

CWE User Experience Working Group Meeting

June 26, 2024



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Agenda

This meeting is being recorded :-)

- **Primary topics**
 - CWE Macro Changes
 - CWE User Interview Guide Draft
 - CWE Usability Mockups Updates
 - Open Discussion
- **Reminders and Adjourn**



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Topic 1

CWE Macro Changes

Chris Coffin



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Usability: Macro- and Micro-Level Review

- **Macro –**

- How to organize weaknesses at structural, site-wide level?
 - Organizing Views
- Site-wide navigation

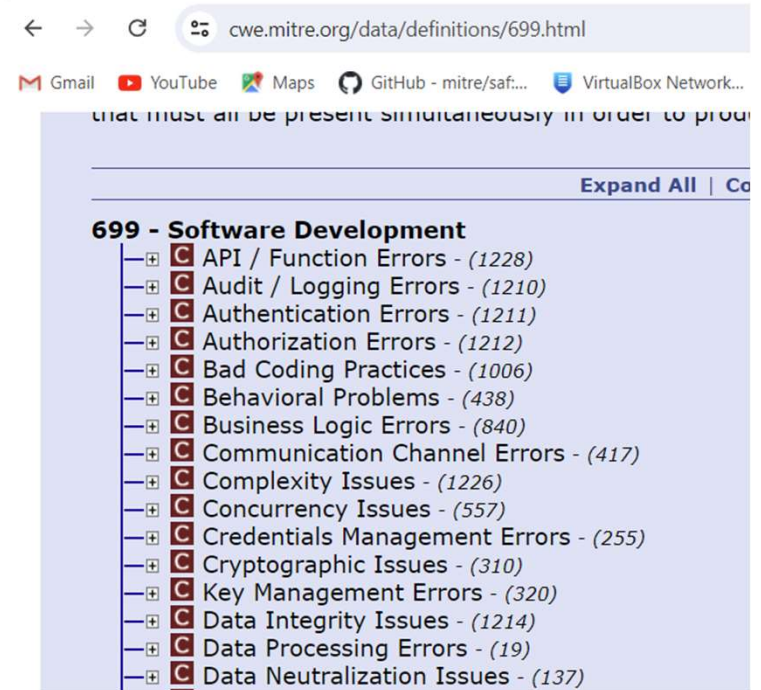
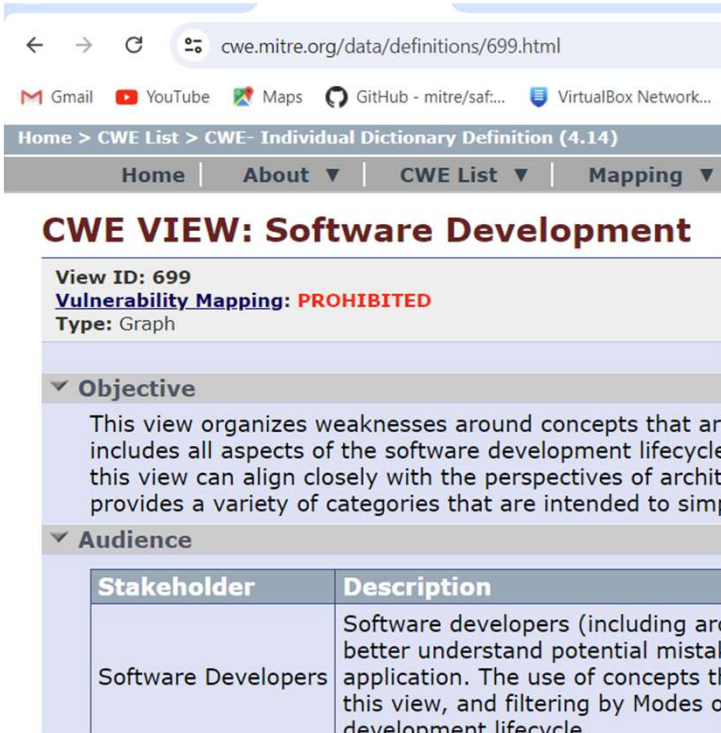
- **Micro –**

- How to define a weakness understandably/accurately
- Remove redundant and unnecessary information
 - Moving information to a better place
- Better leverage the schema



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Other Macro Changes?

