Practical Static Analysis

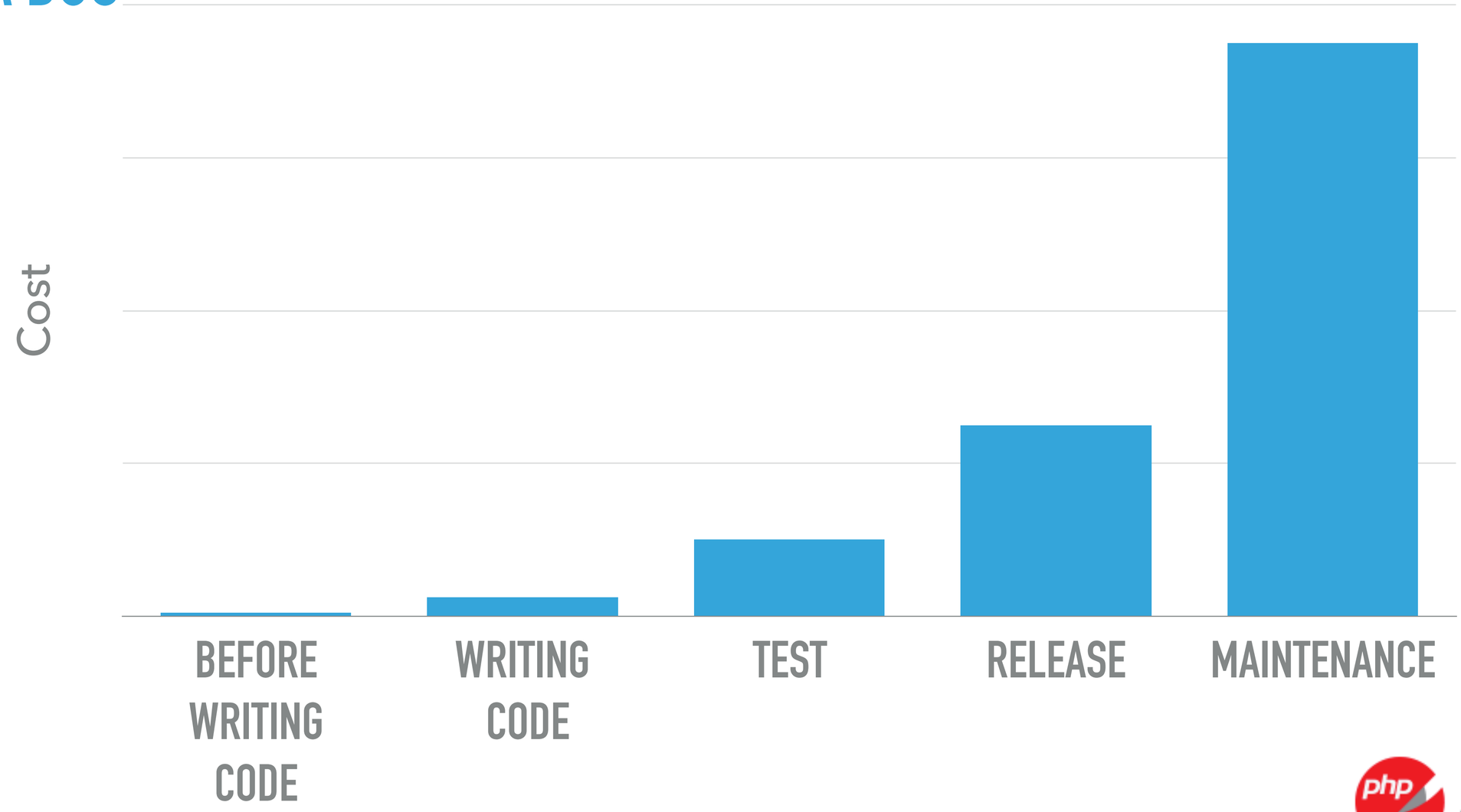
Dave Liddament
(Lamp Bristol)

PHP Russia 2019

Профессиональная конференция для php-разработчиков

APPROPRIATE APPLICATION OF STATIC ANALYSIS REDUCES THE OVERALL COST OF SOFTWARE DEVELOPMENT.

COST OF A BUG


Cost
BEFORE WRITING CODE
WRITING CODE
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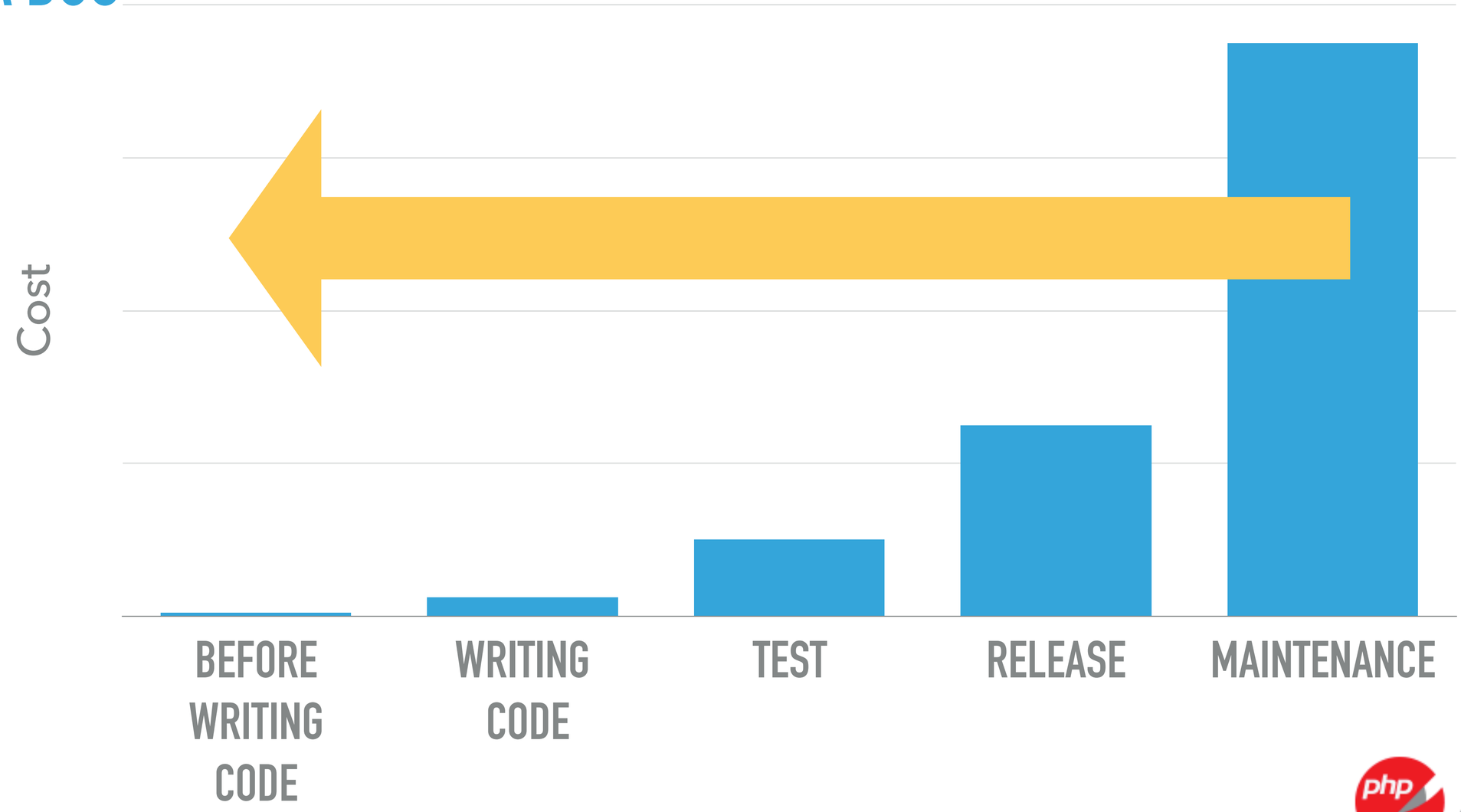
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AGENDA

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STATIC ANALYSIS: IS THIS CORRECT CODE?

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Static analysis tells you that your code is incorrect.

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function getPrice(string $type): int {
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        $price = 10;
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    if ($type === “ADULT”) {
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TEST CASES

	Input	Expected output
Test 1	CHILD	10
Test 2	ADULT	20

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💯 Code coverage

Tests tell you a particular scenario is working correctly.

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⚠ Possible undefined variable

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Static analysis tells you that your code is incorrect.

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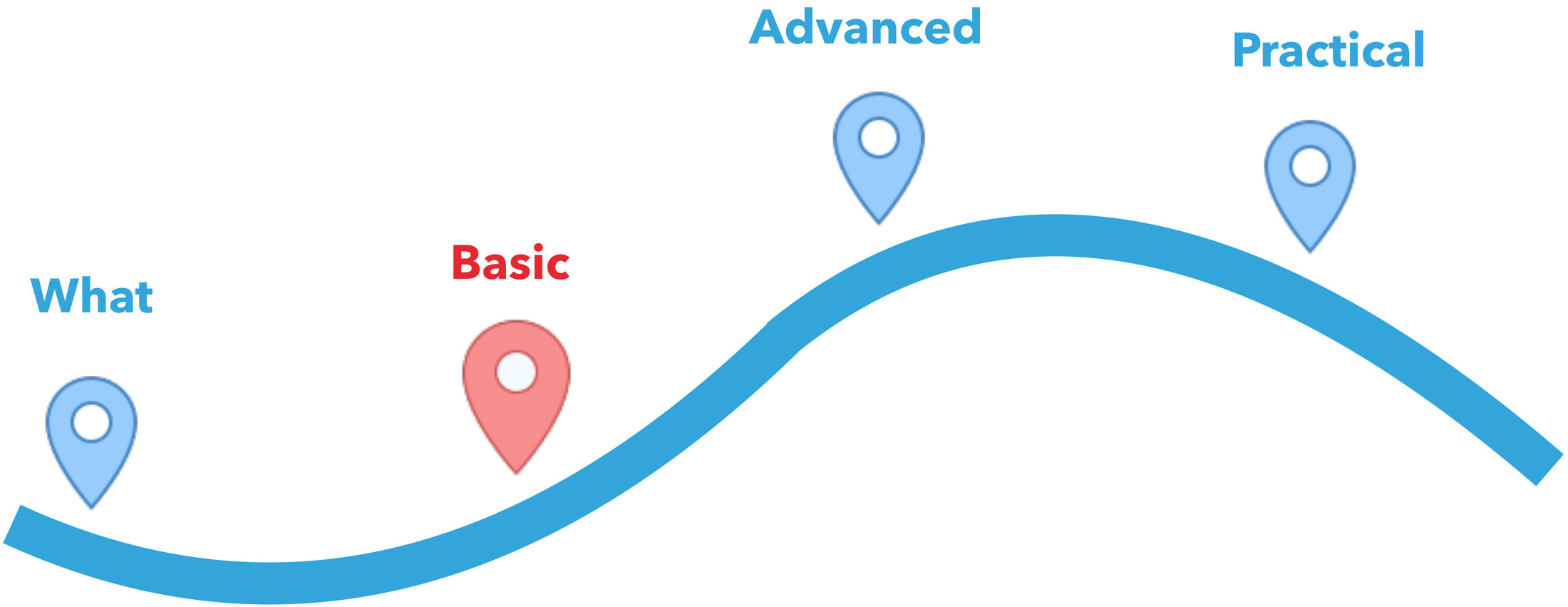

LINTING

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- Install:
  - `composer require —dev jakub-onderka/php-parallel-lint`

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  - `composer require —dev jakub-onderka/php-parallel-lint`
- Run:
  - `vendor/bin/parallel-lint src`

CODING STANDARDS

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- PHP CS fixer: `friendsofsymfony/php-cs-fixer`

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- Auto fix code

SECURITY

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- `sensiolabs/security-checker`

OTHER CHECKS

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- https://github.com/exakat/php-static-analysis-tools

