Module 3
MITRE ATT&CK

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Acknowledgement

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Outline

- What is ATT&CK?
- Mapping to ATT&CK from Finished Cyber Incident Reports
- Mapping to ATT&CK from Raw Data from Cyber Incident
- ATT&CK Navigator
- From ATT&CK Mapping to Defence Recommendation

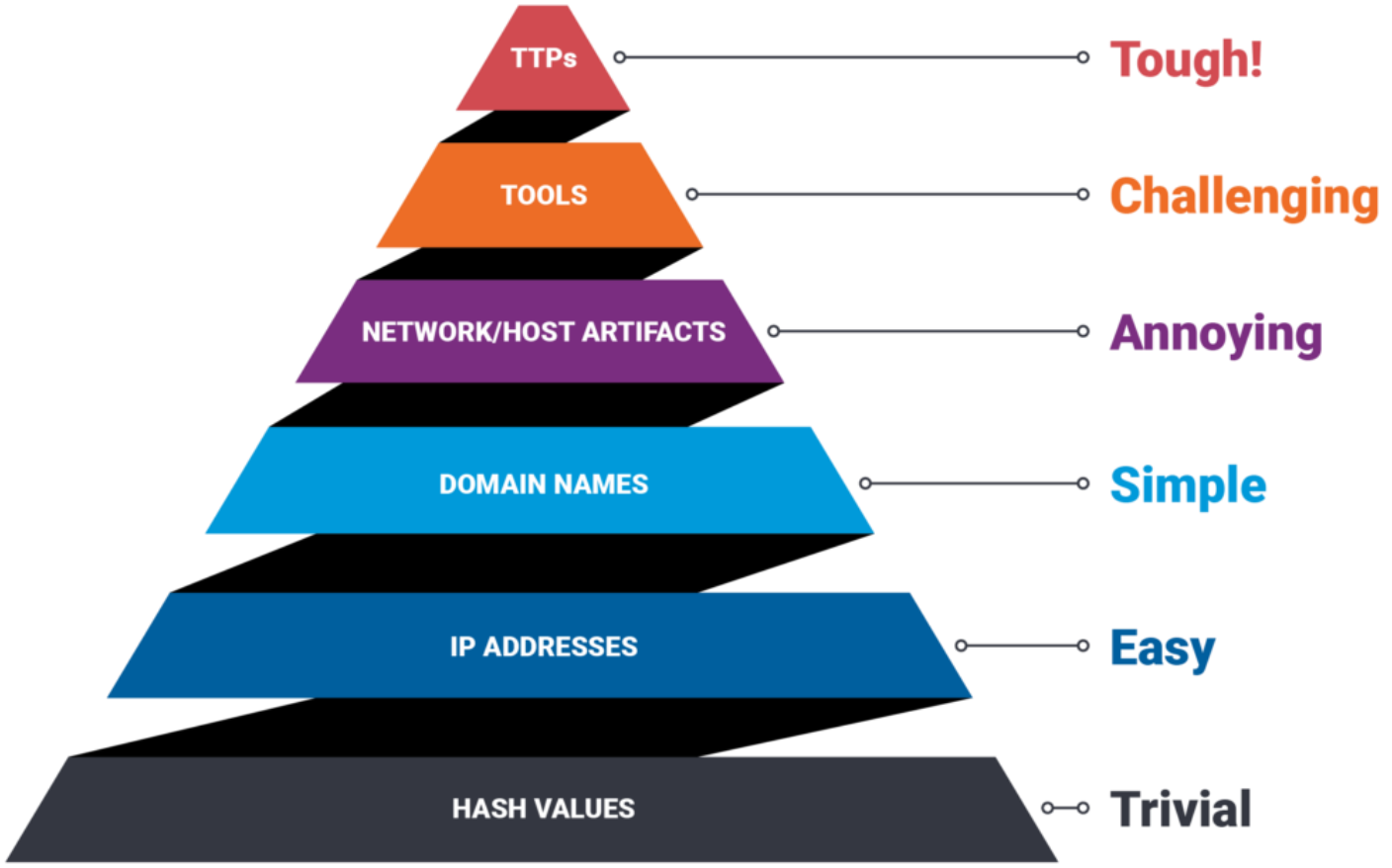
Why should Defenders know about Attacker's Tactics, Techniques and Procedures?