- Any other thoughts or ideas on Macro usability changes?



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Topic 2

CWE User Interview Guide Draft

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CWE User Interview Guide Draft

- **User interview guide to gather feedback from prospective user groups**
- **Will send to UEWG members soon and hope everyone can participate**

CWE – User Interview Guide

Research Questions

- What are the main usability issues users encounter when using the CWE website?
 - Are users able to easily navigate to the information they need to accomplish their goals?
 - Do users find the content and language to be useful, insightful, and actionable?

Warm Up

- To begin, could you tell me briefly about your role? What do you do?
- How long have you been in your role for?

Overall Experience

- Can you walk me through your experience with the CWE website?
- What information are you typically looking for? How quickly are you able to find that information? Is there anything you try to look for but is missing or hard to find?
- What situations have you used the CWE website for? Can you tell us about a recent one?
 - What did you like the most/least about your experience? Why?
 - What information from the website was the most helpful? How did you use the information?
 - What difficulties did you encounter? What would have made it easier to accomplish your specific task?
- What are your common frustrations when using the CWE website?
- What would we need to change for you to use the CWE website more?



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Topic 3

CWE Usability Mockups Updates

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Sharing Mockups with Google Drive

- Work is continuing on the CWE Usability Mockups
- https://drive.google.com/drive/folders/1NqYbkZcyXE7xzlhyADFFRjHXpuKvV01Q?usp=drive_link



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CWE-22: Improper Limitation of a Pathname to a Restricted Directory ('Path Traversal')

Weakness ID: 22

Vulnerability Mapping: ALLOWED

Abstraction: Base

Description

The product uses external input to construct a pathname that is intended to identify a file or directory that is located underneath a restricted parent directory, but the product does not properly neutralize special elements within the pathname that can cause the pathname to resolve to a location that is outside of the restricted directory.

Extended Description

Many file operations are intended to take place within a restricted directory. By using special elements such as ".." and "/" separators, attackers can escape outside of the restricted location to access files or directories that are elsewhere on the system. One of the most common special elements is the "../" sequence, which in most modern operating systems is interpreted as the parent directory of the current location. This is referred to as relative path traversal. Path traversal also covers the use of absolute pathnames such as "/usr/local/bin", which may also be useful in accessing unexpected files. This is referred to as absolute path traversal.

In many programming languages, the injection of a null byte (the 0 or NUL) may allow an attacker to truncate a generated

CWE-22: Improper Limitation of a Pathname to a Restricted Directory

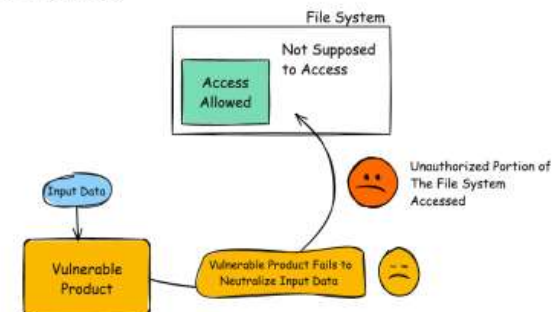
Weakness ID: 22

Vulnerability Mapping: ALLOWED

Abstraction: Base

Description

The product constructs a pathname for file or directory identification using external input, but fails to neutralize special elements within the pathname. This could lead to the pathname resolving to a location outside the restricted directory. Special elements, such as "../", can be used to escape the restricted location and access files or directories elsewhere on the system, a situation known as relative path traversal. The issue also extends to absolute path traversal, where absolute pathnames like "/usr/local/bin" are used. Additionally, the injection of a null byte in some programming languages may truncate a generated filename, potentially broadening the scope of attack.



Alternate Terms

Directory traversal

Path traversal: "Path traversal" is preferred over "directory traversal," but both terms are attack-focused.

Topic 4

Open Discussion

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Open Discussion Topics?

