user discovery techniques:

- cmd
- certutil
- dnscmd
- ldifde
- makecab
- net user/group/use
- netsh
- nltest
- netstat
- ntdsutil
- ping
- PowerShell
- quser
- reg query/reg save
- systeminfo
- tasklist
- wevtutil
- whoami
- wmic
- xcopy

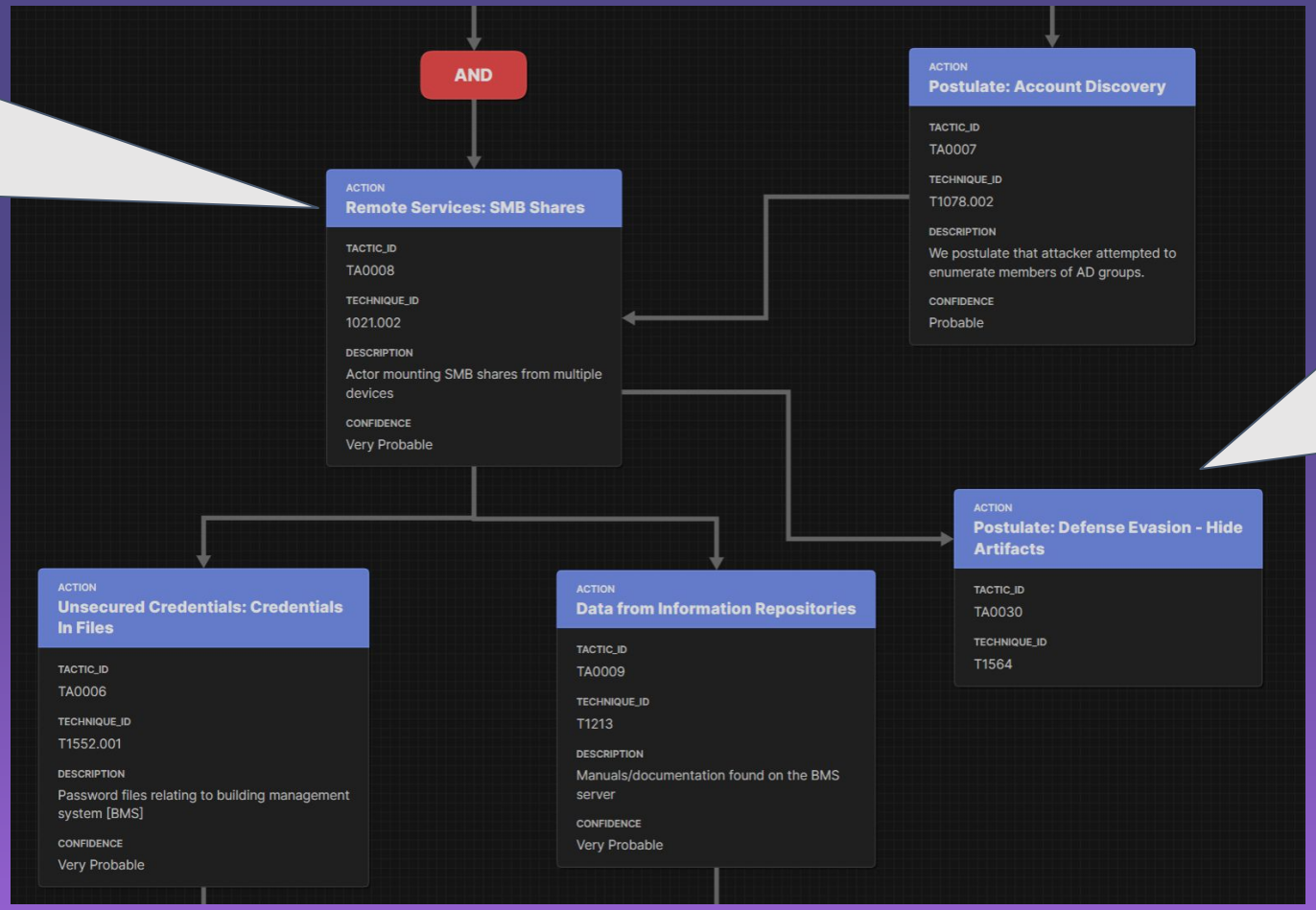
Source: https://research.splunk.com/tags/#external-remote-services & https://center-for-threat-informed-defense.github.io/mappings-explorer

Example questions:

- How common is PowerShell usage in org?
- Will IT/Business Ops be mad if we limit PowerShell use?