STATIC ANALYSIS FOR SYMFONY PROJECTS

- Twig lint: `console lint:twig <dir containing twig templates>`
- Yaml lint: `console lint:yaml <dir containing yaml config>`
- Doctrine : `console doctrine:schema:validate`

COMPOSER SCRIPTS

```
scripts: {
  "ci" : [
    "@composer validate –strict",
    "parallel-lint src tests",
    … other checks …
  ]
}
```

RUNNING A COMPOSER SCRIPT

```
composer run-script ci
```

COMPOSER SCRIPTS

```
scripts: {
   "cs-fix" : "php-cs-fixer fix -v"
}
```

CI SERVER


```yaml
version: 2
jobs:
  build:
    docker:
    - image: circleci/php:7.2-apache-stretch-node-browsers
    steps:
    - checkout
    - restore_cache:
        keys:
        - v1-dependencies-{{ checksum "composer.lock" }}
        - v1-dependencies-
    - run: composer install -n --prefer-dist --no-scripts
    - save_cache:
        key: v1-dependencies-{{ checksum "composer.lock" }}
        paths:
        - vendor
    - run: composer run-script ci
```

https://github.com/DaveLiddament/skeleton-ci-project

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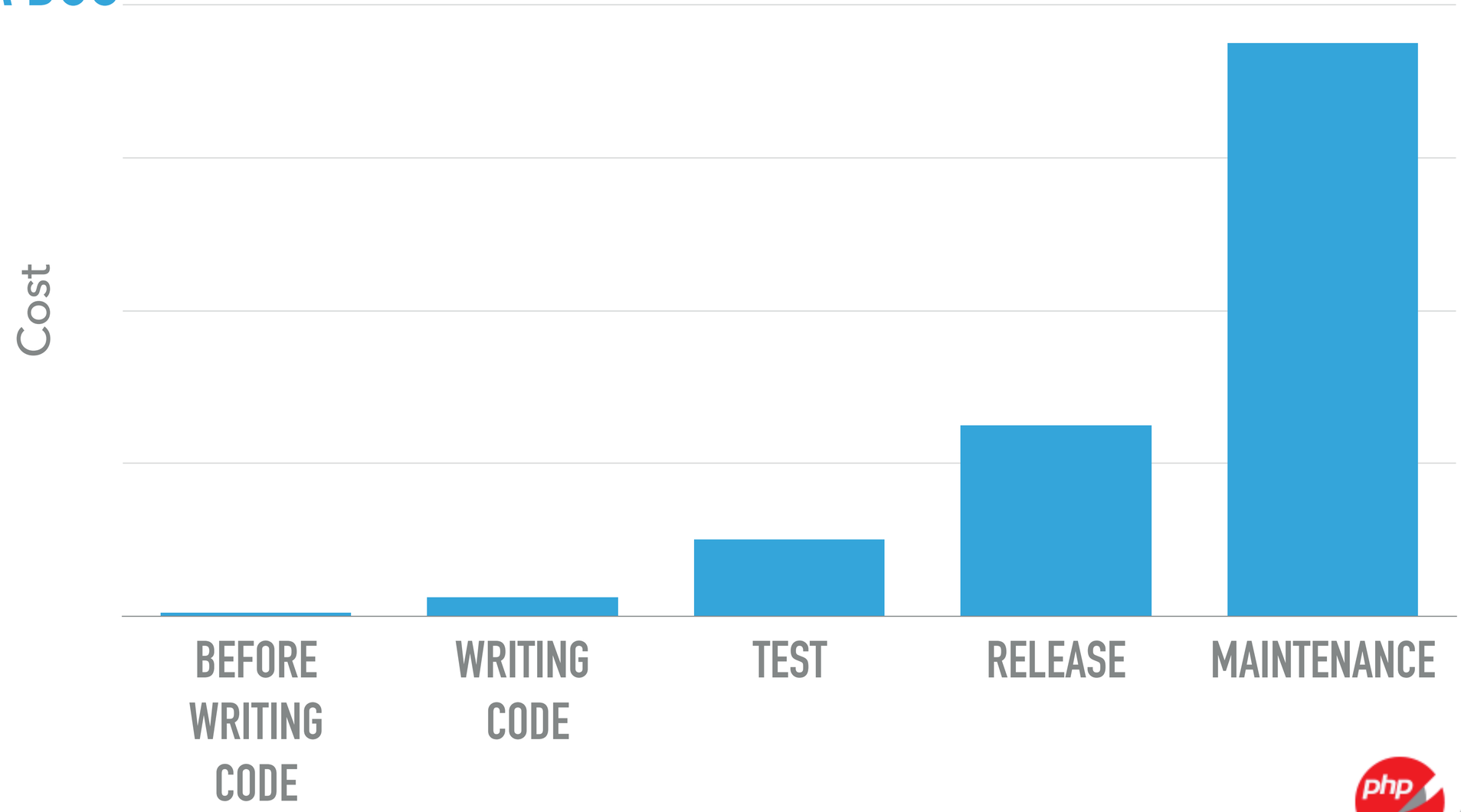
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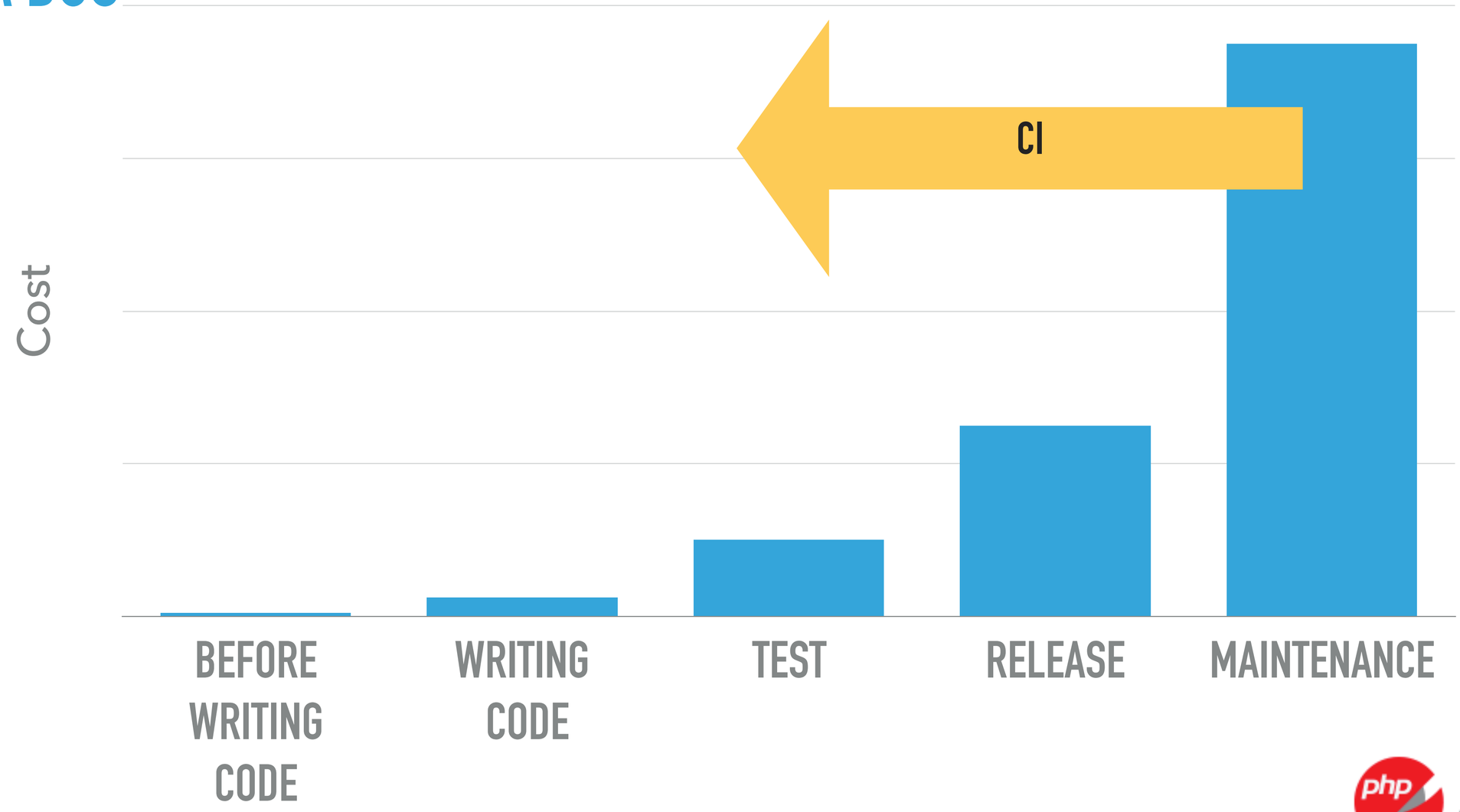
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REQUIREMENTS FOR REAL TIME STATIC ANALYSIS TOOL (IDE)

- Understand entire codebase
- Highlight errors in real time
- Suggest / autocomplete based on context
- Refactoring (e.g. rename, move, extract)

USE AN IDE – SHOWS ERRORS IN REAL TIME

```php
function process(User $user) {
    // some implementation
}

$a = 1;
process($a);
```

Expected User, got int more... (⌘F1)

