



## CWE-284: Improper Access Control

Weakness ID: 284

[Vulnerability Mapping](#): **DISCOURAGED**

Abstraction: Pillar

View customized information:

Conceptual

Operational

Mapping  
Friendly

Complete

Custom

### Description

The product does not restrict or incorrectly restricts access to a resource from an unauthorized actor.

### Extended Description

Access control involves the use of several protection mechanisms such as:

- Authentication (proving the identity of an actor)
- Authorization (ensuring that a given actor can access a resource), and
- Accountability (tracking of activities that were performed)

When any mechanism is not applied or otherwise fails, attackers can compromise the security of the product by gaining privileges, reading sensitive information, executing commands, evading detection, etc.

There are two distinct behaviors that can introduce access control weaknesses:

- **Specification:** incorrect privileges, permissions, ownership, etc. are explicitly specified for either the user or the resource (for example, setting a password file to be world-writable, or giving administrator capabilities to a guest user). This action could be performed by the program or the administrator.
- **Enforcement:** the mechanism contains errors that prevent it from properly enforcing the specified access control requirements (e.g., allowing the user to specify their own privileges, or allowing a syntactically-incorrect ACL to produce insecure settings). This problem occurs within the program itself, in that it does not actually enforce the intended security policy that the administrator specifies.

### Alternate Terms

#### Authorization

The terms "access control" and "authorization" are often used interchangeably, although many people have distinct definitions. The CWE usage of "access control" is intended as a general term for the various mechanisms that restrict which users can access which resources, and "authorization" is more narrowly defined. It is unlikely that there will be community consensus on the use of these terms.

### Common Consequences



#### Impact

*Varies by Context*

#### Details

**Scope:** Other

### Potential Mitigations

Phase(s)	Mitigation
Architecture and Design; Operation	Very carefully manage the setting, management, and handling of privileges. Explicitly manage trust zones in the software.
Architecture and Design	<p><b>Strategy: Separation of Privilege</b></p> <p>Compartmentalize the system to have "safe" areas where trust boundaries can be unambiguously drawn. Do not allow sensitive data to go outside of the trust boundary and always be careful when interfacing with a compartment outside of the safe area.</p> <p>Ensure that appropriate compartmentalization is built into the system design, and the compartmentalization allows for and reinforces privilege separation functionality. Architects and designers should rely on the principle of least privilege to decide the appropriate time to use privileges and the time to drop privileges.</p>

### Relationships

**i** ▼ **Relevant to the view "Research Concepts" (View-1000)**

Nature	Type	ID	Name
MemberOf	V	1000	Research Concepts
ParentOf	C	269	Improper Privilege Management
ParentOf	C	282	Improper Ownership Management
ParentOf	C	285	Improper Authorization
ParentOf	C	286	Incorrect User Management
ParentOf	C	287	Improper Authentication
ParentOf	C	346	Origin Validation Error
ParentOf	B	749	Exposed Dangerous Method or Function
ParentOf	C	923	Improper Restriction of Communication Channel to Intended Endpoints
ParentOf	B	1191	On-Chip Debug and Test Interface With Improper Access Control
ParentOf	B	1220	Insufficient Granularity of Access Control
ParentOf	B	1224	Improper Restriction of Write-Once Bit Fields
ParentOf	B	1231	Improper Prevention of Lock Bit Modification
ParentOf	B	1233	Security-Sensitive Hardware Controls with Missing Lock Bit Protection
ParentOf	B	1252	CPU Hardware Not Configured to Support Exclusivity of Write and Execute Operations
ParentOf	B	1257	Improper Access Control Applied to Mirrored or Aliased Memory Regions
ParentOf	B	1259	Improper Restriction of Security Token Assignment
ParentOf	B	1260	Improper Handling of Overlap Between Protected Memory Ranges
ParentOf	B	1262	Improper Access Control for Register Interface
ParentOf	C	1263	Improper Physical Access Control
ParentOf	B	1267	Policy Uses Obsolete Encoding
ParentOf	B	1270	Generation of Incorrect Security Tokens
ParentOf	B	1274	Improper Access Control for Volatile Memory Containing Boot Code
ParentOf	B	1276	Hardware Child Block Incorrectly Connected to Parent System
ParentOf	B	1280	Access Control Check Implemented After Asset is Accessed
ParentOf	B	1283	Mutable Attestation or Measurement Reporting Data
ParentOf	B	1290	Incorrect Decoding of Security Identifiers
ParentOf	B	1292	Incorrect Conversion of Security Identifiers
ParentOf	C	1294	Insecure Security Identifier Mechanism
ParentOf	B	1296	Incorrect Chaining or Granularity of Debug Components
ParentOf	B	1304	Improperly Preserved Integrity of Hardware Configuration State During a Power Save/Restore Operation
ParentOf	B	1311	Improper Translation of Security Attributes by Fabric Bridge
ParentOf	B	1312	Missing Protection for Mirrored Regions in On-Chip Fabric Firewall
ParentOf	B	1313	Hardware Allows Activation of Test or Debug Logic at Runtime
ParentOf	B	1315	Improper Setting of Bus Controlling Capability in Fabric End-point
ParentOf	B	1316	Fabric-Address Map Allows Programming of Unwarranted Overlaps of Protected and Unprotected Ranges
ParentOf	B	1317	Improper Access Control in Fabric Bridge
ParentOf	B	1320	Improper Protection for Outbound Error Messages and Alert Signals
ParentOf	B	1323	Improper Management of Sensitive Trace Data
ParentOf	B	1334	Unauthorized Error Injection Can Degrade Hardware Redundancy