- As a defender of my organization, I need to know:
  - How effective are my protection and controls against advanced attackers?
  - Is my defensive posture enough to stop APT group attacks?
    - How about APT 3 or APT 29?
  - Can my detection technology and process detect an APT attack?
  - Is the data I collect during network and host monitoring useful in protection, detection or response?
  - Do the tools I have installed for defence – have overlapping functionalities?
  - Will the newest tool from a cyber security vendor help my cyber defence?

What is ATT & CK?

- A knowledge-base of adversary behaviour
  - Based on real-world incident analysis based on a large number of attacks
  - Organized into tactics, techniques and procedures
  - Developed by the MITRE Corporation, USA
  - Available for anyone to use in developing threat intelligence, post incidence analysis, and developing defence tactics, techniques and procedures
- An attacker uses a series of tactics
  - Each tactic can be realized by some technique from a set of techniques
  - Each technique can be implemented with procedures from a set of possible procedures
- The Knowledge-base is community driven and continuously improved

David Bianco's Pyramid of Pain



ATT & CK Matrix

Initial Access	Execution	Persistence	Privilege Escalation	Defense Evasion	Credential Access	Discovery	Lateral Movement	Collection	Exfiltration	Command and Control
Drive-by Compromise	AppleScript	.bash_profile and .bashrc	Access Token Manipulation	Access Token Manipulation	Account Manipulation	Account Discovery	AppleScript	Audio Capture	Automated Exfiltration	Commonly Used Port
Exploit Public-Facing Application	CMSTP	Accessibility Features	Accessibility Features	BITS Jobs	Bash History	Application Window Discovery	Application Deployment Software	Automated Collection	Data Compressed	Communication Through Removable Media
Hardware Additions	Command-Line Interface	AppCert DLLs	AppCert DLLs	Binary Padding	Brute Force	Browser Bookmark Discovery	Distributed Component Object Model	Clipboard Data	Data Encrypted	Connection Proxy
Replication Through Removable Media	Control Panel Items	AppInit DLLs	AppInit DLLs	Bypass User Account Control	Credential Dumping	File and Directory Discovery	Exploitation of Remote Services	Data Staged	Data Transfer Size Limits	Custom Command and Control Protocol
Spearphishing Attachment	Dynamic Data Exchange	Application Shimming	Application Shimming	CMSTP	Credentials in Files	Network Service Scanning	Logon Scripts	Data from Information Repositories	Exfiltration Over Alternative Protocol	Custom Cryptographic Protocol
Spearphishing Link	Execution through API	Authentication Package	Bypass User Account Control	Clear Command History	Credentials in Registry	Network Share Discovery	Pass the Hash	Data from Local System	Exfiltration Over Command and Control Channel	Data Encoding
Spearphishing via Service	Execution through Module Load	BITS Jobs	DLL Search Order Hijacking	Code Signing	Exploitation for Credential Access	Password Policy Discovery	Pass the Ticket	Data from Network Shared Drive	Exfiltration Over Other Network Medium	Data Obfuscation
Supply Chain Compromise	Exploitation for Client Execution	Bootkit	Dylib Hijacking	Component Firmware	Forced Authentication	Peripheral Device Discovery	Remote Desktop Protocol	Data from Removable Media	Exfiltration Over Physical Medium	Domain Fronting
Trusted Relationship	Graphical User Interface	Browser Extensions	Exploitation for Privilege Escalation	Component Object Model Hijacking	Hooking	Permission Groups Discovery	Remote File Copy	Email Collection	Scheduled Transfer	Fallback Channels
Valid Accounts	InstallUtil	Change Default File Association	Extra Window Memory Injection	Control Panel Items	Input Capture	Process Discovery	Remote Services	Input Capture		Multi-Stage Channels
	LSASS Driver	Component Firmware	File System Permissions Weakness	DCShadow	Input Prompt	Query Registry	Replication Through Removable Media	Man in the Browser		Multi-hop Proxy
	Launchctl	Component Object Model Hijacking	Hooking	DLL Search Order Hijacking	Kerberoasting	Remote System Discovery	SSH Hijacking	Screen Capture		Multiband Communication
	Local Job Scheduling	Create Account	Image File Execution Options Injection	DLL Side-Loading	Keychain	Security Software Discovery	Shared Webroot	Video Capture		Multilayer Encryption
	Mshta	DLL Search Order Hijacking	Launch Daemon	Deobfuscate/Decode Files or Information	LLMNR/NBT-NS Poisoning	System Information Discovery	Taint Shared Content			Port Knocking
	PowerShell	Dylib Hijacking	New Service	Disabling Security Tools	Network Sniffing	System Network Configuration Discovery	Third-party Software			Remote Access Tools
		External Remote		Exploitation for Defense		System Network				