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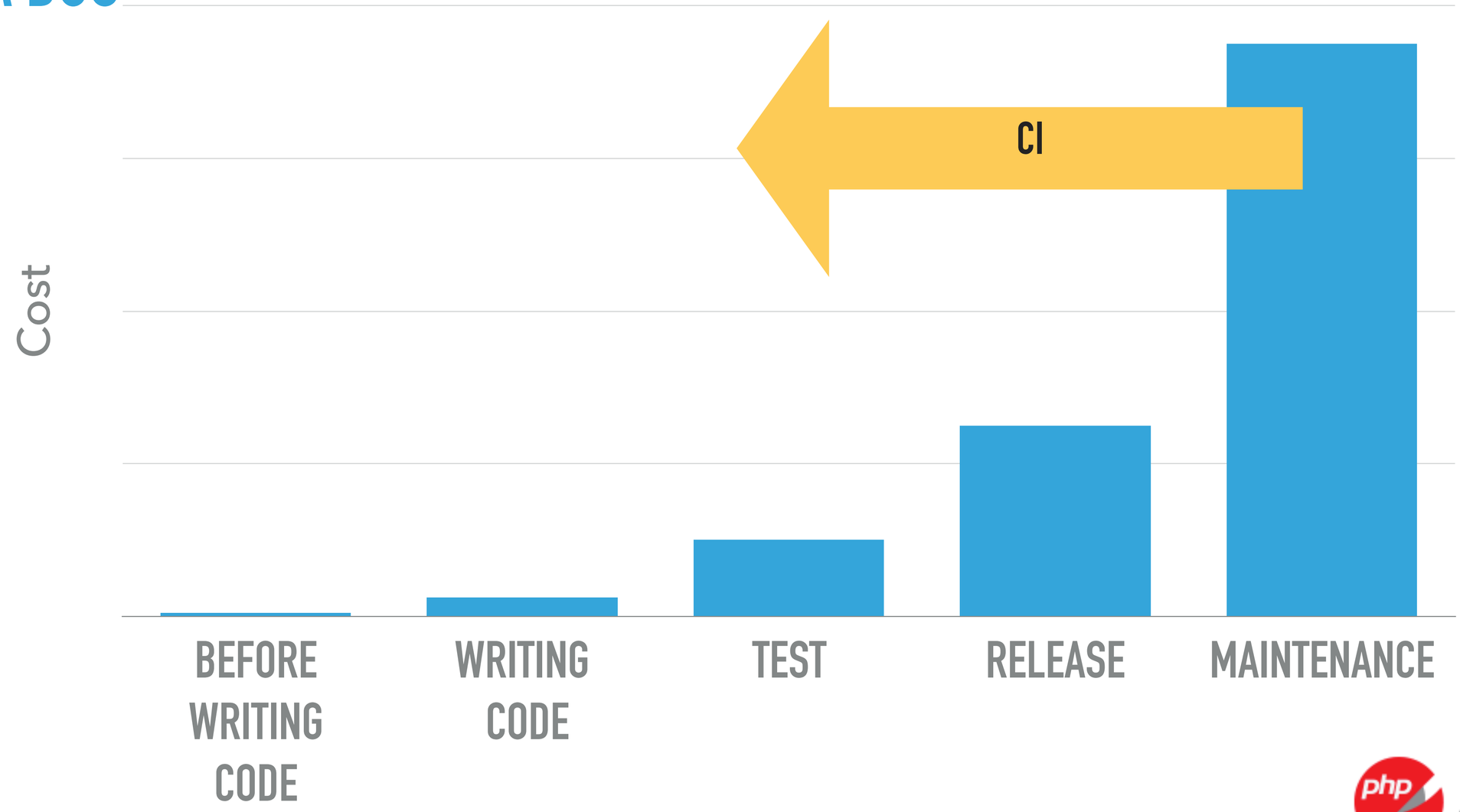
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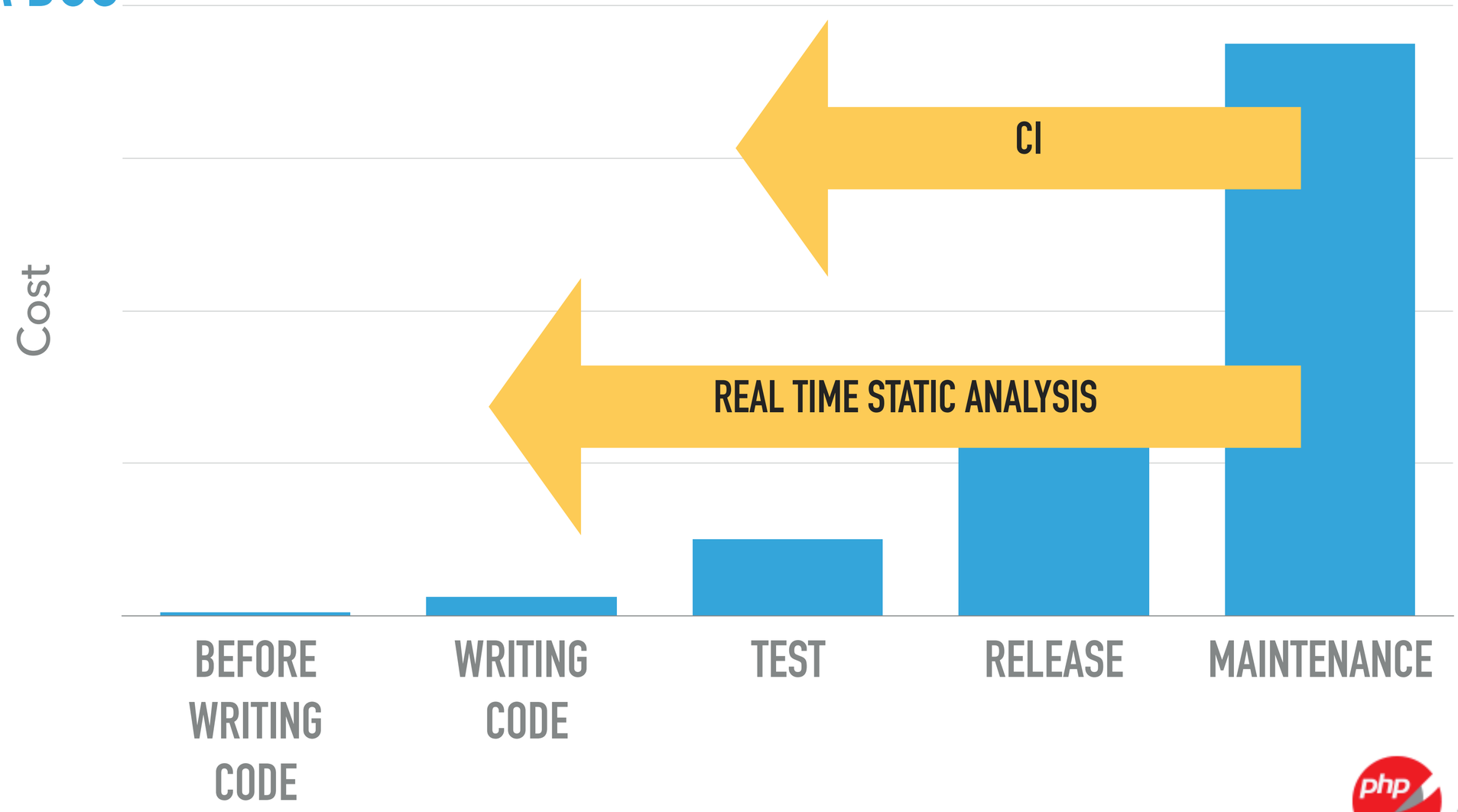
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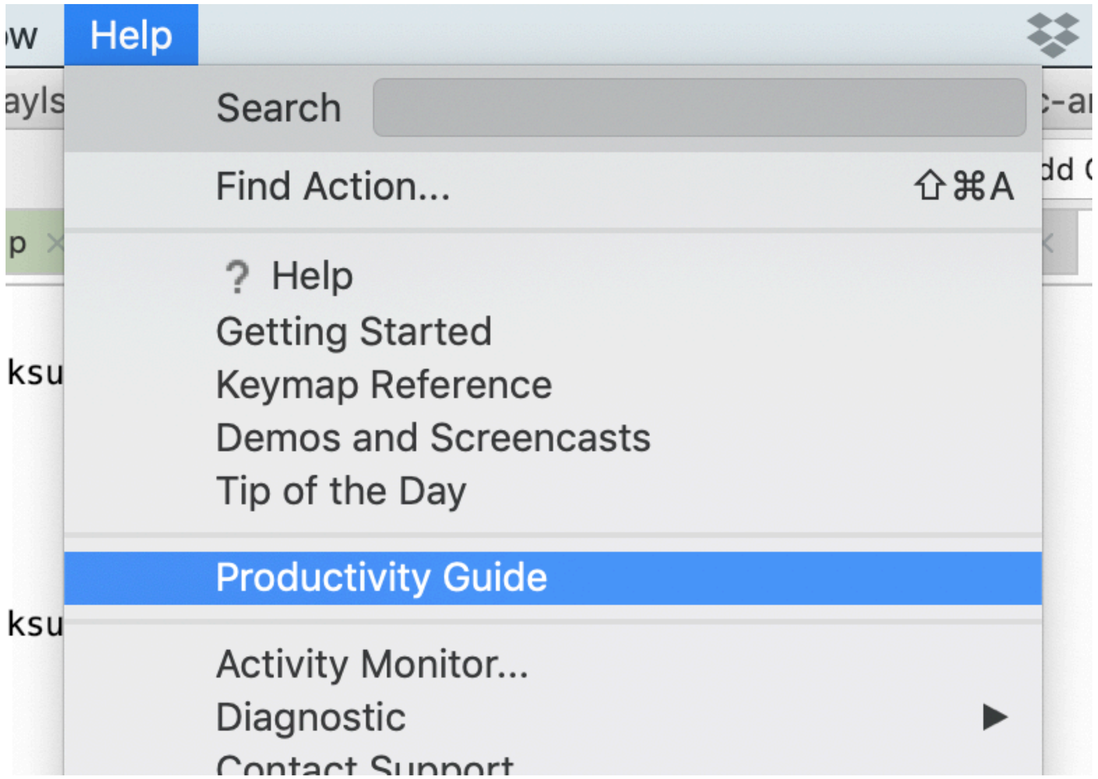

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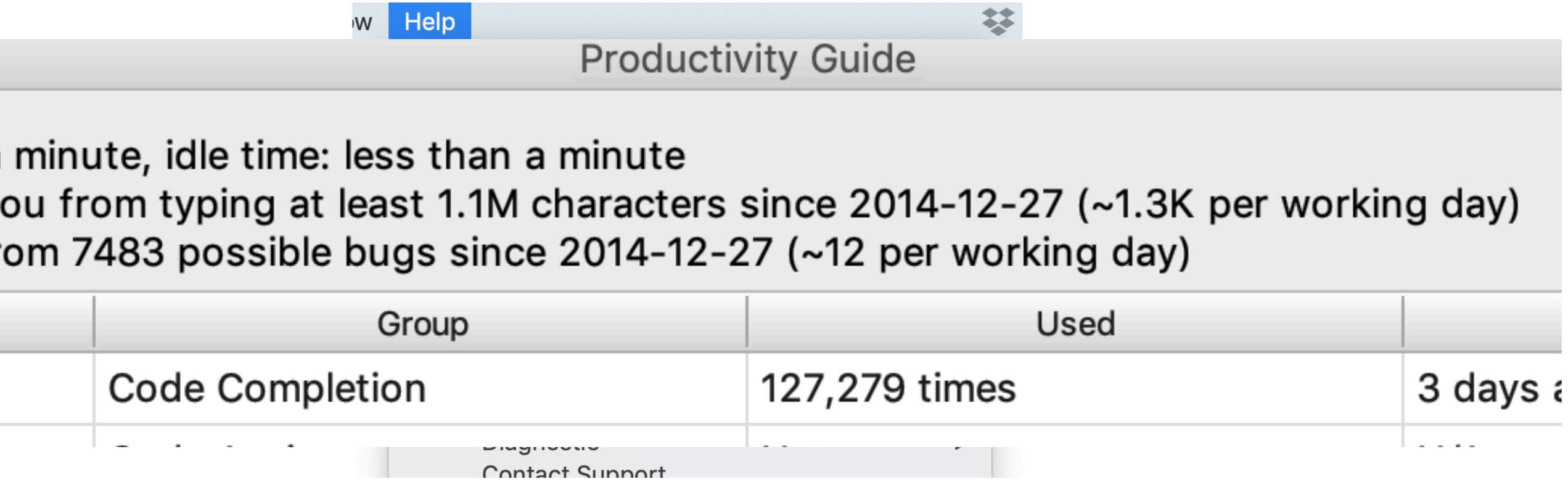

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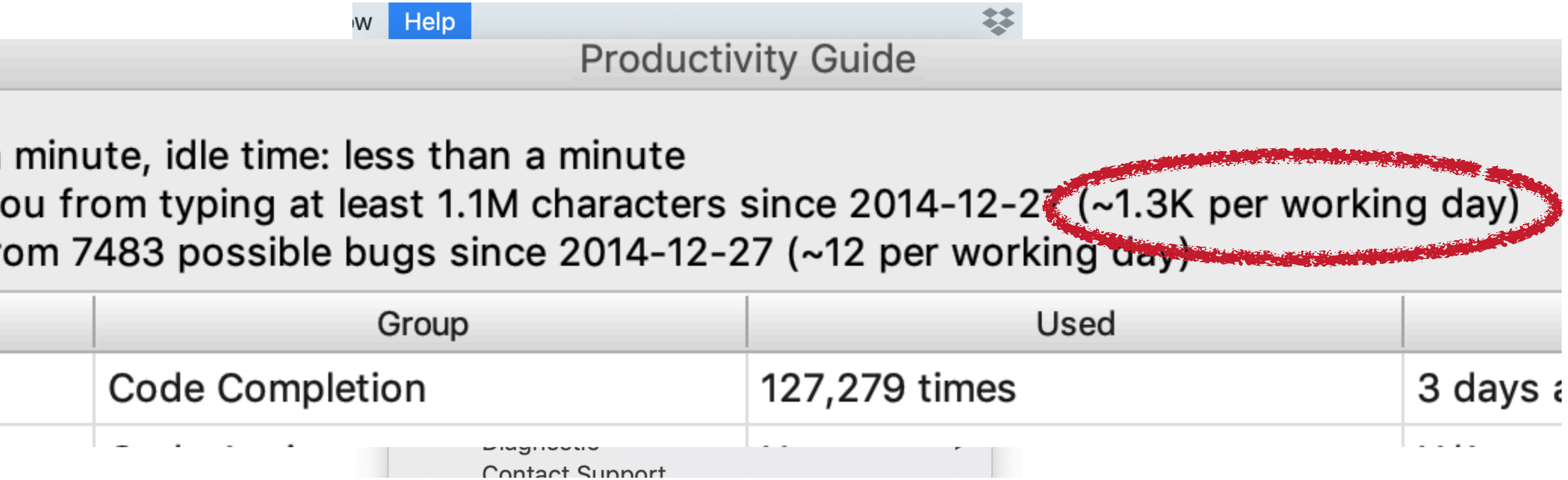