▼ **Relevant to the view "Architectural Concepts" (View-1008)**

Nature	Type	ID	Name
MemberOf	C	1011	Authorize Actors

▼ **Relevant to the view "CISQ Data Protection Measures" (View-1340)**

Nature	Type	ID	Name
ParentOf	C	285	Improper Authorization
ParentOf	C	287	Improper Authentication
ParentOf	B	288	Authentication Bypass Using an Alternate Path or Channel
ParentOf	B	639	Authorization Bypass Through User-Controlled Key
ParentOf	C	862	Missing Authorization
ParentOf	C	863	Incorrect Authorization

▼ **Modes Of Introduction**



Phase	Note
Architecture and Design	
Implementation	REALIZATION: This weakness is caused during implementation of an architectural security tactic.

Operation

### ▼ Applicable Platforms



#### Languages

Class: Not Language-Specific (*Often Prevalent*)

#### Technologies

Class: Not Technology-Specific (*Often Prevalent*)Class: ICS/OT (*Often Prevalent*)Class: Web Based (*Often Prevalent*)

### ▼ Demonstrative Examples

#### Example 1

This code temporarily raises the program's privileges to allow creation of a new user folder.

Example Language: Python (bad code)

```
def makeNewUserDir(username):
    if invalidUsername(username):

        #avoid CWE-22 and CWE-78
        print('Usernames cannot contain invalid characters')
        return False

    try:
        raisePrivileges()
        os.mkdir('/home/' + username)
        lowerPrivileges()

    except OSError:
        print('Unable to create new user directory for user:' + username)
        return False

    return True
```

While the program only raises its privilege level to create the folder and immediately lowers it again, if the call to `os.mkdir()` throws an exception, the call to `lowerPrivileges()` will not occur. As a result, the program is indefinitely operating in a raised privilege state, possibly allowing further exploitation to occur.

#### Example 2

This function runs an arbitrary SQL query on a given database, returning the result of the query.

Example Language: PHP (bad code)

```
function runEmployeeQuery($dbName, $name){
    mysql_select_db($dbName,$globalDbHandle) or die("Could not open Database".$dbName);
    //Use a prepared statement to avoid CWE-89
    $preparedStatement = $globalDbHandle->prepare("SELECT * FROM employees WHERE name = :name");
    $preparedStatement->execute(array(':name' => $name));
    return $preparedStatement->fetchAll();
}
/.../

$employeeRecord = runEmployeeQuery("EmployeeDB",$_GET["EmployeeName"]);
```

While this code is careful to avoid SQL Injection, the function does not confirm the user sending the query is authorized to do so. An attacker may be able to obtain sensitive employee information from the database.

#### Example 3

In 2022, the OT:ICEFALL study examined products by 10 different Operational Technology (OT) vendors. The researchers reported 56 vulnerabilities and said that the products were "insecure by design" [[REF-1283](#)]. If exploited, these vulnerabilities often allowed adversaries to change how the products operated, ranging from denial of service to changing the code that the products executed. Since these products were often used in industries such as power, electrical, water, and others, there could even be safety implications.

Multiple vendors did not use any authentication or used client-side authentication for critical functionality in their OT products.

### Selected Observed Examples

Note: this is a curated list of examples for users to understand the variety of ways in which this weakness can be introduced. It is not a complete list of all CVEs that are related to this CWE entry.