Conscious prioritization

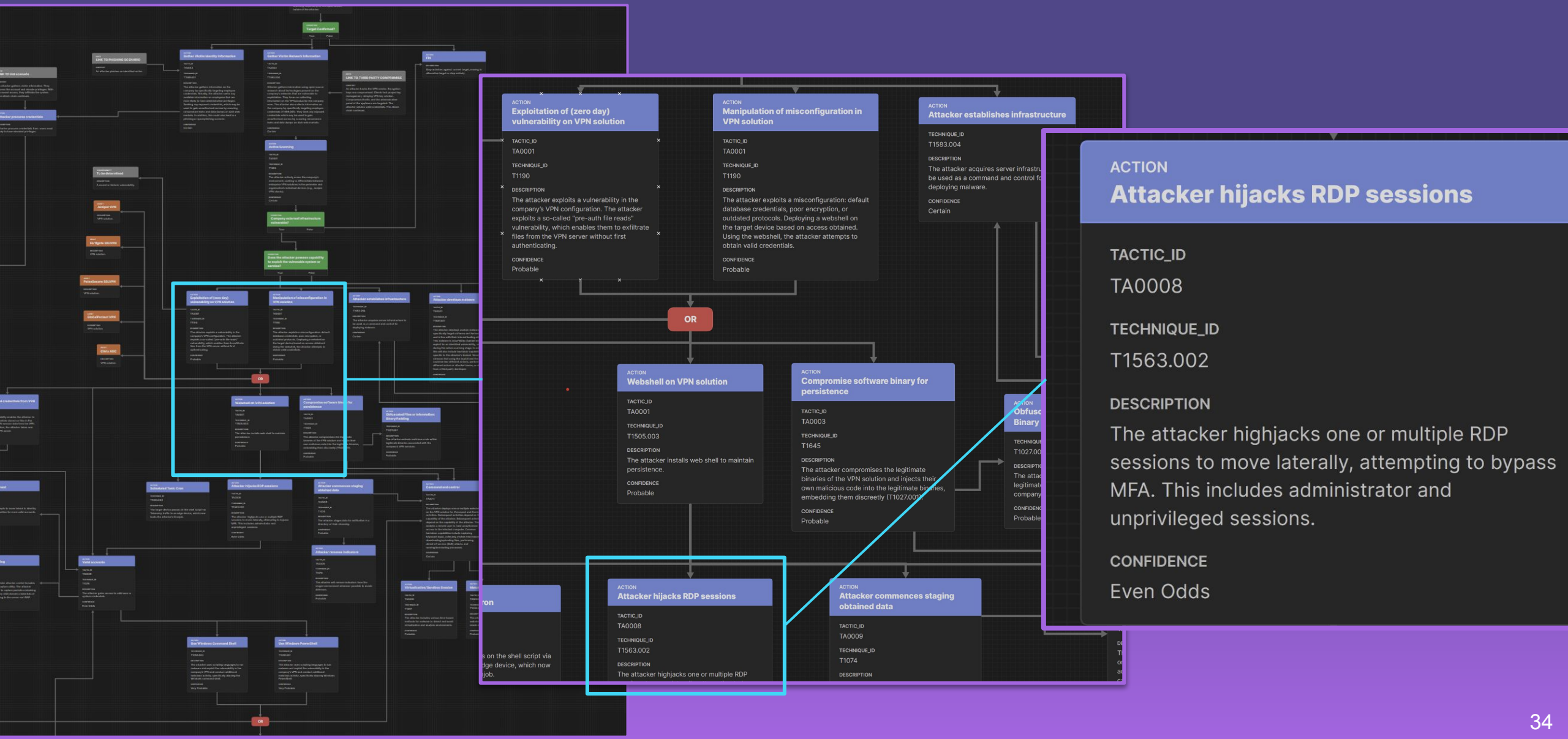
"We know exactly how to this element will be prevented"



"We don't know how defense evasion will play out in our scenario"

Where does that leave us?

Which stakeholders benefits & how



What Attack Trees are really about

Today:

- A mental model, evolving based on new innovations
- Investigate Attack Flow (Center for Threat Informed Defense)

Tomorrow:

- Use Attack Trees in your next IR report, RT engagement or for supporting security investment decisions.

(direct link to Attack Flow builder)

Find us via the following channels

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ceo & founder Venation

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LinkedIn: /gertjanbruggink
Newsletter: https://venation.digital/newsletter

Here’s the references:

Description	Link
Attack Flow Tool	https://center-for-threat-informed-defense.github.io/attack-flow/ui/
Attack Flow Build files used for the examples in this presentation	https://github.com/gertjanbruggink/templates/tree/master/Attack%20Trees
Draw IO Attack Tree Template	https://github.com/gertjanbruggink/templates/tree/master/Attack%20Trees
Repository of Attack Flow premade threat scenarios (paid):	https://venation.digital/scenario-intelligence
CTID Mappings	https://center-for-threat-informed-defense.github.io/mappings-explorer
Splunk tagging	https://research.splunk.com/tags/#external-remote-services
ME Top Techniques	https://top-attack-techniques.mitre-engenuity.org/
CISA advisory example	https://www.cisa.gov/news-events/cybersecurity-advisories/aa24-190a