Technique: Spearphishing Link

Home > Techniques > Enterprise > Phishing > Spearphishing Link

Phishing: Spearphishing Link

Other sub-techniques of Phishing (3)

ID	Name
T1566.001	Spearphishing Attachment
T1566.002	Spearphishing Link
T1566.003	Spearphishing via Service

Adversaries may send spearphishing emails with a malicious link in an attempt to elicit sensitive information and/or gain access to victim systems. Spearphishing with a link is a specific variant of spearphishing. It is different from other forms of spearphishing in that it employs the use of links to download malware contained in email, instead of attaching malicious files to the email itself, to avoid defenses that may inspect email attachments.

All forms of spearphishing are electronically delivered social engineering targeted at a specific individual, company, or industry. In this case, the malicious emails contain links. Generally, the links will be accompanied by social engineering text and require the user to actively click or copy and paste a URL into a browser, leveraging User Execution. The visited website may compromise the web browser using an exploit, or the user will be prompted to download applications, documents, zip files, or even executables depending on the pretext for the email in the first place. Adversaries may also include links that are intended to interact directly with an email reader, including embedded images intended to exploit the end system directly or verify the receipt of an email (i.e. web bugs/web beacons). Links may also direct users to malicious applications designed to Steal Application Access Tokens, like OAuth tokens, in order to gain access to protected applications and information.[1]

ID: T1566.002

Sub-technique of: T1566

Tactic: Initial Access

Platforms: Linux, Office 365, SaaS, Windows, macOS

Data Sources: DNS records, Detonation chamber, Email gateway, Mail server, Packet capture, SSL/TLS inspection, Web proxy

CAPEC ID: CAPEC-163

Contributors: Jeff Sakowicz, Microsoft Identity Developer Platform Services (IDPM Services); Mark Wee; Saisha Agrawal, Microsoft Threat Intelligent Center (MSTIC); Shailesh Tiwary (Indian Army)

Version: 1.0

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Version Permalink

Procedure Examples

Phishing for Information: Spearphishing Link

Other sub-techniques of Phishing for Information (3)

Adversaries may send spearphishing messages with a malicious link to elicit sensitive information that can be used during targeting. Spearphishing for information is an attempt to trick targets into divulging information, frequently credentials or other actionable information. Spearphishing for information frequently involves social engineering techniques, such as posing as a source with a reason to collect information (ex: Establish Accounts or Compromise Accounts) and/or sending multiple, seemingly urgent messages.

All forms of spearphishing are electronically delivered social engineering targeted at a specific individual, company, or industry. In this scenario, the malicious emails contain links generally accompanied by social engineering text to coax the user to actively click or copy and paste a URL into a browser.[1][2] The given website may closely resemble a legitimate site in appearance and have a URL containing elements from the real site. From the fake website, information is gathered in web forms and sent to the attacker. Adversaries may also use information from previous reconnaissance efforts (ex: Search Open Websites/Domains or Search Victim-Owned Websites) to craft persuasive and believable lures.