Reference	Description
<a href="#">CVE-2023-26463</a>	Chain: IPSec VPN product uses the same variable for multiple purposes in the same function ( <a href="#">CWE-1109</a> ), leading to incorrect access control ( <a href="#">CWE-284</a> ) and expired pointer dereference ( <a href="#">CWE-825</a> )
<a href="#">CVE-2022-24985</a>	A form hosting website only checks the session authentication status for a single form, making it possible to bypass authentication when there are multiple forms
<a href="#">CVE-2022-29238</a>	Access-control setting in web-based document collaboration tool is not properly implemented by the code, which prevents listing hidden directories but does not prevent direct requests to files in those directories.
<a href="#">CVE-2022-23607</a>	Python-based HTTP library did not scope cookies to a particular domain such that "supercookies" could be sent to any domain on redirect
<a href="#">CVE-2021-21972</a>	Chain: Cloud computing virtualization platform does not require authentication for upload of a tar format file ( <a href="#">CWE-306</a> ), then uses .. path traversal sequences ( <a href="#">CWE-23</a> ) in the file to access unexpected files, as exploited in the wild per CISA KEV.
<a href="#">CVE-2021-37415</a>	IT management product does not perform authentication for some REST API requests, as exploited in the wild per CISA KEV.
<a href="#">CVE-2021-35033</a>	Firmware for a WiFi router uses a hard-coded password for a BusyBox shell, allowing bypass of authentication through the UART port
<a href="#">CVE-2020-10263</a>	Bluetooth speaker does not require authentication for the debug functionality on the UART port, allowing root shell access
<a href="#">CVE-2020-13927</a>	Default setting in workflow management product allows all API requests without authentication, as exploited in the wild per CISA KEV.
<a href="#">CVE-2010-4624</a>	Bulletin board applies restrictions on number of images during post creation, but does not enforce this on editing.

### Weakness Ordinalities



Ordinality	Description
Primary	(where the weakness exists independent of other weaknesses)

### Affected Resources

- File or Directory

### Memberships

Nature	Type	ID	Name
MemberOf	<b>C</b>	<a href="#">254</a>	7PK - Security Features
MemberOf	<b>C</b>	<a href="#">723</a>	OWASP Top Ten 2004 Category A2 - Broken Access Control
MemberOf	<b>C</b>	<a href="#">944</a>	SFP Secondary Cluster: Access Management
MemberOf	<b>C</b>	<a href="#">1031</a>	OWASP Top Ten 2017 Category A5 - Broken Access Control
MemberOf	<b>V</b>	<a href="#">1340</a>	CISQ Data Protection Measures
MemberOf	<b>C</b>	<a href="#">1345</a>	OWASP Top Ten 2021 Category A01:2021 - Broken Access Control
MemberOf	<b>C</b>	<a href="#">1369</a>	ICS Supply Chain: IT/OT Convergence/Expansion
MemberOf	<b>C</b>	<a href="#">1372</a>	ICS Supply Chain: OT Counterfeit and Malicious Corruption
MemberOf	<b>C</b>	<a href="#">1396</a>	Comprehensive Categorization: Access Control

MemberOf		<a href="#">1435</a>	Weaknesses in the 2025 CWE Top 25 Most Dangerous Software Weaknesses
MemberOf		<a href="#">1436</a>	OWASP Top Ten 2025 Category A01:2025 - Broken Access Control

#### ▼ Vulnerability Mapping Notes

<b>Usage</b>	<b>DISCOURAGED</b> (this CWE ID should not be used to map to real-world vulnerabilities)														
<b>Reasons</b>	Frequent Misuse, Frequent Misinterpretation, Abstraction														
<b>Rationale</b>	<a href="#">CWE-284</a> is extremely high-level, a Pillar. Its name, "Improper Access Control," is often misused in low-information vulnerability reports <a href="#">[REF-1287]</a> or by active use of the OWASP Top Ten, such as "A01:2021-Broken Access Control". It is not useful for trend analysis.														
<b>Comments</b>	Consider using descendants of <a href="#">CWE-284</a> that are more specific to the kind of access control involved, such as those involving authorization (Missing Authorization ( <a href="#">CWE-862</a> ), Incorrect Authorization ( <a href="#">CWE-863</a> ), Incorrect Permission Assignment for Critical Resource ( <a href="#">CWE-732</a> ), etc.); authentication (Missing Authentication ( <a href="#">CWE-306</a> ) or Weak Authentication ( <a href="#">CWE-1390</a> )); Incorrect User Management ( <a href="#">CWE-286</a> ); Improper Restriction of Communication Channel to Intended Endpoints ( <a href="#">CWE-923</a> ); etc.														
<b>Suggestions</b>	<table border="1"> <thead> <tr> <th>CWE-ID</th> <th>Comment</th> </tr> </thead> <tbody> <tr> <td><a href="#">CWE-862</a></td> <td>Missing Authorization</td> </tr> <tr> <td><a href="#">CWE-863</a></td> <td>Incorrect Authorization</td> </tr> <tr> <td><a href="#">CWE-732</a></td> <td>Incorrect Permission Assignment for Critical Resource</td> </tr> <tr> <td><a href="#">CWE-306</a></td> <td>Missing Authentication</td> </tr> <tr> <td><a href="#">CWE-1390</a></td> <td>Weak Authentication</td> </tr> <tr> <td><a href="#">CWE-923</a></td> <td>Improper Restriction of Communication Channel to Intended Endpoints</td> </tr> </tbody> </table>	CWE-ID	Comment	<a href="#">CWE-862</a>	Missing Authorization	<a href="#">CWE-863</a>	Incorrect Authorization	<a href="#">CWE-732</a>	Incorrect Permission Assignment for Critical Resource	<a href="#">CWE-306</a>	Missing Authentication	<a href="#">CWE-1390</a>	Weak Authentication	<a href="#">CWE-923</a>	Improper Restriction of Communication Channel to Intended Endpoints
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#### ▼ Notes