- **Increase motivations to fix weaknesses versus vulnerabilities**
 - Could we find a way to incorporate cost and expense associated with a weakness into CWE?
- **What CWE personas most benefit from weakness visualizations?**
 - Technical writers and security architects whose audience is less technical could benefit from reusing visualizations
 - New or junior level Software or Hardware developers could better understand security issues in visual form
- **CWE persona for technical manager?**



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Next Meeting – July 31 @ 12pm

PLEASE CONTACT WITH ANY QUESTIONS OR THOUGHTS

CWE@MITRE.ORG



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Backups



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UEWG: Purpose

- **Mission:** Identifying areas where CWE content, rules, guidelines, and best practices must improve to better support stakeholder community, and work collaboratively to fix them
- **Periodic reporting of activities to CWE Board**
 - Next quarterly Board meeting TBD Q2-2024
- **Please solicit participation from your contacts**
 - Contact: cwe@mitre.org



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Housekeeping

- **CWE UEWG May Meeting**
 - The next regularly scheduled meeting is Wed 7/31
- **The CWE Program is continuously seeking feedback on UEWG activities and priorities during these sessions or via email: cwe@mitre.org**



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Usability Task Micro Updates Initial Goals

Above the fold (before the webpage scroll point):

- Important and concise text is above the fold so the reader can easily scan and digest

Points to Make Above the Fold:

- Describe just the weakness and provide a visual aid
 - Concise summary of weakness (only in description, no extended description)
 - Describe the condition and some context about the condition
 - Concise is 3 – 4 sentences. Images will provide additional context.

Reorder Elements:

- Alternate Terms
- Consequences Element (bad outcomes)
- Mitigations Element (what to do about the weakness)
- Remaining Elements follow



Prioritizing User Experience Improvements

- **User Experience Working Group was established in response to negative feedback related to CWE's usability**
 - This group has accomplished much in response (e.g., submission guidelines, mapping guidance, "New to CWE?" launch, weakness filtering)
 - We must now begin to address usability and understandability in further ways throughout the corpus structure and down to individual weakness language
- **CWE entry clean-up (across the entire corpus)**
 - Understandability: revising all entries for simpler language; remove redundancy
 - Simplifying descriptions/extended descriptions to leverage other elements appropriately
 - E.g., removing example instance, impacts, etc. language from descriptions
 - Only having one description written in concise, accurate language focusing on the weakness
 - Completeness: ensuring all entries have basic required elements populated
 - Visualizations: adding to entries to explain topics visually (leverage Abhi's top25 examples, build from there)



Usability: Macro- and Micro-Level

- **Macro –**

- How to organize weaknesses at structural, site-wide level?
 - Organizing Views
- Site-wide navigation

- **Micro –**

- How to define a weakness understandably/accurately
- Remove redundant and unnecessary information
- Better leverage the schema



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CWE-89: Improper Neutralization of Special Elements used in an SQL Command ('SQL Injection')

Weakness ID: 89

Abstraction: Base
Structure: Simple

Description

The product constructs all or part of an SQL command using externally-influenced input from an upstream component, but it does not neutralize or incorrectly neutralizes special elements that could modify the intended SQL command when it is sent to a downstream component.

Extended Description

Without sufficient removal or quoting of SQL syntax in user-controllable inputs, the generated SQL query can cause those inputs to be interpreted as SQL instead of ordinary user data. This can be used to alter query logic to bypass security checks, or to insert additional statements that modify the back-end database, possibly including execution of system commands.

SQL injection has become a common issue with database-driven web sites. The flaw is easily detected, and easily exploited, and as such, any site or product package with even a minimal user base is likely to be subject to an attempted attack of this kind. This flaw depends on the fact that SQL makes no real distinction between the control and data planes.

