

# What is a race condition?

A race condition is a vulnerability where the outcome depends on the timing of concurrent operations, and an attacker exploits the gap between a check and the action (a "time-of-check to time-of-use" flaw) by sending many requests simultaneously. This lets them do things once-only logic should prevent: redeem a coupon multiple times, withdraw more than a balance, or bypass a limit. The fix is making the critical operation atomic with database constraints, locks, or transactions.

## HOW IT WORKS

### 01 How it works and example

The attacker sends a burst of identical requests timed to arrive together:

- Redeem a single-use coupon many times: 50 simultaneous redeem requests all pass the "unused?" check before the first marks it used.
- Overdraw a balance: parallel withdrawals each see the original balance.
- Bypass a rate or quantity limit by racing past the counter update.
- Modern tooling sends requests in a single packet to minimise timing jitter.

Examples shown for defensive context.

#### CHECK AND ACT ATOMICALLY

*Race conditions come from a check and an action being separate. Make the operation atomic, a single database statement, a unique constraint, a row lock, or a transaction, so concurrent requests cannot interleave.*

## HOW TO DEFEND

- Make critical operations atomic: enforce uniqueness and limits at the database (unique constraints, conditional updates like `UPDATE ... WHERE balance >= amount`).
- Use locking or transactions so a check and its action cannot be split by concurrency.
- Avoid read-then-write logic in application code for limited resources.
- Idempotency keys for operations that must happen once.
- Test sensitive endpoints with concurrent/parallel requests, not just sequential ones.

## SOURCES

- [1] OWASP Web Security Testing Guide
- [2] MITRE CWE-362: Concurrent Execution using Shared Resource (Race Condition)
- [3] OWASP Top 10

Test your application for race conditions and 30+ other classes.

[securelayer7.net/learn/application-security/race-conditions](https://securelayer7.net/learn/application-security/race-conditions)

[Open online](https://securelayer7.net/learn/application-security/race-conditions)