##### Maintenance

This entry needs more work. Possible sub-categories include:

- Trusted group includes undesired entities (partially covered by [CWE-286](#))
- Group can perform undesired actions
- ACL parse error does not fail closed

#### ▼ Taxonomy Mappings

Mapped Taxonomy Name	Node ID	Fit	Mapped Node Name
PLOVER			Access Control List (ACL) errors
WASC	2		Insufficient Authorization
7 Pernicious Kingdoms			Missing Access Control

#### ▼ Related Attack Patterns

CAPEC-ID	Attack Pattern Name
<a href="#">CAPEC-19</a>	Embedding Scripts within Scripts
<a href="#">CAPEC-441</a>	Malicious Logic Insertion
<a href="#">CAPEC-478</a>	Modification of Windows Service Configuration
<a href="#">CAPEC-479</a>	Malicious Root Certificate
<a href="#">CAPEC-502</a>	Intent Spoof
<a href="#">CAPEC-503</a>	WebView Exposure
<a href="#">CAPEC-536</a>	Data Injected During Configuration
<a href="#">CAPEC-546</a>	Incomplete Data Deletion in a Multi-Tenant Environment

<a href="#">CAPEC-550</a>	Install New Service
<a href="#">CAPEC-551</a>	Modify Existing Service
<a href="#">CAPEC-552</a>	Install Rootkit
<a href="#">CAPEC-556</a>	Replace File Extension Handlers
<a href="#">CAPEC-558</a>	Replace Trusted Executable
<a href="#">CAPEC-562</a>	Modify Shared File
<a href="#">CAPEC-563</a>	Add Malicious File to Shared Webroot
<a href="#">CAPEC-564</a>	Run Software at Logon
<a href="#">CAPEC-578</a>	Disable Security Software

#### References

[REF-7]	Michael Howard and David LeBlanc. "Writing Secure Code". Chapter 6, "Determining Appropriate Access Control" Page 171. 2nd Edition. Microsoft Press. 2002-12-04. < <a href="https://www.microsoftpressstore.com/store/writing-secure-code-9780735617223">https://www.microsoftpressstore.com/store/writing-secure-code-9780735617223</a> >.
[REF-44]	Michael Howard, David LeBlanc and John Viega. "24 Deadly Sins of Software Security". "Sin 17: Failure to Protect Stored Data." Page 253. McGraw-Hill. 2010.
[REF-1287]	MITRE. "Supplemental Details - 2022 CWE Top 25". Details of Problematic Mappings. 2022-06-28. < <a href="https://cwe.mitre.org/top25/archive/2022/2022_cwe_top25_supplemental.html#problematicMappingDetails">https://cwe.mitre.org/top25/archive/2022/2022_cwe_top25_supplemental.html#problematicMappingDetails</a> >. (URL validated: 2024-11-17)
[REF-1283]	Forescout Vedere Labs. "OT:ICEFALL: The legacy of "insecure by design" and its implications for certifications and risk management". 2022-06-20. < <a href="https://www.forescout.com/resources/ot-icefall-report/">https://www.forescout.com/resources/ot-icefall-report/</a> >.

#### Content History

Submissions		
Submission Date	Submitter	Organization
2006-07-19 (CWE Draft 3, 2006-07-19)	PLOVER	
Modifications		
Previous Entry Names		