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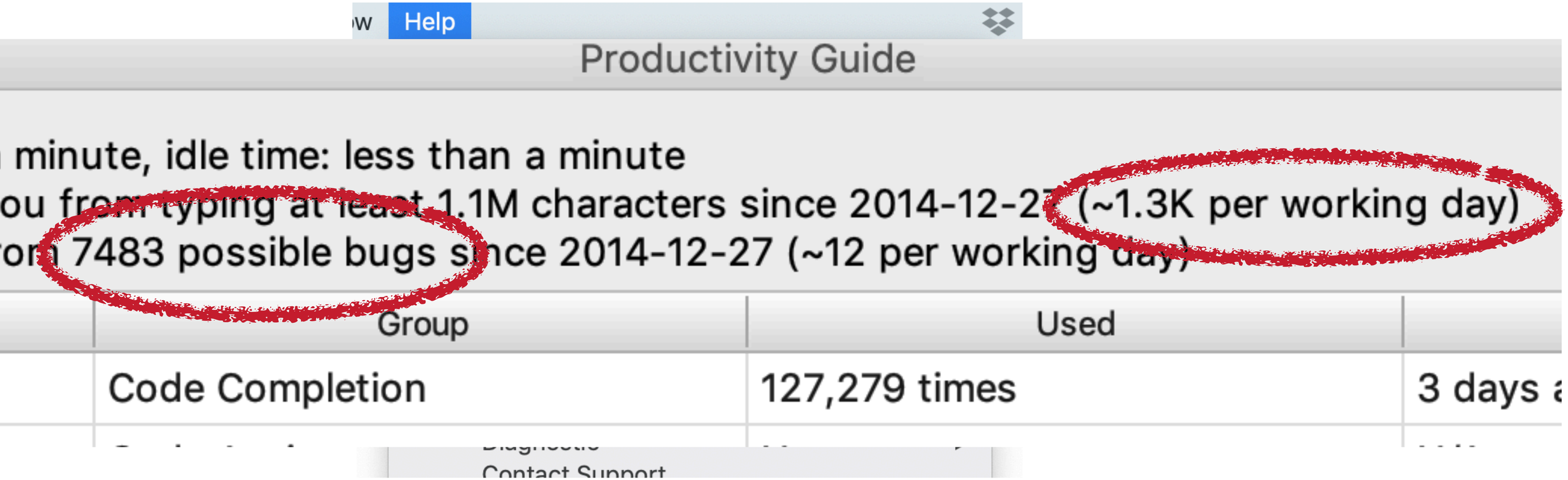

BASIC STATIC ANALYSIS

https://github.com/DaveLiddament/skeleton-ci-project

AGENDA

STILL THIS NAGGING PROBLEM

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✅ Real time static analysis

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❌ CI

ADVANCED STATIC ANALYSIS TOOLS

- Psalm https://getpsalm.org/
- Phan: https://github.com/phan/phan
- PHPStan https://github.com/phpstan/phpstan

ADVANCED STATIC ANALYSIS TOOLS

```php
<?php

function foo(string $s) : void {
    return "bar";
}

$a = ["hello", 5];
foo($a[1]);
foo();

if (rand(0, 1)) $b = 5;
echo $b;

$c = rand(0, 5);
if ($c) {} elseif ($c) {}

```

```
Psalm output (using commit add7c14):

ERROR: InvalidReturnStatement - 4:5 - No return values are expected for foo

INFO: UnusedParam - 3:21 - Param $s is never referenced in this method

ERROR: InvalidReturnType - 3:27 - The declared return type 'void' for foo is incorrect, got 'string'
```

↗ Shrink Get link

COMMON CONCEPTS: LEVELS

	Least strict	Strictest
Psalm	8	1
Phan	5	1
PHPStan	0	7

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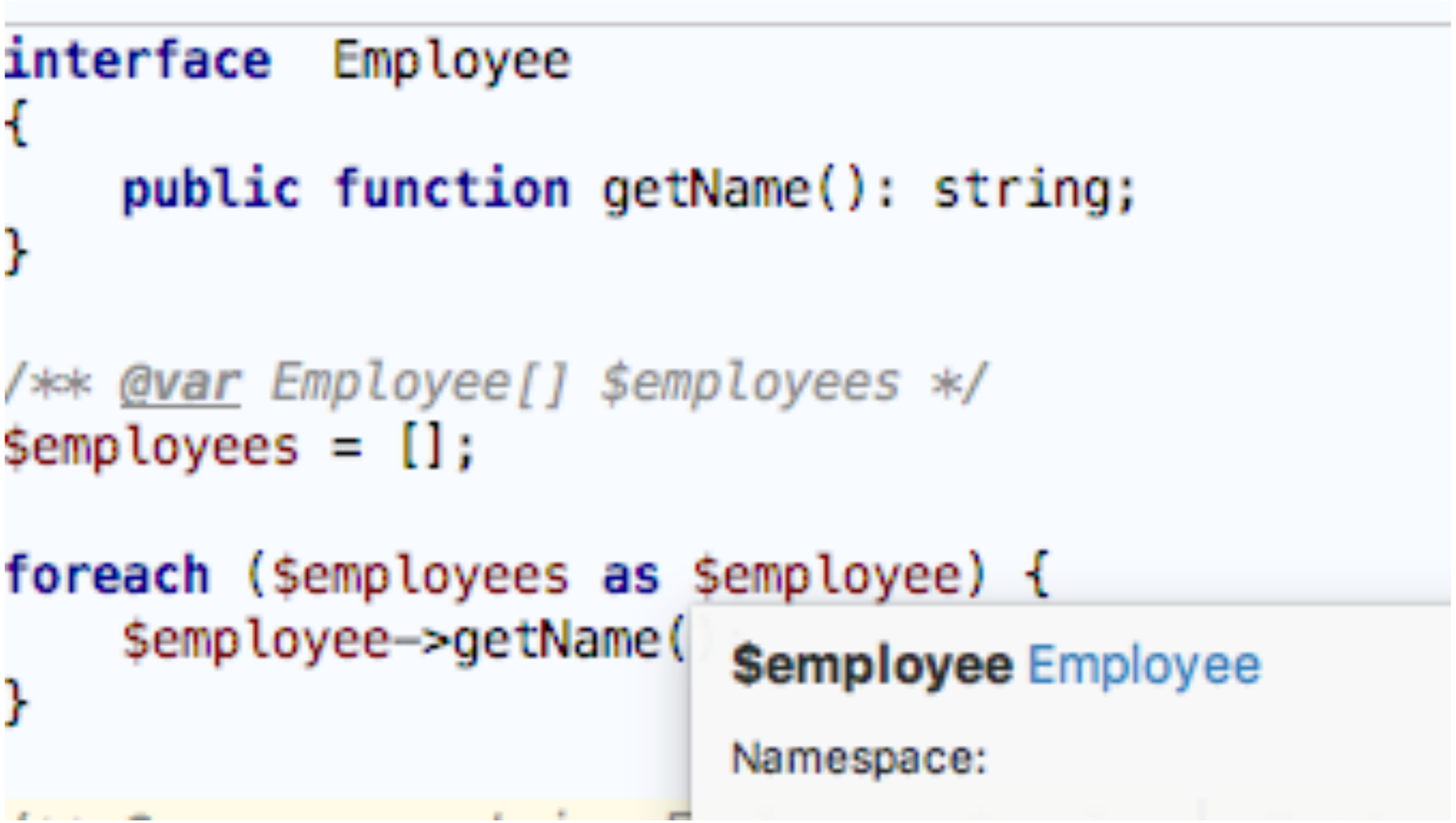

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function promote(Employee $employee): void {…}

function welcome(string $name): void {…}


foreach($business->getEmployees() as $name => $employee) {

    welcome($name);

    promote($employee);

}
```

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COMMON CONCEPTS: GENERICS

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19 foreach($business->getEmployees() as $name => $employee) {
20     promote($employee);
21     welcome($name);
22 }
```

```
Psalm output (using commit add7c14):

INFO: MixedArgument - 21:12 - Argument 1 of welcome cannot be mixed, expecting string
```

COMMON CONCEPTS: GENERICS

```
class Business {

    /** @return array<string,Employee> */

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COMMON CONCEPTS: GENERICS

```php
interface  Employee
{
    public function getName(): string;
}

/** @var array<string,Employee> $employees */
$employees = [];

foreach ($employees as $employee) {
    $employee->getName(
}
```

$employee mixed

Namespace:

COMMON CONCEPTS: GENERICS

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{
    public function getName(): string;
}

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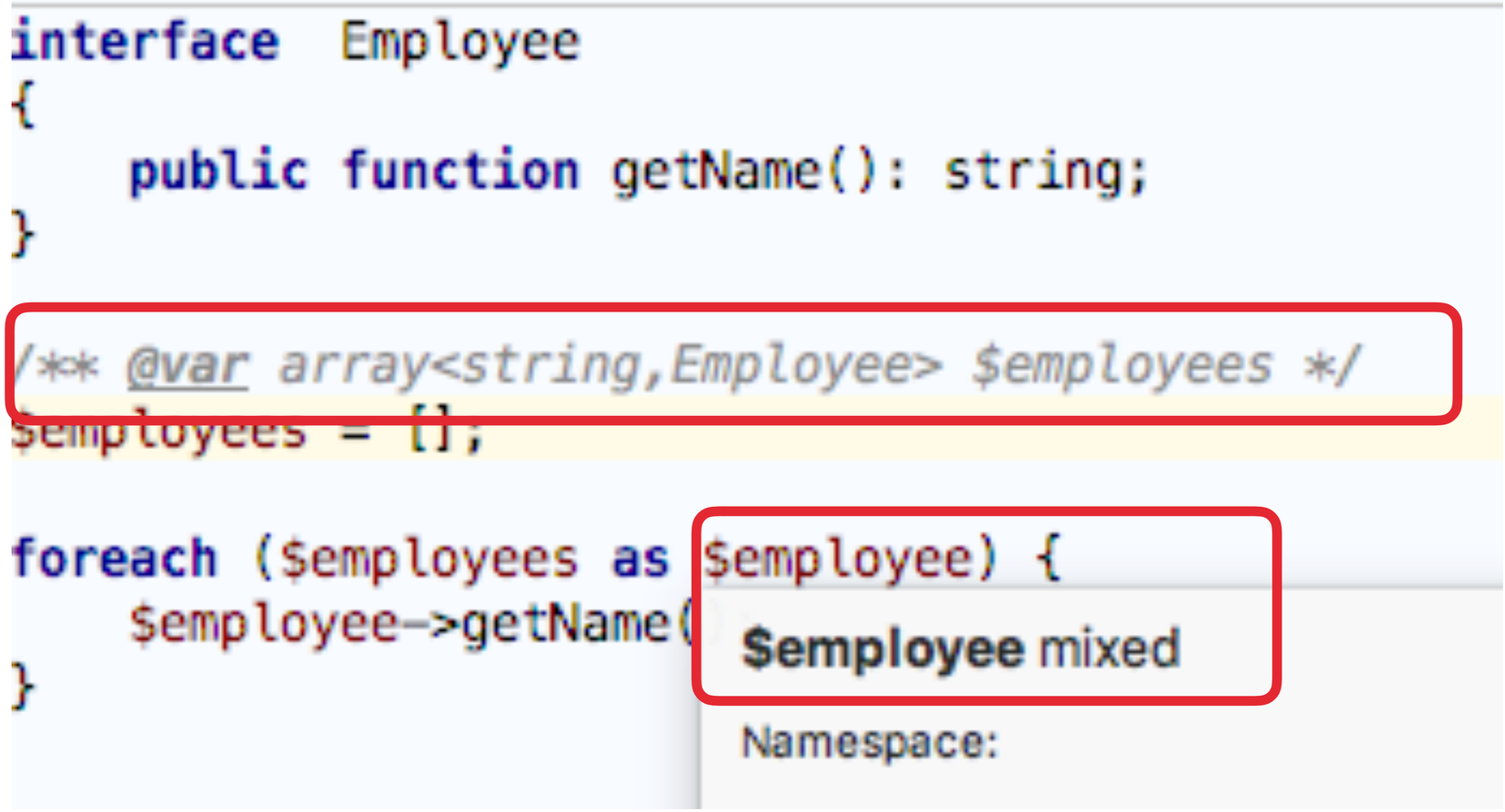

COMMON CONCEPTS: GENERICS