ID: T1598.003

Sub-technique of: T1598

ⓘ Tactic: Reconnaissance

ⓘ Platforms: PRE

ⓘ Data Sources: Application Log: Application Log Content, Network Traffic: Network Traffic Content, Network Traffic: Network Traffic Flow

Contributors: Philip Winther; Robert Simmons, @MalwareUtkonos; Sebastian Salla, McAfee

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Procedure Examples

ID	Name	Description
G0050	APT32	APT32 has used malicious links to direct users to web pages designed to harvest credentials.[3]
G0094	Kimsuky	Kimsuky has used links in e-mail to steal account information.[4]
G0034	Sandworm Team	Sandworm Team has crafted spearphishing emails with hyperlinks designed to trick unwitting recipients into revealing their account credentials.[5]
G0121	Sidewinder	Sidewinder has sent e-mails with malicious links to credential harvesting websites.[6]
G0122	Silent Librarian	Silent Librarian has used links in e-mails to direct victims to credential harvesting websites designed to appear like the targeted organization's login page.[7][8][9][10][11][12]

Tactics: Techniques: Procedures

ID: TA0001

Created: 17 October 2018

Last Modified: 19 July 2019

ID: T1566.002

Sub-technique of: T1566

ⓘ Tactic: Initial Access

ⓘ Platforms: Google Workspace, Linux, Office 365, SaaS, Windows, macOS

Contributors: Jeff Sakowicz, Microsoft Identity Developer Platform Services (IDPM Services); Kobi Haimovich, CardinalOps; Mark Wee; Menachem Goldstein; Philip Winther; Saisha Agrawal, Microsoft Threat Intelligent Center (MSTIC); Shailesh Tiwary (Indian Army)

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S0677	AADInternals
S0584	AppleJeus
G0006	APT1
G0007	APT28
G0016	APT29
G0022	APT3
G0050	APT32
G0064	APT33

APT Groups

GROUPS

- APT28
- APT29
- APT3
- APT30
- APT32
- APT33
- APT37
- APT38
- APT39
- APT41
- Aquatic Panda
- Axiom

Home > Groups > APT28

APT28

APT28 is a threat group that has been attributed to Russia's General Staff Main Intelligence Directorate (GRU) 85th Main Special Service Center (GTsSS) military unit 26165.[1][2] This group has been active since at least 2004.[3][4][5][6][7][8][9][10][11][12][13]

APT28 reportedly compromised the Hillary Clinton campaign, the Democratic National Committee, and the Democratic Congressional Campaign Committee in 2016 in an attempt to interfere with the U.S. presidential election. [5] In 2018, the US indicted five GRU Unit 26165 officers associated with APT28 for cyber operations (including close-access operations) conducted between 2014 and 2018 against the World Anti-Doping Agency (WADA), the US Anti-Doping Agency, a US nuclear facility, the Organization for the Prohibition of Chemical Weapons (OPCW), the Spiez Swiss Chemicals Laboratory, and other organizations.[14] Some of these were conducted with the assistance of GRU Unit 74455, which is also referred to as Sandworm Team.

ID: G0007

ⓘ Associated Groups: IRON TWILIGHT, SNAKEMACKEREL, Swallowtail, Group 74, Sednit, Sofacy, Pawn Storm, Fancy Bear, STRONTIUM, Tsar Team, Threat Group-4127, TG-4127

Contributors: Sébastien Ruel, CGI; Drew Church, Splunk; Emily Ratliff, IBM; Richard Gold, Digital Shadows

Version: 4.0

Created: 31 May 2017

Last Modified: 26 March 2023

Mitigations and Detection

Mitigations

ID	Mitigation	Description
M1047	Audit	Audit applications and their permissions to ensure access to data and resources are limited based upon necessity and principle of least privilege.
M1021	Restrict Web-Based Content	Determine if certain websites that can be used for spearphishing are necessary for business operations and consider blocking access if activity cannot be monitored well or if it poses a significant risk.
M1054	Software Configuration	Use anti-spoofing and email authentication mechanisms to filter messages based on validity checks of the sender domain (using SPF) and integrity of messages (using DKIM). Enabling these mechanisms within an organization (through policies such as DMARC) may enable recipients (intra-org and cross domain) to perform similar message filtering and validation.[117][118].

