Information Exposure (IEX) Class in the Bugs Framework (BF)

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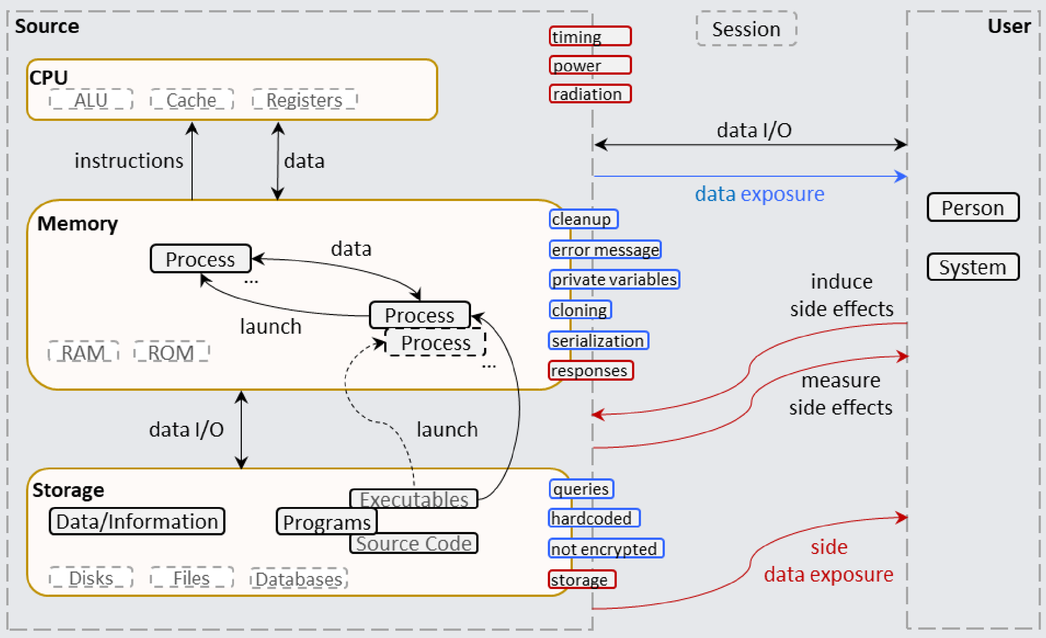
https://samate.nist.gov/BF

Exposure of sensitive information can be harmful on its own and in addition could enable further attacks. A rigorous and unambiguous definition of information exposure bugs can help researchers and practitioners identify them, thus avoiding security failures. Information Exposure (IEX) is a new class in the Bugs Framework (BF). The BF comprises rigorous definitions and (static) attributes of bugs classes, along with their related dynamic properties, such as proximate and secondary causes, consequences and sites. ....

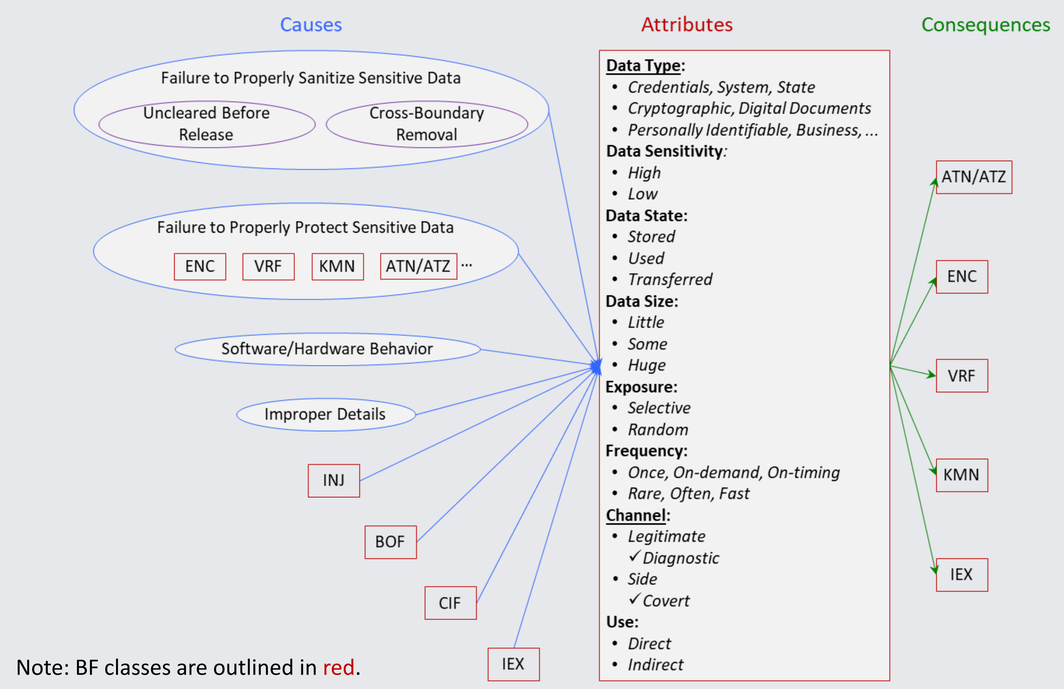
Definition of IEX: Information is leaked through legitimate or side channels.

- BF Model of Information Exposure



Note: Legitimate channels are in blue. Side channels are in red.

- IEX Taxonomy



Note: BF classes are outlined in red.

- We use the IEX taxonomy to analyze specific vulnerabilities and provide clear descriptions.
- The following are examples from the MITRE Common Vulnerabilities and Exposures (CVE).

- CVE-2007-5172

IEX_1 of password leads to ATN leads to IEX_2

IEX_1
Cause: Improper Details
(password in error message)
Attributes:
Data Type : Credentials (password)
Data Sensitivity: High
Data State: Stored
Data Size: Little
Exposure: Selective
Frequency: On-Demand
Channel: Diagnostic
(connection error message)
Use: Indirect
Consequences: ATN.

ATN (to be described later)

IEX_2
Cause: Failure to Properly Protect Sensitive Data (password)
Attributes:
Data Type : Any (user data)
Data Sensitivity: Low/High
Data State: Stored
Data Size: Huge
Exposure: Selective
Frequency: On-Demand
Channel: Legitimate
Use: Direct (valuable on its own)
Consequences: Any IEX consequence

- CVE-2017-5754 (Meltdown)

Cause: Hardware Behavior
(CPU out-of-order execution)
Attributes:
Data Type: Any (passwords in password manager or browser, personal photos, emails, instant messages, business documents)
Data Sensitivity: High
Data State: Stored
(in kernel-memory registries of other processes or virtual machines in the cloud)
Data Size: Huge (at will access with high rate)
Exposure: Selective
Frequency: On-Demand
Channel: Covert (cache-based timing)
Use: Any
Consequences: Any IEX consequence