Relationships



Relevant to the view "Research Concepts" (CWE-1000)

| Nature | Type | ID | Name |
|-----------|------|-----|---|
| ChildOf | G | 943 | Improper Neutralization of Special Elements in Data Query Logic |
| ParentOf | V | 564 | SQL Injection: Hibernate |
| CanFollow | V | 456 | Missing Initialization of a Variable |



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CWE-89: Improper Neutralization of Special Elements used in an SQL Command

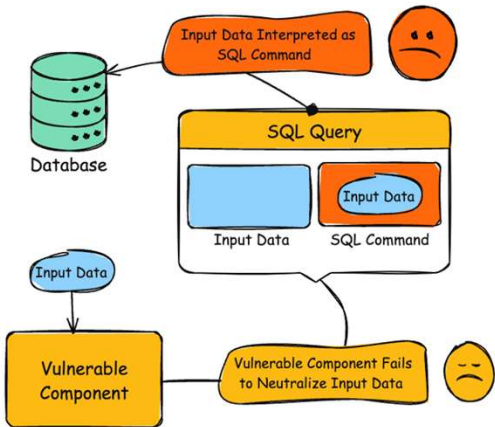
Weakness ID: 89

Usage for Mapping: ALLOWED (this CWE ID may be used to map to real-world vulnerabilities)

Abstraction: Base

Description

The product uses user-controllable input to construct an SQL command incorrectly or without neutralizing its special elements. This can cause inputs to be interpreted as SQL code instead of ordinary user data. This weakness depends on the fact that SQL makes no real distinction between the control and data planes.



Alternate Terms

'SQL Injection'

Common Consequences



| Scope | Impact |
|-----------------|--|
| Confidentiality | Technical Impact: Read Application Data A user could construct an SQL command to reveal sensitive information stored in a database |

Overall Prioritization

- **At what level should we begin our focus?**
- **Macro (CWE organization and navigation) vs Micro level (weakness understandability)**
- **Micro could include CWE record:**
 - Understandability
 - Completeness
 - Visualizations



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A possible path forward

- **Discuss a single CWE and how we could improve usability by**
 - Merging the description and extended descriptions
 - Removing redundant information
 - Moving information that belongs in other parts of the schema
 - Removing vulnerability specific information
- **We could walk through one example in the meeting**
- **Would anyone be interested in trying this exercise with another CWE on their own**
 - Could present their results in the next meeting



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Topic 2

New to CWE Updates

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Prioritizing User Experience Improvements

- **To come: New Strategy and Implementation Plan for usability improvements across CWE corpus aligned to required elements and their requirements as outlined in CWE content suggestion guidelines**
- **Community partners in UEWG are invited to help us tackle this important work**
 - More intentional focus in UEWG
 - CWE Content Web Submission Form for suggested mods on any weakness
 - Content Development Repository (CDR), GitHub repo for community collaboration is coming soon and will provide transparent, collaborative platform on which to work



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Recent Discussions on SW Licensing Issues

- **Since November, a resurrection of debate around SW licensing issues being in/out of CWE scope on the CWE-Research email listserv**
- **In 2018, it was determined that “improper licensing” was outside of CWE's scope**
 - Rationale: Impact to software and its usage not through the technical exploitation of a software security weakness in architecture, design, or code. Rather, it is through policy/programmatic exploitation.
 - Availability concern comparable with supply chain issues where one disrupts a supplier to stop/limit a product from being delivered, and hence make it not available
- **Recent arguments are varied:**
 - Pro: Misusing SW licenses can negatively affect maintainability, availability
 - Against: Invalid/Improper licenses cannot lead to a vulnerability
 - Pro: CWE absorbed CQE content ~2018; improper licensing is a code quality issue
 - Against: Licensing issues are not a property of SW, but of the society and economy around the SW