Detection

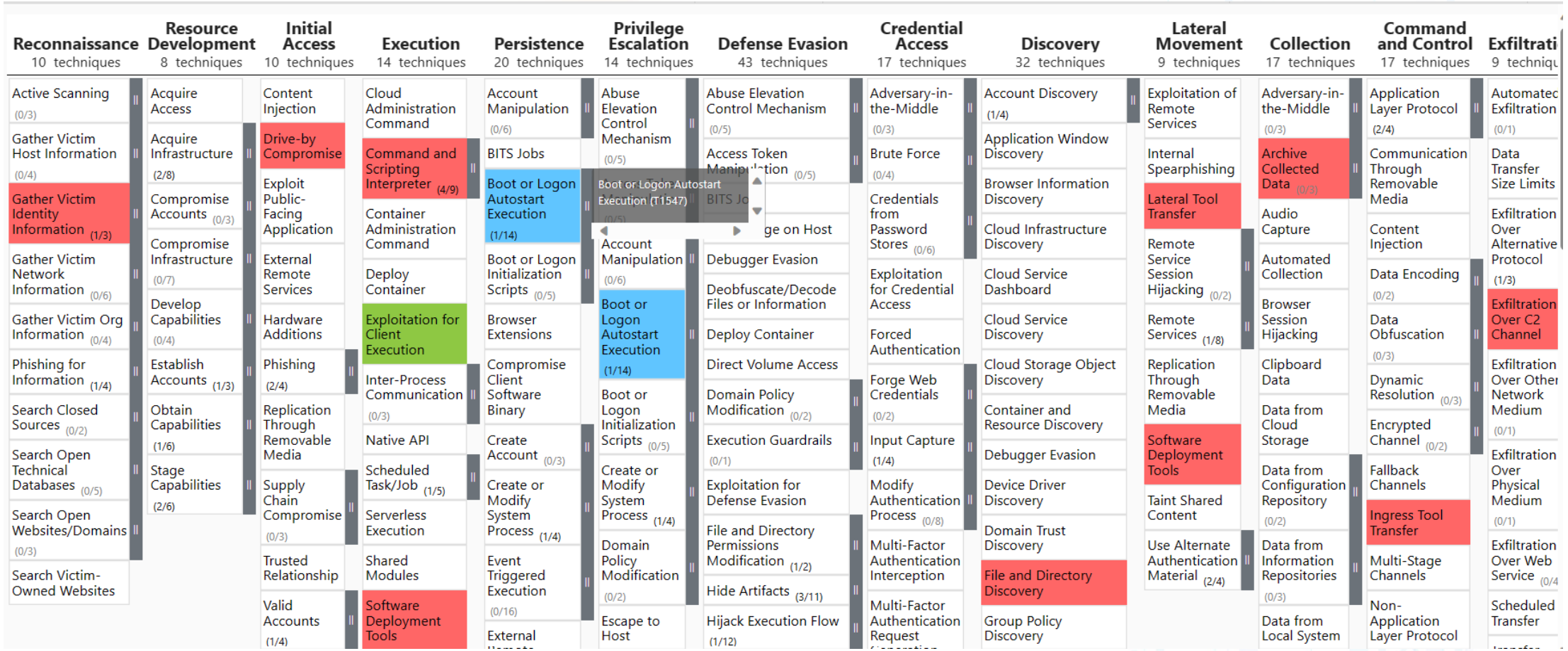
ID	Data Source	Data Component	Detects
DS0015	Application Log	Application Log Content	Monitor for third-party application logging, messaging, and/or other artifacts that may send spearphishing emails with a malicious link in an attempt to gain access to victim systems. Filtering based on DKIM+SPF or header analysis can help detect when the email sender is spoofed.[117][118] URL inspection within email (including expanding shortened links and identifying obfuscated URLs) can help detect links leading to known malicious sites.[2] Detonation chambers can be used to detect these links and either automatically go to these sites to determine if they're potentially malicious, or wait and capture the content if a user visits the link.