```
class Business {
    /**
     * @return Employee[]
     * @psalm-return array<string,Employee>
     */
    public function getEmployees(): array {…}
}
```

COMMON CONCEPTS: GENERICS

```
class Business {

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COMMON CONCEPTS: GENERICS

- In addition to normal annotations:
  - `@var, @param, @return`
- In Psalm:
  - `@psalm-var, @psalm-param, @psalm-return`
- In Phan:
  - `@phan-var, @phan-param, @phan-return`

COMMON CONCEPTS: IGNORE VIOLATIONS

- Set level
- Annotate code:
  - `@psalm-suppress <Issue>`
- Config:
  - Ignore directory
  - Turn off errors
  - Ignore types of errors in certain directories

PSALM: GETTING STARTED

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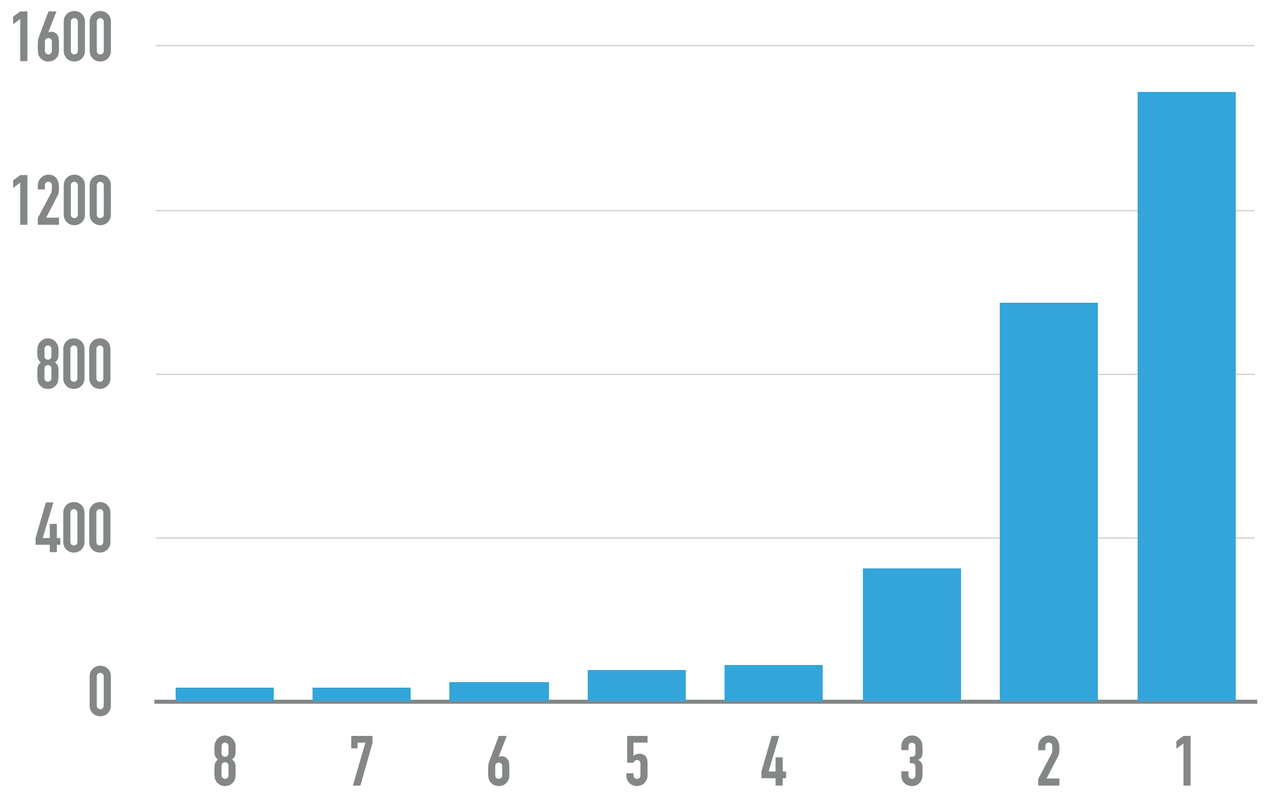
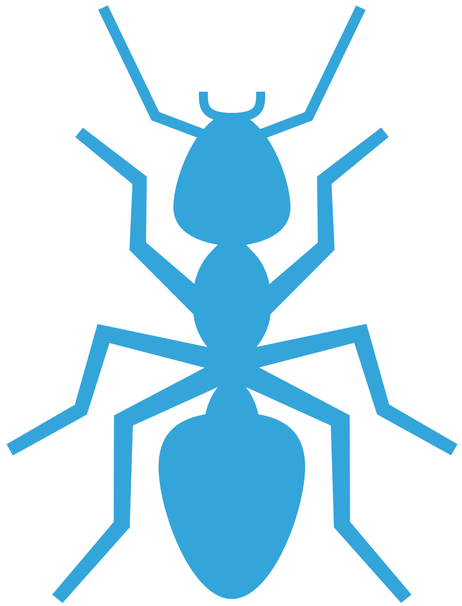
- Run:
  - `vendor/bin/psalm`
- `Cry.`

RESULTS

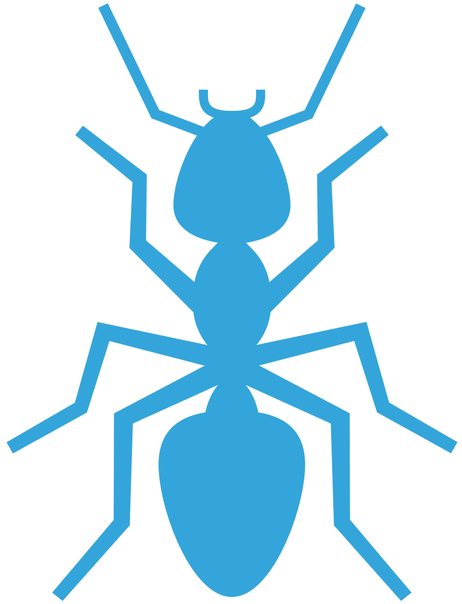


WHAT IS A BUG?



WHAT IS A BUG?

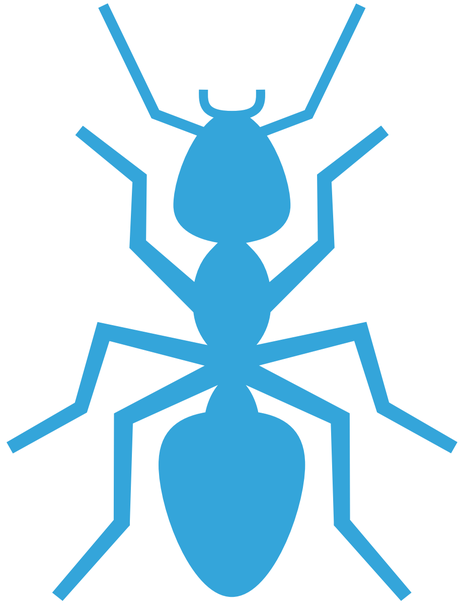
A “bug”



WHAT IS A BUG?

A “bug”

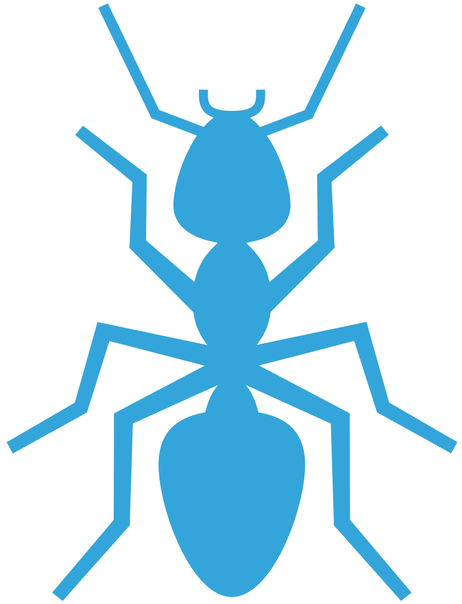
Deferred bug



WHAT IS A BUG?

A “bug”

Deferred bug

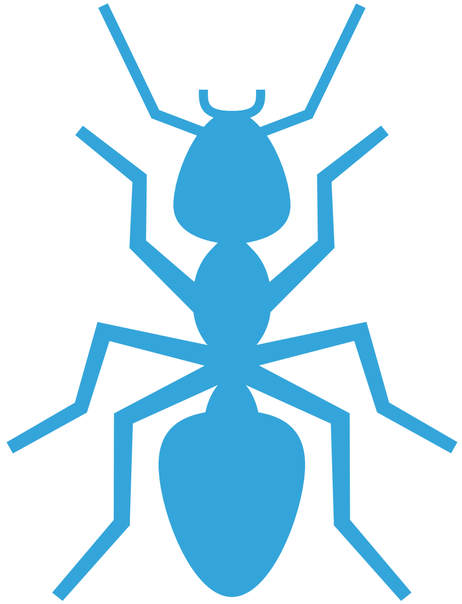


Evolvability defect

WHAT IS A BUG?

A “bug”

Deferred bug



Evolvability defect

False positive

THIS IS A BUG

```
function process(User $user) {
  // some implementation
}

$a = 1;
process($a);
```

THESE ARE DEFERRED BUGS…

```
function getPrice(string $type): int {
    if ($type === “CHILD") {
        $price = 10;
    }
    if ($type === “ADULT”) {
        $price = 20;
    }
    return $price;
}
```

Are “deferred bugs” really bugs?

Are “deferred bugs” really bugs?

Probably quicker to fix than to risk it.

Evolvability Defect

CODE THAT MAKES CODE BASE LESS COMPLIANT WITH STANDARDS, MORE ERROR PRONE, OR MORE DIFFICULT TO MODIFY, EXTEND OR UNDERSTAND.