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CWE Scope

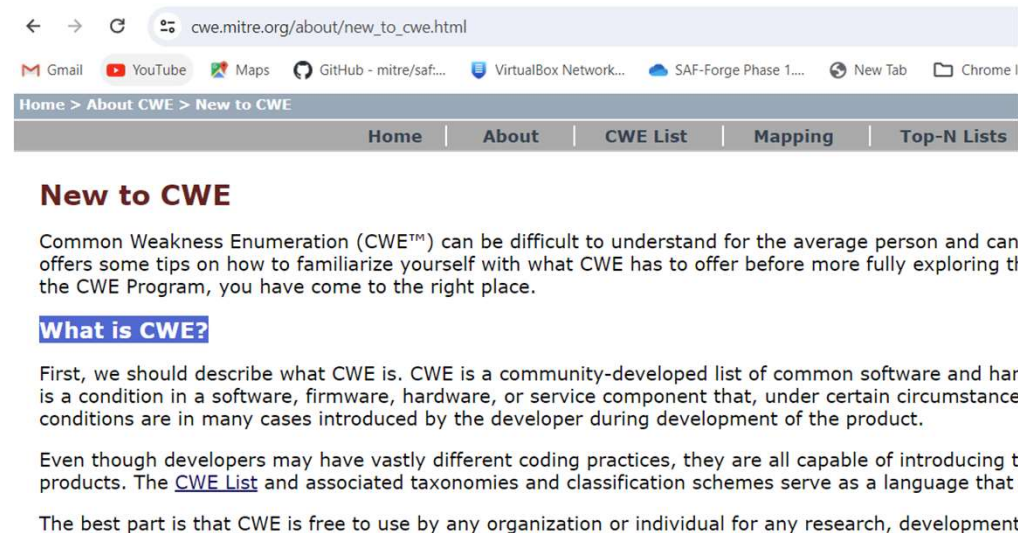
- **CWE's definition of "Weakness":**
 - A condition in a software, firmware, hardware, or service component that, under certain circumstances, could contribute to the introduction of vulnerabilities
- **Community members sometimes suggest new entries to CWE that do not satisfy this "weakness" definition, but they want CWE to treat them as "weaknesses"**
- **Other times, people effectively suggest the expansion of CWE's scope beyond "traditional" software/hardware**
- **"Scope exclusions" attempt to formalize decisions about what can or cannot be included in CWE as an official "weakness" entry**
 - Have already been used in external submissions



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New to CWE – Additional Examples

- The current New to CWE page has one example “CWE-798: Use of Hard-coded Credentials”
- More examples are needed
- Should be simple to understand to closely match the intended audience of the New to CWE page
- Examples for consideration?
 - Might focus on 2023 Top 25 CWEs?
 - CWE-434: Unrestricted Upload of File with Dangerous Type
 - CWE-287: Improper Authentication
 - Others?



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New to CWE – Additional Examples – Selection Criteria (Continued)

- What CWE characteristics are important when determining the best examples for new CWE users?
- Is the description easy to understand for a non-developer or industry expert?
- Does it include good examples (demonstrative and observed)?
- Is it a well-known/well-understood weakness?
- Does it exist in the Top 25 list (now or previous years)?
- Others?

CWE-787: Out-of-bounds Write

Weakness ID: 787
Abstraction: Base
Structure: Simple

View customized information:

Conceptual

Operational

Mapping
Friendly

Complete

Custom

Description

The product writes data past the end, or before the beginning, of the intended buffer.

Extended Description

Typically, this can result in corruption of data, a crash, or code execution. The product may modify an index or perform pointer arithmetic that references a memory location that is outside of the boundaries of the buffer. A subsequent write operation then produces undefined or unexpected results.

Alternate Terms

Memory Corruption: Often used to describe the consequences of writing to memory outside the bounds of a buffer, or to memory that is invalid, when the root cause is something other than a sequential copy of excessive data from a fixed starting location. This may include issues such as incorrect pointer arithmetic, accessing invalid pointers due to incomplete initialization or memory release, etc.

Relationships

Relevant to the view "Research Concepts" (CWE-1000)

