Risk Assessment & Treatment

CS668 Course Project
Instructor - Prof. Sandeep K. Shukla

- Sumit Patel
- Rishik Jain
- Ayush Mohod
- Chandra Sekhar
- Bharat Kumar
- Sandeep Vissa

Agenda

- Motivation & Goal
- Design
- Tech Stack and References
- Implementation
- Results
- Demo
- Future Scope

Motivation & Goal

- In the ever-evolving threat landscape, organisations need to be regular in their effort to monitor the risks to their systems and apply suitable controls to reduce the risk
- There are abundant resources available to security engineers to perform vulnerability assessment, threat modelling etc. However, they often lack coherence and hence difficult to integrate

- The goal of this project was to design an interactive risk assessment and treatment application using open source tools and repositories.
- We hope that this project can be extended to include other parameters as mentioned in the future possibilities section later.

Design

Asset Inventory & Vulnerability assessment	List relevant threats	Design risk scoring application	List relevant mitigations	Update risk score by applying mitigations
Create a central asset inventory by listing CPE names (NVD) and their corresponding impact values. Use NVD CVEs to perform a vulnerability assessment in an online manner	Using MITRE ATT&CK techniques, we map the obtained CVEs to techniques and list all relevant techniques for each asset	Construct a database for threat-probability and use the impact values to calculate an initial score as well as each asset's contribution	Using MITRE ATT&CK mitigations for each technique, list the relevant mitigations in decreasing order of impact	By allowing user to select a subset of mitigations, update the risk score by reducing the likelihood of corresponding threats

Tech Stack, References and Work Distribution

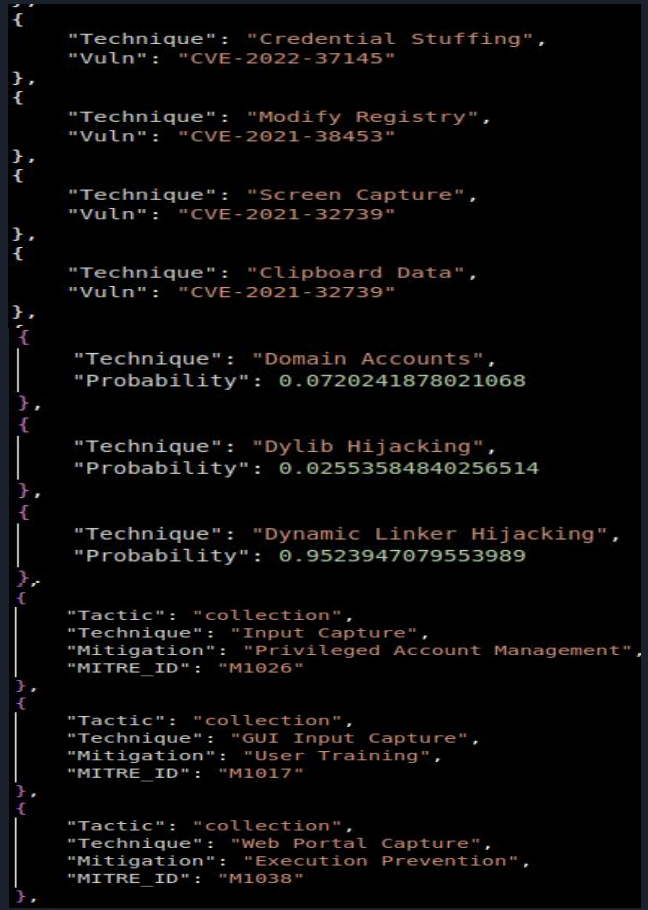
	Modelling & Design	Frontend	Backend	Data Collection
Technology stack	Python, AQL	HTML, CSS, ReactJS	NodeJS, MongoDB	JSON, CSV
Members assigned	Rishik Jain	Chandra Sekhar, Bharat Kumar	Sumit Patel, Sandeep Vissa	Ayush, Rishik Jain

References -

1. MITRE ATT&CK
2. NIST National Vulnerability Database
3. Linking Threat Tactics, Techniques, and Patterns with Defensive Weaknesses, Vulnerabilities and Affected Platform Configurations for Cyber Hunting