Evolvability Defect

EVOLVABILITY IS IMPORTANT

- Evolvability defects account for 80% of bugs found during code review [1, 2]
- Low evolvability costs money:
  - New features took 28% longer to implement [3]
  - Fixing bugs took 36% longer [3]

AN EVOLVABILITY DEFECT

```
/**
 * @param $person
 * @return int
 */
function getAgeNextBirthday($a)
{
    return “Age next birthday ” . $a->asI() + 1;
}
```

AN EVOLVABILITY DEFECT

```
/**
 * @param $person
 * @return int
 */
function getAgeNextBirthday($a)
{
    return "Age next birthday " . $a->asI() + 1;
}
```

AN EVOLVABILITY DEFECT

```
/**
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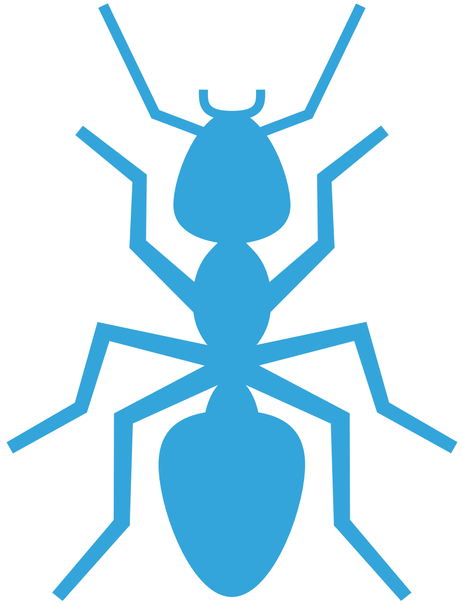
WHAT IS A BUG?

A “bug”

Deferred bug

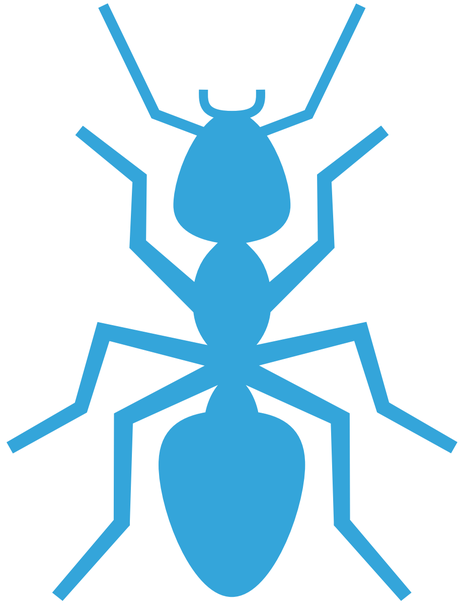


Evolvability defect

False positive

WHAT IS A BUG?

A “bug” ✓



Evolvability defect

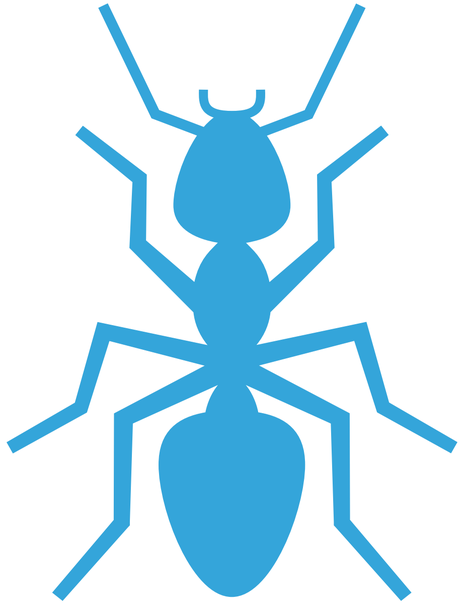
Deferred bug

False positive

WHAT IS A BUG?

A “bug” ✓

Deferred bug ✓



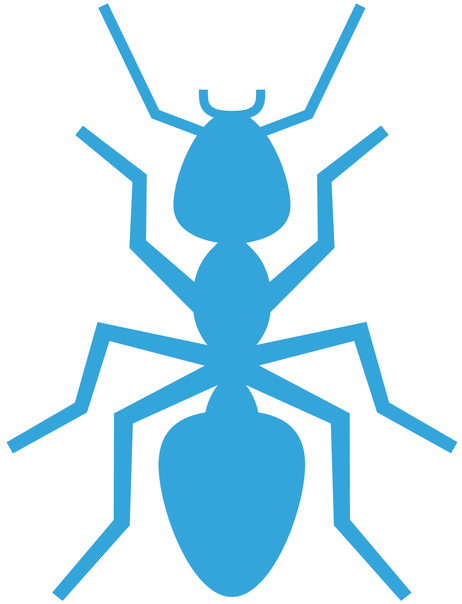
Evolvability defect ✓

False positive

WHAT IS A BUG?

A “bug” ✓

Deferred bug ✓



Evolvability defect ✓

False positive ✓

A REAL BUG

```
private function getEmailAddress(array $row): string
{
    $email = $row[self::EMAIL];
    if (empty($email)) {
        throw new ImportEntryException('Invalid or missing email address');
    }

    return $email;
}
```

A REAL BUG

```
private function getEmailAddress(array $row): string
{
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    return $email;
}
```

A DEFERRED BUG

```
class Location {
  public function getSlug(): ?string {…}
}

function createSearchTerm(Postcode $postcode, string $slug): SearchTerm {…}


… some code …

$searchTerm = createSearchTerm($postcode, $location->getSlug());
```

A DEFERRED BUG

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class Location {
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… some code …

$searchTerm = createSearchTerm($postcode, $location->getSlug());
```

EVOLVABILITY DEFECT

```
$plots = array_map(function(Bookmark $bookmark)          {
      return $bookmark->getPlot();
   },$bookmarks);
```

EVOLVABILITY DEFECT

```
$plots = array_map(function(Bookmark $bookmark) :Plot {
      return $bookmark->getPlot();
   },$bookmarks);
```

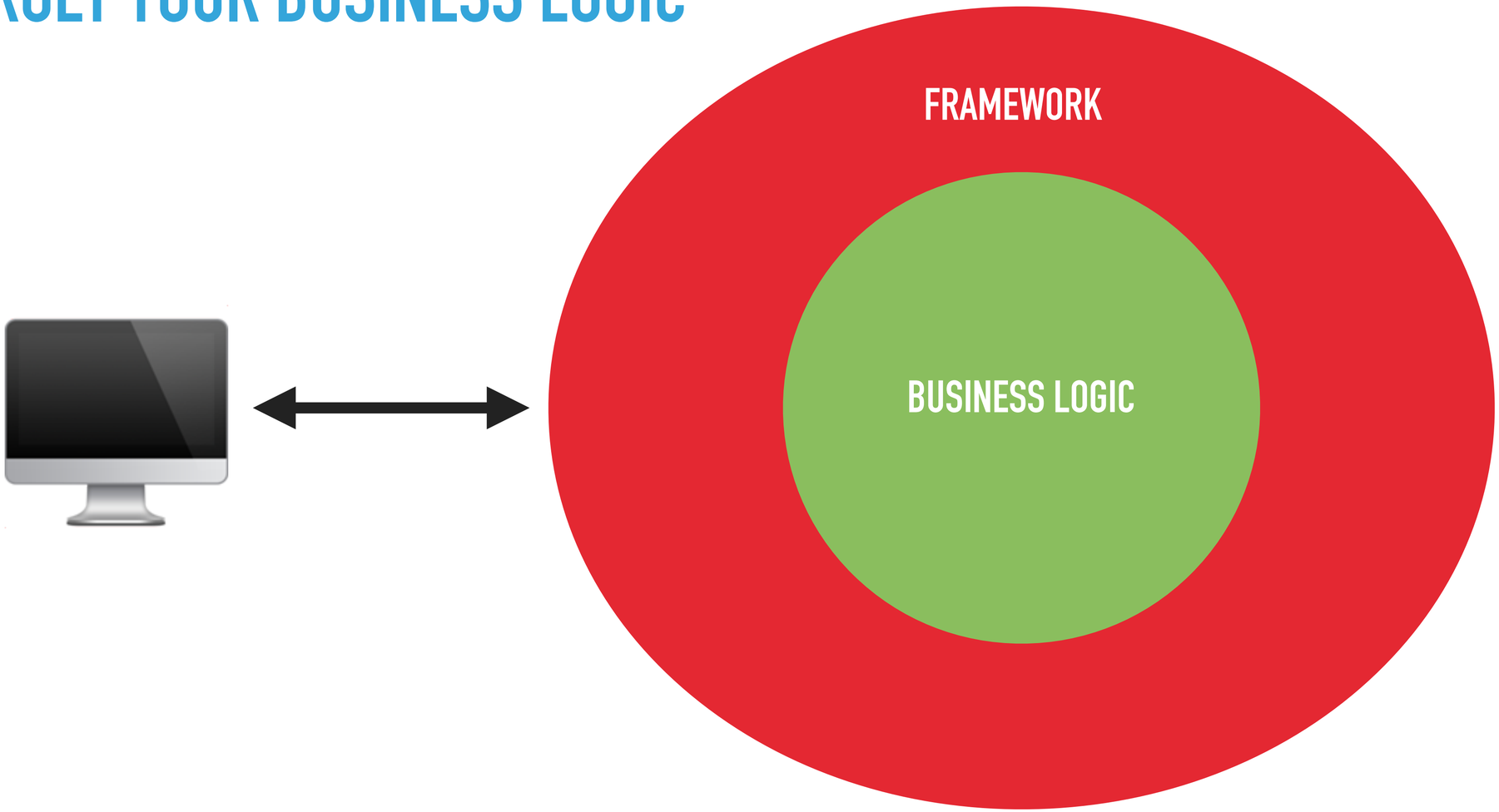
You don't really expect me to fix all those "bugs"?

You don't really expect me to fix all those "bugs"?

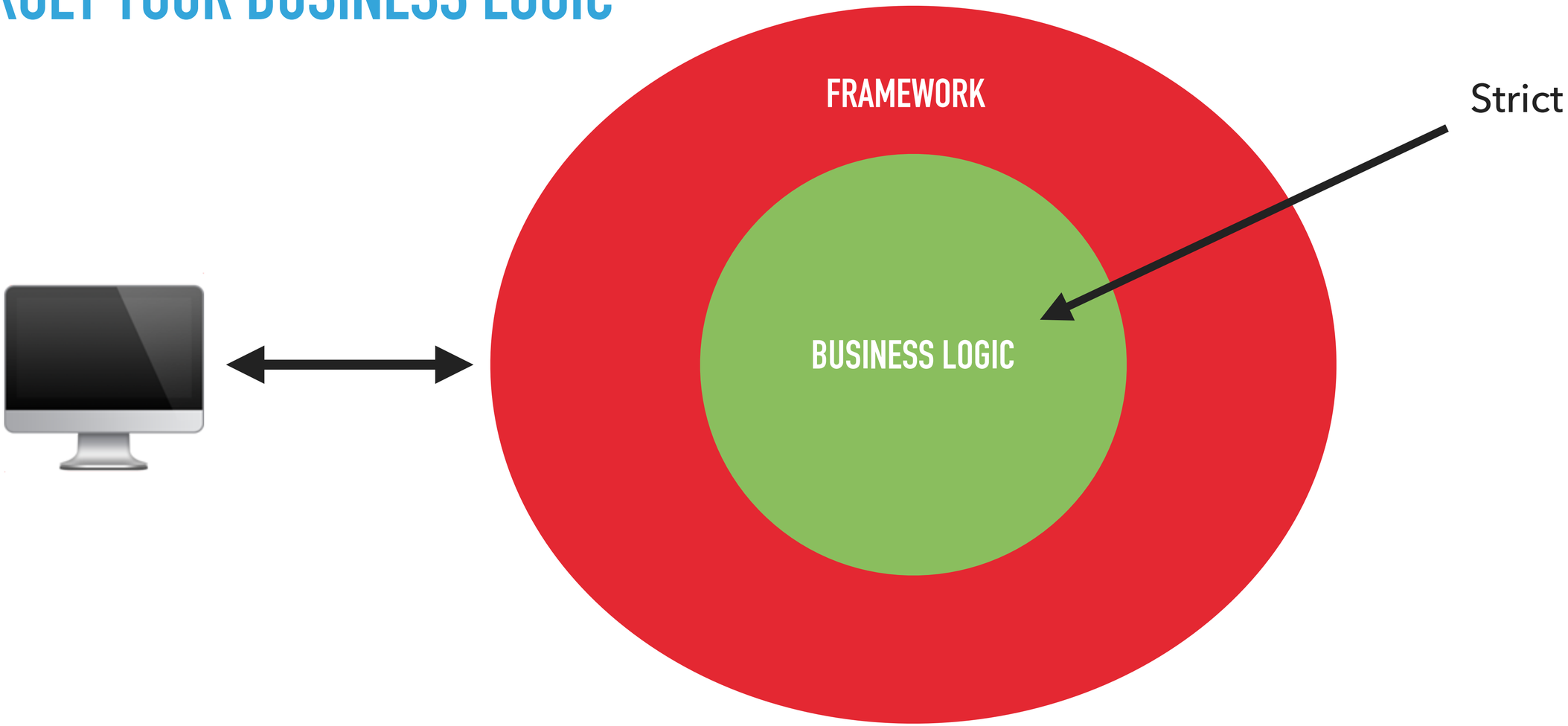
No. Here are some tips.