Use Cases of ATT&CK

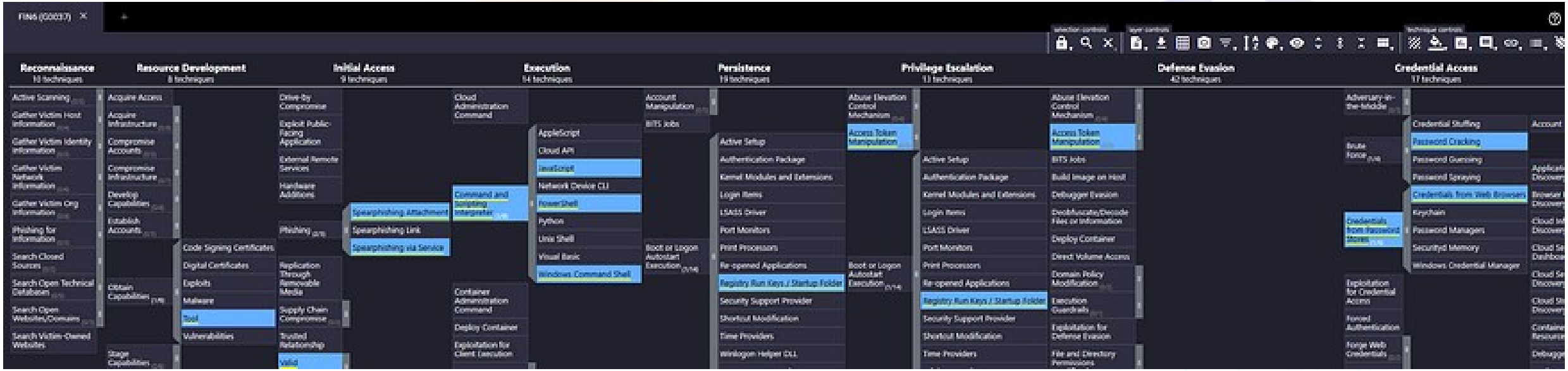
- Detection

```
processes = search Process:Create
    reg = filter processes where (exe == "reg.exe" and parent_exe == "cmd.exe")
    cmd = filter processes where (exe == "cmd.exe" and parent_exe != "explorer.exe"")
    reg_and_cmd = join (reg, cmd) where (reg.ppid == cmd.pid and reg.hostname ==
    cmd.hostname)
output reg_and_cmd
```

Comparing two threat groups



Gap Analysis and Engineering Defence



Adversary Emulation

Local Job Scheduling	Access Token Manipulation	Credential Access	
Trap	Bypass User Account Control	Forced Authentication	
Launchctl	Process Injection	Hooking	
Signed Binary Proxy Execution	Image File Execution Options Injection	Password Filter DLL	
User Execution	Plist Modification	LLMNR/NBT-NS Poisoning	
Exploitation for Client Execution	Valid Accounts	Private Keys	
CMSTP	DLL Search Order Hijacking	Keychain	
Dynamic Data Exchange	AppCert DLLs	Input Prompt	
Mshta	Hooking	Bash History	
AppleScript	Startup Items	Two-Factor Authentication Interception	
Source	Launch Daemon	Replication Through Removable Media	
Space after Filename	Dylib Hijacking	Input Capture	
Execution through Module Load	Application Shimming	Network Sniffing	
Regsvcs/Regasm	AppInit DLLs		
	Web Shell		
	Service Registry Permissions Weakness		
	New Service		

Signed Script Proxy Execution	
DCShadow	
Port Knocking	
Indirect Command Execution	
BITS Jobs	
Control Panel Items	
CMSTP	
Process Doppelgänging	

Cyber Threat Intelligence (CTI)

- To defend an organizational cyber infrastructure, you need to know
  - Who might be attacking you and their motivations
  - Frequency and volume of the attacks
  - The various attack surfaces they tend to exploit
  - The tactics used by different groups of attackers
  - The techniques they use to implement their tactics
  - The procedures they use to make the technique work
  - What kind of malware they use
  - Their Command-and-Control Infrastructure
  - Indicators of compromise
  - Artifacts – e.g. IP addresses, URLs, Malware, credentials, files. Certificates etc.

ATT&CK and CTI

- Knowledge of Adversary behaviour is helpful in planning defence
- Structuring CTI with ATT&CT TTPs help us:
  - Compare behaviours
    - Between threat groups
    - Same group over time
    - Groups to defences
  - Communicate in a common language for sharing CTI across organizations

Communicating to defenders

- APT 18 used legitimate credentials to log into external remote services
- APT 29 used compromised identities to access networks via VPNs and Citrix
- APT 41 compromised an online billing/payment service using VPN access between a 3rd party service provider and the targeted payment service

- All are using T1133 (External Remote Services) technique