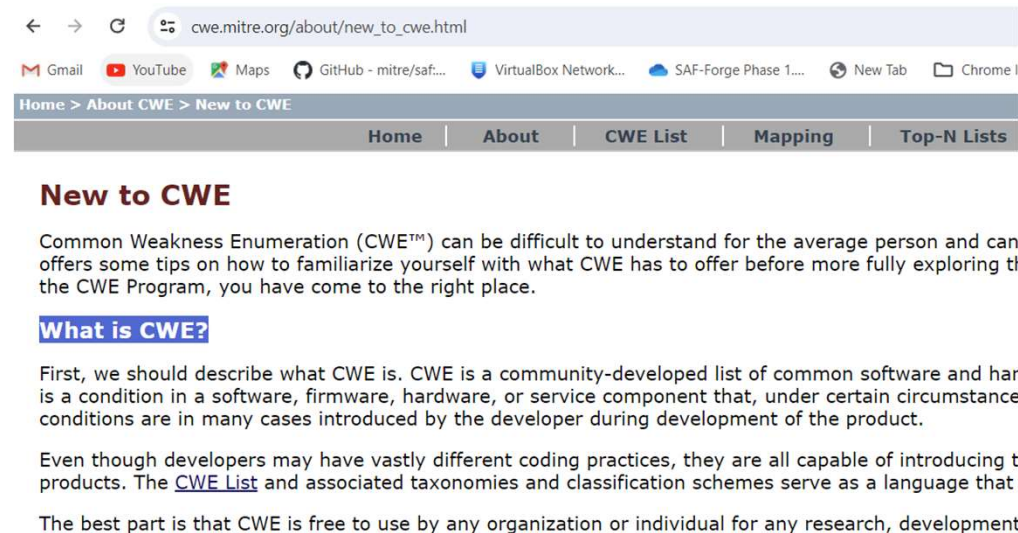
| Nature | Type | ID | Name |
|-----------|------|-----|---|
| ChildOf | ✓ | 119 | Improper Restriction of Operations within the Bounds of a Memory Buffer |
| ParentOf | ✓ | 121 | Stack-based Buffer Overflow |
| ParentOf | ✓ | 122 | Heap-based Buffer Overflow |
| ParentOf | ✓ | 123 | Write-what-where Condition |
| ParentOf | ✓ | 124 | Buffer Underwrite ('Buffer Underflow') |
| CanFollow | ✓ | 822 | Untrusted Pointer Dereference |
| CanFollow | ✓ | 823 | Use of Out-of-range Pointer Offset |
| CanFollow | ✓ | 824 | Access of Uninitialized Pointer |



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New to CWE Series – Future Topics

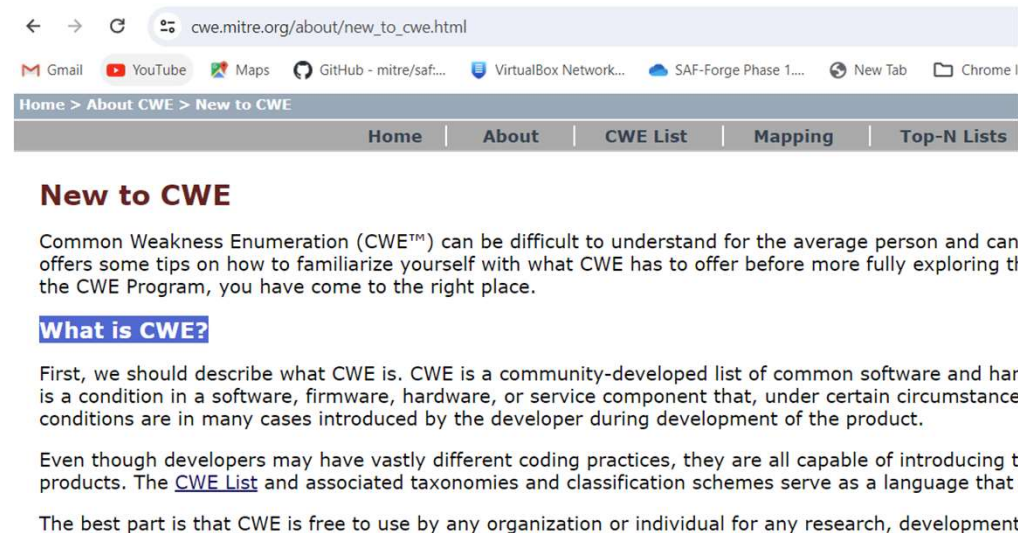
- The CWE team is considering developing additional documents as part of a “New to CWE” series
- Keep them short so that new and casual users can read quickly
- Each document would link to others in the series where appropriate
- Topics for consideration?
 - Categorization - Views and Categories
 - How do I navigate the CWE corpus?
 - CWE Hierarchy - Pillars, Classes, Bases, and Variants
 - Others?