AGENDA

TARGET YOUR BUSINESS LOGIC



TARGET YOUR BUSINESS LOGIC



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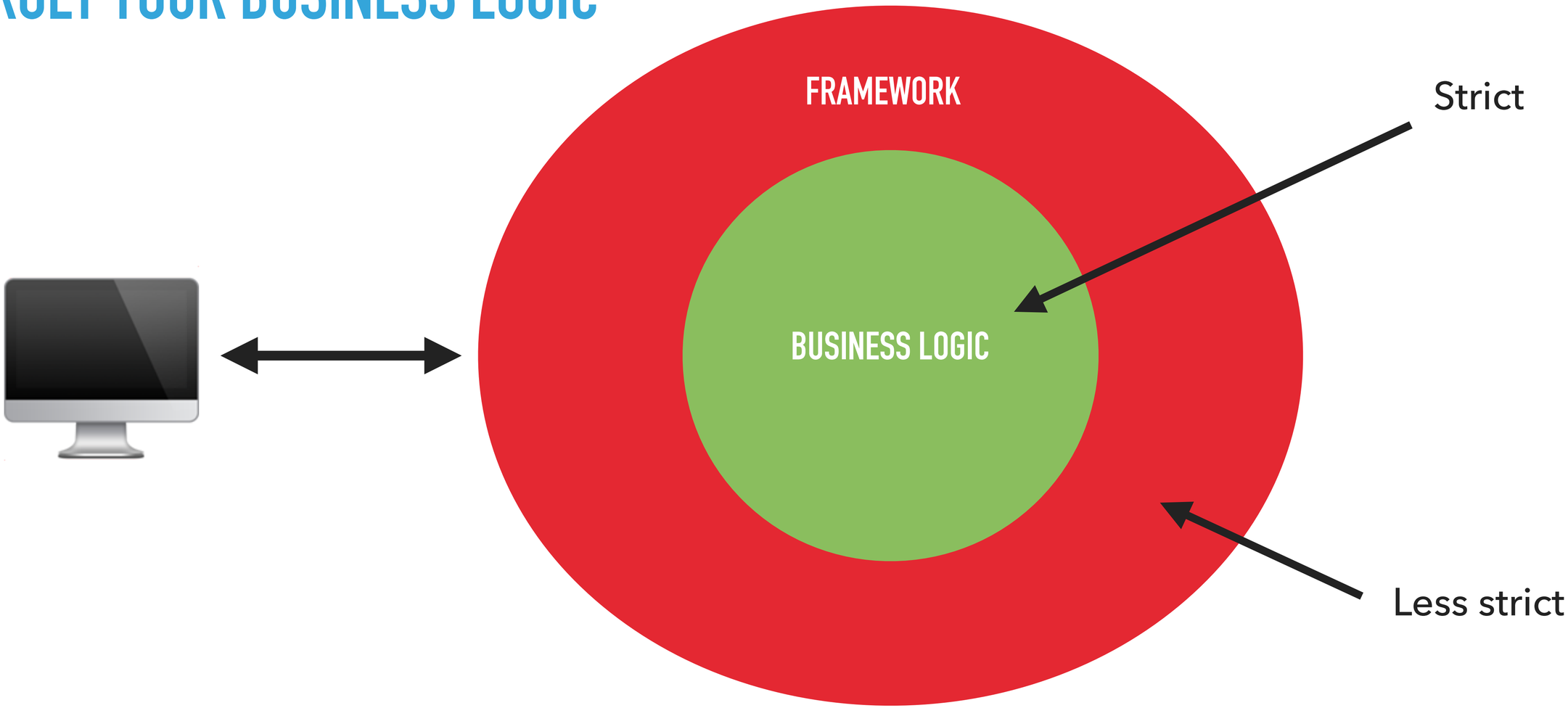

ADAPTORS FOR 3RD PARTY LIBRARIES: PROBLEM

```
interface Hasher {

    /**
     * @return string
     */
    public function encode();

}

… in our code …

$hash = $this->hasher->encode($id);
```

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```

ADAPTORS FOR 3RD PARTY LIBRARIES: A SOLUTION

```
class CleanHasher {

  /** @var Hasher $hasher */
  private $hasher;

  … constructor to inject Hasher …

  public function encode(int $id): string {
      return $this->hasher->encode($id);
  }
}


… in our code …

$hash = $this->cleanHasher->encode($id);
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… in our code …

$hash = $this->cleanHasher->encode($id);
```

FURTHER STATIC ANALYSIS TIPS

```
class Foo {
  public function sayHello(): void {…}
}

class DIContainer
{
    /**
     * @param string $className
     * @return mixed
     */
    public function make(string $className) {…}
}


$foo = $this->diContainer->make(Foo::class);
$foo->sayHello();
```

FURTHER STATIC ANALYSIS TIPS

```
class Foo {
  public function sayHello(): void {…}
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     * @return mixed
     */
    public function make(string $className) {…}
}

/** @var Foo $foo */
$foo = $this->diContainer->make(Foo::class);
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```

FURTHER STATIC ANALYSIS TIPS

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class Foo {
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}

class DIContainer
{
    /**
     * @param string $className
     * @return mixed
     */
    public function make(string $className) {…}
}

/** @var Foo $foo */
$foo = $this->diContainer->make(Foo::class);
$foo->sayHello();
```

FURTHER STATIC ANALYSIS TIPS

```
$foo = $this->diContainer->make('\MyApp\Foo');
$foo->sayHello();
```

FURTHER STATIC ANALYSIS TIPS

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FURTHER STATIC ANALYSIS TIPS

```
$foo = $this->diContainer->make('\MyApp\Foo');
$foo->sayHello();


class DIContainer
{
    /**
     * @param string $className
     * @psalm-param class-string $className
     * @return mixed
     */
    public function make(string $className) {…}
}
```

FURTHER STATIC ANALYSIS TIPS

```
$foo = $this->diContainer->make('\MyApp\Foo');
$foo->sayHello();


class DIContainer
{
    /**
     * @param string $className
     * @psalm-param class-string $className
     * @return mixed
     */
    public function make(string $className) {…}
}
```

FURTHER STATIC ANALYSIS TIPS

```
/** @var Foo $foo */
$foo = $this->diContainer->make(Bar::class);
$foo->sayHello();
```

FURTHER STATIC ANALYSIS TIPS

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$foo = $this->diContainer->make(Bar::class);
$foo->sayHello();
```

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```

FURTHER STATIC ANALYSIS TIPS

```
/** @var Foo $foo */
$foo = $this->diContainer->make(Bar::class);
$foo->sayHello();
```

```
class DIContainer
{
    /**
     * @param string $className
     * @psalm-param class-string $className
     * @template T
     * @template-typeof T $className
     * @psalm-return T
     */
    public function make(string $className) {…}
}
```

FURTHER STATIC ANALYSIS TIPS

```
/** @var Foo $foo */
$foo = $this->diContainer->make(Bar::class);
$foo->sayHello();
```

```
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     * @param string $className
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    public function make(string $className) {…}
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     * @template-typeof T $className
     * @psalm-return T
     */
    public function make(string $className) {…}
}
```

FURTHER STATIC ANALYSIS TIPS

```php
/** @var Foo $foo */
$foo = $this->diContainer->make(Bar::class);
$foo->sayHello();
```

```php
class DIContainer
{
    /**
     * @param string $className
     * @psalm-param class-string $className
     * @template T
     * @template-typeof T $className
     * @psalm-return T
     */
    public function make(string $className) {…}
}
```

FURTHER STATIC ANALYSIS TIPS

```
class LoginCommand
{
  public function __construct(…) {…}

  public function execute(): void {…}

  public function getAccessToken(): string {…}
}
```

FURTHER STATIC ANALYSIS TIPS

```
class LoginCommand
{
  public function __construct(…) {…}

  public function execute(): void {…}

  public function getAccessToken(): string {…}
}



$login =  new LoginCommand();
$login->getAccessToken();
```

FURTHER STATIC ANALYSIS TIPS

```
/**
 * @var string
 */
private $accessToken;


public function getAccessToken(): string
{

    return $this->accessToken;
}
```

FURTHER STATIC ANALYSIS TIPS

```
/**
 * @var string
 */
private $accessToken;

public function getAccessToken(): string
{

    return $this->accessToken;
}
```

FURTHER STATIC ANALYSIS TIPS

```
/**
 * @var string|null
 */
private $accessToken;


public function getAccessToken(): string
{

    return $this->accessToken;
}
```

FURTHER STATIC ANALYSIS TIPS

```
/**
 * @var string|null
 */
private $accessToken;


public function getAccessToken(): string
{

    return $this->accessToken;
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public function getAccessToken(): string
{

    return $this->accessToken;
}
```

FURTHER STATIC ANALYSIS TIPS

```
/**
 * @var string|null
 */
private $accessToken;


public function getAccessToken(): string
{
     if ($this->accessToken === null) {
        throw new LogicException(… message …);
     }
     return $this->accessToken;
}
```

FURTHER STATIC ANALYSIS TIPS

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{
    if ($this->accessToken === null) {
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    }
    return $this->accessToken;
}
```

FURTHER STATIC ANALYSIS TIPS

```
/**
 * @var string|null
 */
private $accessToken;


public function getAccessToken(): string
{
    Assert::notNull($this->accessToken, …message…);

    return $this->accessToken;
}
```

FURTHER STATIC ANALYSIS TIPS

```
/**
 * @var string|null
 */
private $accessToken;


public function getAccessToken(): string
{
    Assert::notNull($this->accessToken, …message…);

    return $this->accessToken;
}
```

FURTHER STATIC ANALYSIS TIPS

```
class Assert
{

   /**
    * @param mixed|null $expression
    * @param string $message
    */
   public static function notNull($expression, string $message): void
   {
      if ($expression === null) {
         throw new LogicException($message);
      }
   }

}
```

FURTHER STATIC ANALYSIS TIPS

```
class Assert
{
  public static function notNull($expression, string $message): void
  {
     self::assertTrue($expression !== null, $message);
  }

  … other assertions …

  public static function assertTrue($expression, string $message): void
  {
     if ($expression !== true) {
        throw new LogicException($message);
     }
  }
}
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FURTHER STATIC ANALYSIS TIPS

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        }
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  }

  … other assertions …

  public static function assertTrue($expression, string $message): void
  {
     if ($expression !== true) {
        throw new LogicException($message);
     }
  }
}
```

FURTHER STATIC ANALYSIS TIPS

```
class Assert
{



  public static function notNull($expression, string $message): void
  {
      self::assertTrue($expression !== null, $message);
  }

 }
```

FURTHER STATIC ANALYSIS TIPS

```
class Assert
{

  /**
   * @psalm-assert !null $expression
   */
  public static function notNull($expression, string $message): void
  {
      self::assertTrue($expression !== null, $message);
  }

 }
```

FURTHER STATIC ANALYSIS TIPS

```
class Assert
{

    /**
     * @psalm-assert !null $expression
     */
    public static function notNull($expression, string $message): void
    {
        self::assertTrue($expression !== null, $message);
    }

}
```

FURTHER STATIC ANALYSIS TIPS

What about 3rd party libraries?

FURTHER STATIC ANALYSIS TIPS

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Stubs/Assert.php

FURTHER STATIC ANALYSIS TIPS

Stubs/Assert.php

```
namespace Webmozart\Assert;

class Assert
{
   /**
    * @psalm-assert !null $value
    */
   public static function notNull($value, $message="") {}

   … other functions …
") {}

}
```

FURTHER STATIC ANALYSIS TIPS

Stubs/Assert.php

```
namespace Webmozart\Assert;

class Assert
{
    /**
     * @psalm-assert !null $value
     */
    public static function notNull($value, $message="") {}

    … other functions …
") {}

}
```

FURTHER STATIC ANALYSIS TIPS

```
<psalm …>

  … other config …

  <stubs>
    <file name="Stubs/Assert.php" />
    … other stub files …
  </stubs>

<psalm>
```

FURTHER STATIC ANALYSIS TIPS

```
<psalm …>

  … other config …

  <stubs>
    <file name="Stubs/Assert.php" />
    … other stub files …
  </stubs>

<psalm>
```

LEARN FROM MISTAKES AND DON'T BE SLOPPY

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- Learn from issues raised
- Type hint everything
- Create / use plugins / stubs to give extra information to static analysis tools
- Use tools that auto fix issues
  - psalter (Part of Psalm)
  - rector https://github.com/rectorphp/rector/

Do you really expect me to fix all 3895 bugs before writing new code.

