



# Mutation Testing for PHP

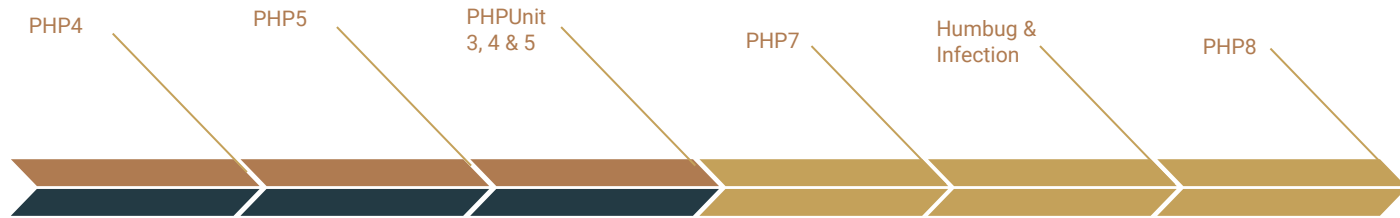
Using infection to test your tests



# About Me

- Software developer for nearly 20 years
- Been using PHP since version 4
- Spent a bit of time in the internals of PHP
- Passionate about robust and reliable software
- Started a IT Consultancy & Services company

# History of Unit Testing



# How Mutation Testing Works

1. Modify/mutate some source code in our application/library
2. Run our unit tests
3. If they fail, then our tests are working well
4. If the unit tests pass, then we're not adequately testing

Mutation testing doesn't warn us about bugs in code, it just warns us about missing tests.

# Sample Function

```
public function getTargetPerDay(int $items, int $days): int
{
    $average = (int) round($items / $days);
    $total = $average * $days;
    if (($total - $items) > self::MAXIMUM_TOLERANCE) {
        $total = $items + self::MAXIMUM_TOLERANCE;
    }
    return $items;
}
```

# Sample Test

```
public function testGetTargetPerDay1(): void
{
    $result = $this->instance->getTargetPerDay(20, 1);
    self::assertSame(20, $result);
}
```

```
PHPUnit 9.6.17 by Sebastian Bergmann and contributors.
```

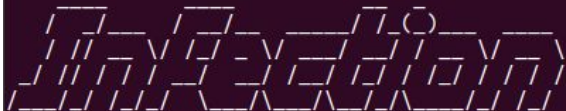
```
.
```

```
1 / 1 (100%)
```

```
Time: 00:00.001, Memory: 8.00 MB
```

```
OK (1 test, 1 assertion)
```

# Infection finds an untested part of our code



Infection - PHP Mutation Testing Framework version 0.26.21

Escaped mutants:

=====

1) /app/src/Example.php:12 [M] Division

--- Original

+++ New

@@ @@

```
    public const MAXIMUM_TOLERANCE = 1;
    public function getTargetPerDay(int $items, int $days) : int
    {
-       $average = (int) round($items / $days);
+       $average = (int) round($items * $days);
        $total = $average * $days;
        if ($total - $items > self::MAXIMUM_TOLERANCE) {
            $total = $items + self::MAXIMUM_TOLERANCE;
        }
    }
}
```

# Adding a new test

```
public function testGetTargetPerDay2(): void
{
    $result = $this->instance->getTargetPerDay(20, 5);
    self::assertSame(4, $result);
}
```

```
PHPUnit 9.6.17 by Sebastian Bergmann and contributors.
```

```
.F
```

```
2 / 2 (100%)
```

```
Time: 00:00.002, Memory: 8.00 MB
```

```
There was 1 failure:
```

```
1) EstratoTests\ExampleTest::testGetTargetPerDay2
Failed asserting that 20 is identical to 4.
```

```
/app/tests/ExampleTest.php:29
```

```
FAILURES!
```

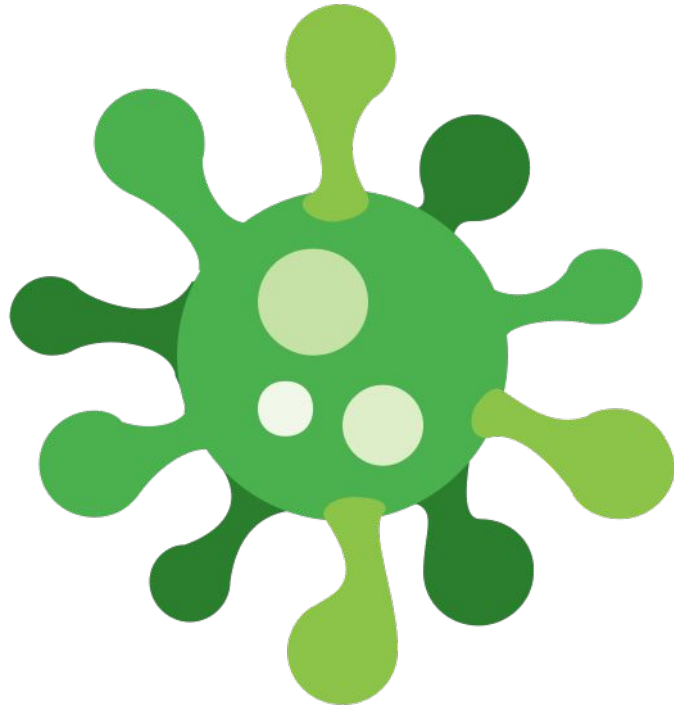
```
Tests: 2, Assertions: 2, Failures: 1.
```