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New to CWE Series – How to Navigate CWE

- The CVE -> CWE Mapping Guidance exists on the website today
- The Mapping Methodologies section of the guidance could be reused with some modification
 - Keyword search
 - Views
 - PDF Visualization
- The goal is to create a “New to CWE: How to Navigate CWE” document that could be referenced by the current “New to CWE” page that exists today



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CWE Element/Information Presentation – Mockup for New CWE Users

CWE-125: Out-of-bounds Read

Weakness ID: 125

Abstraction: Base

Structure: Simple

View customized information:

Conceptual

Operational

Mapping Friendly

Complete

Custom

What is the Weakness?

Description

The product reads data past the end, or before the beginning, of the intended buffer.

Extended Description

Typically, this can allow attackers to read sensitive information from other memory locations or cause a crash. A crash can occur when the code reads a variable amount of data and assumes that a sentinel exists to stop the read operation, such as a NUL in a string. The expected sentinel might not be located in the out-of-bounds memory, causing excessive data to be read, leading to a segmentation fault or a buffer overflow. The product may modify an index or perform pointer arithmetic that references a memory location that is outside of the boundaries of the buffer. A subsequent read operation then produces undefined or unexpected results.

How can the Weakness affect me?

Common Consequences

| Scope | Impact | Likelihood |
|-----------------|---|------------|
| Confidentiality | Technical Impact: Read Memory | |
| | Technical Impact: Bypass Protection Mechanism | |
| Confidentiality | By reading out-of-bounds memory, an attacker might be able to get secret values, such as memory addresses, which can be bypass protection mechanisms such as ASLR in order to improve the reliability and likelihood of exploiting a separate weakness to achieve code execution instead of just denial of service. | |

Demonstrative Examples

Example 1

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CWE Element/Information Presentation – Mockup for New CWE Users

index or perform pointer arithmetic that references a memory location that is outside of the boundaries of the buffer. A subsequent read operation then produces undefined or unexpected results.

How does this Weakness relate to others?

Relationships

Relevant to the view "Research Concepts" (CWE-1000)

| Nature | Type | ID | Name |
|-----------|------|-----|---|
| ChildOf | 🟢 | 119 | Improper Restriction of Operations within the Bounds of a Memory Buffer |
| ParentOf | 🟡 | 126 | Buffer Over-read |
| ParentOf | 🟡 | 127 | Buffer Under-read |
| CanFollow | 🟡 | 822 | Untrusted Pointer Dereference |
| CanFollow | 🟡 | 823 | Use of Out-of-range Pointer Offset |
| CanFollow | 🟡 | 824 | Access of Uninitialized Pointer |
| CanFollow | 🟡 | 825 | Expired Pointer Dereference |

Relevant to the view "Software Development" (CWE-699)

| Nature | Type | ID | Name |
|----------|------|------|--------------------------------------|
| MemberOf | 🔴 | 1218 | Memory Buffer Errors |

Relevant to the view "Weaknesses for Simplified Mapping of Published Vulnerabilities" (CWE-1003)

Relevant to the view "CISQ Quality Measures (2020)" (CWE-1305)

Relevant to the view "CISQ Data Protection Measures" (CWE-1340)

Where can I get more information?

References

[REF-1034] Raoul Strackx, Yves Younan, Pieter Philippaerts, Frank Piessens, Sven Lachmund and Thomas Walter. "Breaking the memory secrecy assumption". ACM. 2009-03-31. <<https://dl.acm.org/doi/10.1145/1519144.1519145>>. URL validated: 2023-04-07.

[REF-1035] Fermin J. Serna. "The info leak era on software exploitation". 2012-07-25. <<https://media.blackhat.com/bh-us-12/Busi/Serna/Busi-Serna-12-Info-Leak-Era-Slides.pdf>>.



