# CWE Detail – CWE-331

## Description

The product uses an algorithm or scheme that produces insufficient entropy, leaving patterns or clusters of values that are more likely to occur than others.

## Extended Description

N/A

## Threat-Mapped Scoring

Score: 0.0

Priority: Unclassified

## Observed Examples (CVEs)

**•** CVE-2001-0950: Insufficiently random data used to generate session tokens using C rand(). Also, for certificate/key generation, uses a source that does not block when entropy is low.

**•** CVE-2008-2108: Chain: insufficient precision (CWE-1339) in  
 random-number generator causes some zero bits to be reliably  
 generated, reducing the amount of entropy (CWE-331)

## Related Attack Patterns (CAPEC)

* CAPEC-59

## Modes of Introduction

**•** Architecture and Design: N/A

**•** Implementation: REALIZATION: This weakness is caused during implementation of an architectural security tactic.

## Common Consequences

**•** Impact: Bypass Protection Mechanism, Other — Notes: An attacker could guess the random numbers generated and could gain unauthorized access to a system if the random numbers are used for authentication and authorization.

## Potential Mitigations

**•** Implementation: Determine the necessary entropy to adequately provide for randomness and predictability. This can be achieved by increasing the number of bits of objects such as keys and seeds. (Effectiveness: N/A)

## Applicable Platforms

**•** None (Class: Not Language-Specific, Prevalence: Undetermined)

## Demonstrative Examples

**•** Because the seed for the PRNG is always the user's ID, the session ID will always be the same. An attacker could thus predict any user's session ID and potentially hijack the session.

**•** This code uses the Random.nextInt() function to generate "unique" identifiers for the receipt pages it generates. Because Random.nextInt() is a statistical PRNG, it is easy for an attacker to guess the strings it generates. Although the underlying design of the receipt system is also faulty, it would be more secure if it used a random number generator that did not produce predictable receipt identifiers, such as a cryptographic PRNG.

## Notes

**•** Maintenance: As of CWE 4.5, terminology related to randomness, entropy, and  
 predictability can vary widely. Within the developer and other  
 communities, "randomness" is used heavily. However, within  
 cryptography, "entropy" is distinct, typically implied as a  
 measurement. There are no commonly-used definitions, even within  
 standards documents and cryptography papers. Future versions of  
 CWE will attempt to define these terms and, if necessary,  
 distinguish between them in ways that are appropriate for  
 different communities but do not reduce the usability of CWE for  
 mapping, understanding, or other scenarios.