# We've found a bug before production

```
public function getTargetPerDay(int $items, int $days): int
{
    $average = (int) round($items / $days);
    $total = $average * $days;
    if (($total - $items) > self::MAXIMUM_TOLERANCE) {
        $total = $items + self::MAXIMUM_TOLERANCE;
    }
    return $items $average;
}
```

Any questions?



# Infection Configuration

composer require --dev infection/infection

vendor/bin/infection

```
Welcome to the Infection config generator
```

```
We did not find a configuration file. The following questions will help us to generate it for you.
```

```
Which source directories do you want to include (comma separated)? [src]:
```

```
[0] .
```

```
[1] src
```

```
[2] tests
```

```
[3] vendor
```

```
> src
```

vendor/bin/infection --show-mutations

# Mutators

Infection provides hundreds of mutators out of the box:

<https://infection.github.io/guide/mutators.html>

```
{
  "$schema": "vendor/infection/infection/resources/schema.json",
  "source": {
    "directories": [
      "src"
    ]
  },
  "mutators": {
    "@default": true,
    "@cast": false
  }
}
```

# Mutators

```
{
  "$schema": "vendor/infection/infection/resources/schema.json",
  "source": {
    "directories": [
      "src"
    ]
  },
  "mutators": {
    "@default": true,
    "global-ignoreSourceCodeByRegex": ["assert(.*);"],
    "@cast": false
  }
}
```

# Command Line

`--threads=max`

`--min-covered-msi=100`

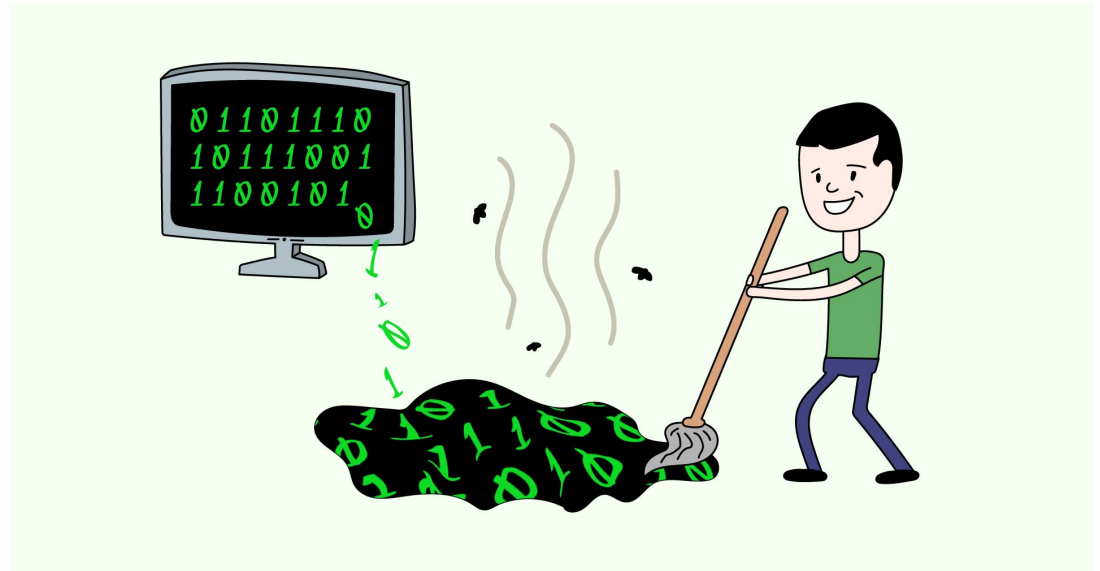
`--ignore-msi-with-no-mutations`

# Legacy Codebases

`--git-diff-lines`

`--git-diff-base=main`

`--git-diff-filter=AM`



# Understanding Mutation Results



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    public const MAXIMUM_TOLERANCE = 1;
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        $total = $average * $days;
        if ($total - $items > self::MAXIMUM_TOLERANCE) {
            $total = $items + self::MAXIMUM_TOLERANCE;
        }
    }
}
```



# Thank you!



## PHP Mutation Testing Framework

GET STARTED

TRY IT!

<https://infection.github.io/guide/>

<https://infection-php.dev/>