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Grouping CWEs

- **CWE entries are currently “grouped” in different ways to provide useful subsets of the CWE corpus for different purposes:**
 - Views: a subset of CWE entries that provides a way of examining CWE content. The two main view structures are Slices (flat lists) and Graphs (containing relationships between entries), examples include:
 - [CWE-1194: Hardware Design](#)
 - [CWE-699: Software Development](#)
 - [CWE-1400: Comprehensive Categorization for Software Assurance Trends](#)
 - [CWE-1003: Weaknesses for Simplified Mapping of Published Vulnerabilities](#) (NVD)
 - Categories: a CWE entry that contains a set of other entries that share a common characteristic. A category is not a weakness, but rather a structural item that helps users find weaknesses that share the stated common characteristic.
 - [CWE-1199: General Circuit and Logic Design Concerns](#)
 - ~ Overall Hierarchy
 - [CWE-1000: Research Concepts](#) contains all CWE entries in one hierarchical structure

Grouping CWEs, cont.

- **What groupings are most useful to new or casual CWE users? Experienced users?**
- **How can groupings be better presented/discovered/identified to the user?**
- **Should new users be guided to groupings of CWEs for learning about CWE? (e.g., links in user stories)**
- **Are there additional groupings that we are missing? Too many?**



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CSV Single Colon Separators Within Column Data

- A double colon is used to separate csv fields/columns data, while a single colon is used to separate multi-value data within fields/columns
- The Observed Examples field contains Reference and link data that includes a url in some cases (colon within “http://...”)
- Should a note be added to the download data that warns the user of this, or should we look into an alternative separator?
- Example taken from CWE - CWE-41: Improper Resolution of Path Equivalence (4.12) (mitre.org)
 - ::REFERENCE:CVE-2000-1114:DESCRIPTION:Source code disclosure using trailing dot:LINK:https://www.cve.org/CVERecord?id=CVE-2000-1114::REFERENCE:CVE-2002-1986:DESCRIPTION:Source code disclosure using trailing



CWE User Pain Points

- Pain point topics that the group is aware of or would like to discuss
- For those on the call, what were your biggest questions or concerns when beginning to use CWE?
- Are there common questions that CWE users have that are not covered in the current FAQ?
- Other potential opportunities:
 - Features we could expand or improve to make CWE consumption easier?
 - Maybe engage the community in one or more ways to solicit this kind of feedback (see topic #3)
- Other thoughts?



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Community Engagement Strategy

- **Develop a strategy for engaging the CWE user community for feedback**
- **What are the best methods to query the community on topics such as the pain points covered in topic #2**
- **What communication methods should be employed?**
 - E.g., polls, emails, web, social media
- **Should we target specific user types?**

- **Other thoughts?**



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CWE Video Tips Series

■ Current video ideas:

- How to search CWE for a weakness
- How to display only the information that you need with presentation filters
- What is a weakness (vs a vulnerability)
- How are weaknesses organized
- What is a category (how is it different than a pillar)
- What are views
- How and why to use the research view
- Use cases for CWE (could user stories be used?)
- How do I submit an idea for a new weakness
- How can I improve the quality of existing weaknesses



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New to CWE – Future Content

- **The New to CWE content audience is different from what has been catered to previously**
- **The audience is the casual or new user to CWE or even the manager who makes security funding decisions**
- **The team has previously drafted material for the New to CWE audience that covers the CWE hierarchy**
 - Not yet released material
 - Do members agree that this topic should be covered for New to CWE?
- **Are there other topics that UEWG members feel strongly about or believe should be covered given the intended audience?**
- **Should there be a close coupling of the topics covered here with the CWE Video Tips series?**



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CWE Naming and Vulnerability Mapping

- **Being thinking about solutions for common and well-known issues surrounding use of CWE names and how to more easily map vulnerabilities to CWEs**
- **Current CWE structure is difficult to understand and use**
- **Community needs better root cause information for vulnerabilities**
- **Does CWE naming need a change or update to support easier mapping?**
 - Remove CWE names for Views and/or Categories?
 - New naming that embeds a structure (e.g., CWE-1234-1)



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