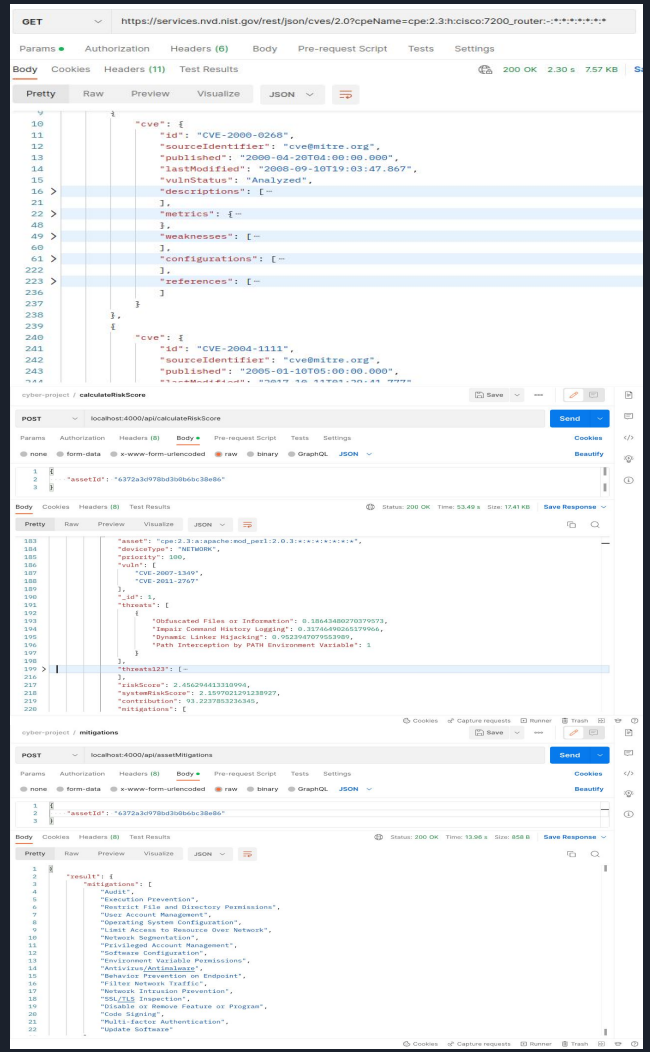
Implementation

- Creation of Technique-Vulnerability map
  - By querying BRON database
- Creation of Technique-Prob map
  - Using number of CVEs corresponding to each technique
- Creation of Technique-Mitigation map
  - By querying BRON database



Implementation

- saveAsset API to save asset to the database and perform vulnerability assessment using NIST API
- calcRiskScore API to compute initial risk score based on weighted mean
- assetMitigation to list the mitigations for the entire system and reduceScore to update the risk score based on selected mitigations



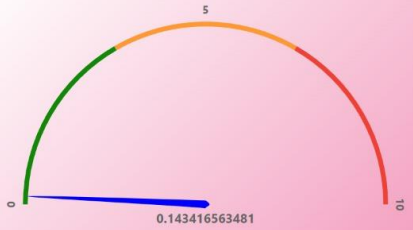
Results Achieved

Asset	DeviceType	Impact	Vulnerabilities
cpe:2.3:a:novell:netmail:-:*:*:*:*:*:*:*	NW	1	CVE-2006-6424 ,CVE-2006-6425
cpe:2.3:a:apache:mod_perl:2.0.3:*:*:*:*:*:*:*	PC	1	CVE-2007-1349 ,CVE-2011-2767
cpe:2.3:h:cisco:7200_router:-:*:*:*:*:*:*:*	PC	1	CVE-2000-0268 ,CVE-2004-1111 ,CVE-2010-0578

CALCULATE RISK SCORE

Assets	Contribution	Threats
cpe:2.3:h:cisco:7200_router:-:*:*:*:*:*:*:*	0	No threats Found
cpe:2.3:a:apache:mod_perl:2.0.3:*:*:*:*:*:*:*	9.09090909090909	• Obfuscated Files or Information • Impair Command History Logging • Dynamic Linker Hijacking • Path Interception by PATH Environment Variable
cpe:2.3:a:novell:netmail:-:*:*:*:*:*:*:*	0	No threats Found

GO TO MITIGATIONS



	Mitigations
☐	Antivirus/Antimalware
☐	Behavior Prevention on Endpoint
☐	Environment Variable Permissions
☐	Operating System Configuration
☐	Audit
☑	Execution Prevention
☐	User Account Management
☑	Restrict File and Directory Permissions

REDUCE RISK SCORE

Demo

Future Possibilities

- Integration with OpenSCAP for each asset
  - List system hardening vulnerabilities using STIG files and tools (for eg. scc, oscap)
  - Map each vulnerability with CCI (Control Correlation Identifier)
  - Create a list of most relevant CCIs similar to MITRE mitigations
- Deploy an agent on organisational assets to perform real-time risk profiling
- Include information and human assets
  - Hard to assign impact scores and list weaknesses
- Include policy compliance as a parameter
  - Assign score based on whether policy is defined, understood and implemented

Thank You