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No. Create a baseline.

BASELINE STATIC ANALYSIS RESULTS

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Problem

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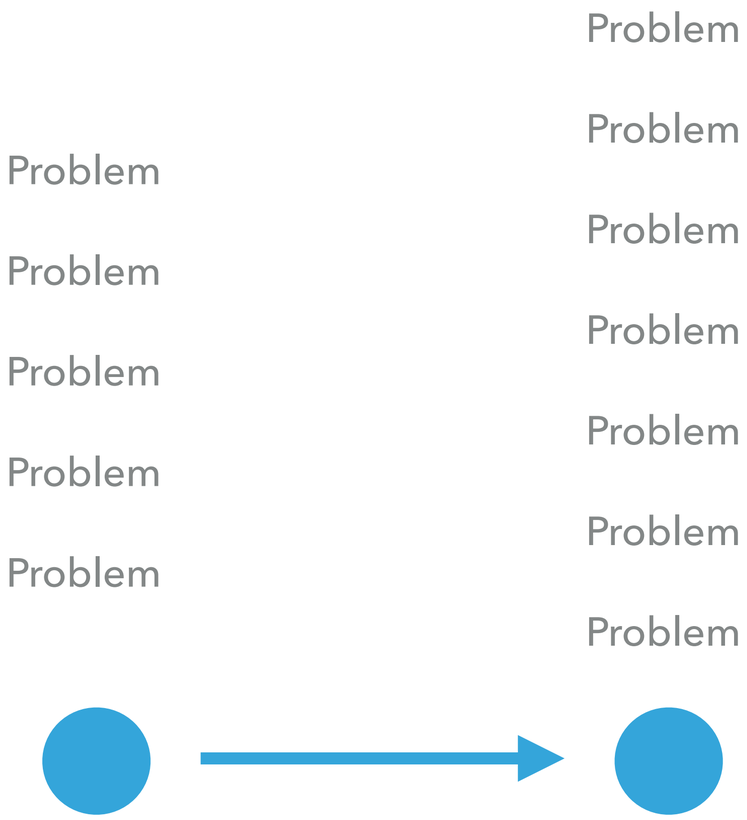
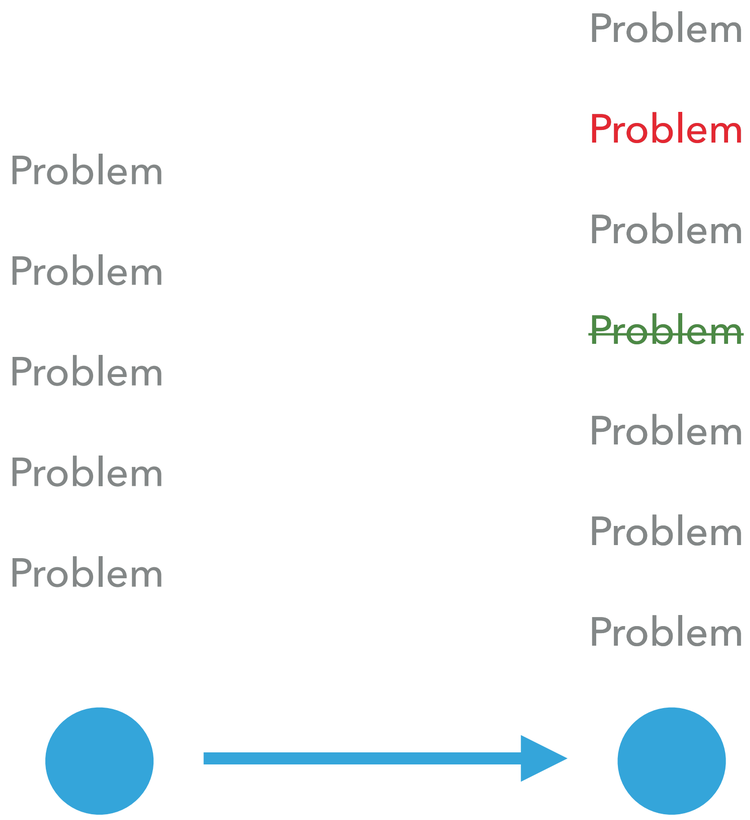
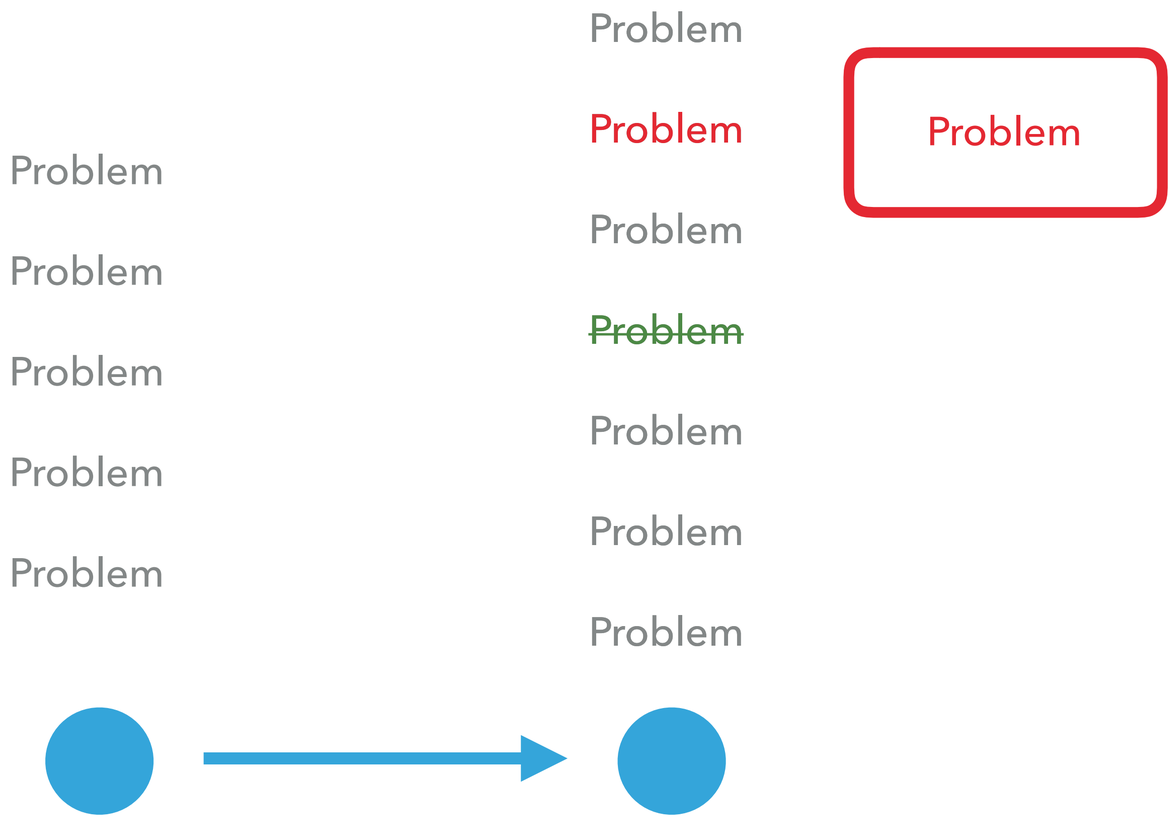
BASELINE STATIC ANALYSIS RESULTS



BASELINE STATIC ANALYSIS RESULTS



BASELINE STATIC ANALYSIS RESULTS



STATIC ANALYSIS RESULTS BASELINE (SARB)

- Available: https://github.com/DaveLiddament/sarb
  - Supports:
    - Psalm, PHPStan
    - Easy to add more static analysis tools. Don't need to be for PHP.
  - Requires repo uses git

SARB: CREATE BASELINE

```
# Run Psalm on the code


> sarb create-baseline … args …

Baseline created with 328 problems.

>
```

SARB: REMOVE BASELINE FROM RESULTS

```
# Run Psalm on the updated code


> sarb remove-baseline-results … args …


Original results contained 334 problems.
Baseline contained 328 problems.
After baseline removed there are 15 new problems.
>
```

SARB: REMOVE BASELINE FROM RESULTS

```
# Run Psalm on the updated code


> sarb remove-baseline-results … args …


Original results contained 334 problems.
Baseline contained 328 problems.
After baseline removed there are 15 new problems.
>
```

SARB BEHIND THE SCENES: BASELINE

Type: psalm-json **History Marker**: 06b982c6b3d15ef1eae827038d9d2bcb0ae71329

Type	File	Line number
InvalidNullableReturnType	src/Entity/Person.php	93
PossiblyNullReference	src/Entity/Shop.php	57
InvalidScalarArgument	src/Purchase/Begin.php	126

SARB BEHIND THE SCENES: BASELINE

```
class Person

{


… Some code …


public function foo()

{

… some code …

  return $bar

}
```

SARB BEHIND THE SCENES: BASELINE

```
class Person

{


… Some code …


public function foo()

{

… some code …

  return $bar

}
```

Line 93: InvalidNullableReturnType

SARB BEHIND THE SCENES: AFTER CODING

```
class Person

{


… Some code …


public function foo()

{

… some code …

  return $bar

}
```

SARB BEHIND THE SCENES: AFTER CODING

```
class ~~Person~~ Employee
{


… Some code …


public function foo()
{
… some code …
  return $bar
}
```

SARB BEHIND THE SCENES: AFTER CODING

```
class Person
{

… some code …

public function foo()
{
… some code …
  return $bar
}
```

Employee

Remove 20 lines of code

SARB BEHIND THE SCENES: AFTER CODING

```
class Person
{

… some code …

public function foo()
{
… some code …
  return $bar
}
```

Employee

Remove 20 lines of code

Line 73: InvalidNullableReturnType

SARB BEHIND THE SCENES: REMOVING THE BASELINE RESULTS

SARB BEHIND THE SCENES: REMOVING THE BASELINE RESULTS

- **Problem:** InvalidNullableReturnType src/Entity/Employee.php:73

SARB BEHIND THE SCENES: REMOVING THE BASELINE RESULTS

- **Problem:** InvalidNullableReturnType src/Entity/Employee.php:73
- What is the location of src/Entity/Employee.php:73 at the baseline?

SARB BEHIND THE SCENES: REMOVING THE BASELINE RESULTS

- **Problem:** InvalidNullableReturnType src/Entity/Employee.php:73
- What is the location of src/Entity/Employee.php:73 at the baseline?
- History Analyser says: src/Entity/Person.php:93

SARB BEHIND THE SCENES: REMOVING THE BASELINE RESULTS

- **Problem:** InvalidNullableReturnType src/Entity/Employee.php:73
- What is the location of src/Entity/Employee.php:73 at the baseline?
- History Analyser says: src/Entity/Person.php:93
- Did we have a problem InvalidNullableReturnType at src/Entity/Person.php:93 in the baseline?

SARB BEHIND THE SCENES: BASELINE

Type: psalm-json **History Marker**: 06b982c6b3d15ef1eae827038d9d2bcb0ae71329

Type	File	Line number
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PossiblyNullReference	src/Entity/Shop.php	57
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SARB BEHIND THE SCENES: REMOVING THE BASELINE RESULTS

- **Problem:** InvalidNullableReturnType src/Entity/Employee.php:73
- What is the location of src/Entity/Employee.php:73 at the baseline?
- History Analyser says: src/Entity/Person.php:93
- Did we have a problem InvalidNullableReturnType at src/Entity/Person.php:93 in the baseline?
- Yes. This problem was in the baseline. Don’t report as new issue.

STATIC ANALYSIS WITH SARB

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- Run static analysis tool

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- Repeat forever:
  - Write code
  - Run analysis
  - Remove baseline results from latest analysis
  - Fix newly introduced bugs

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- Run static analysis tool
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- Repeat forever:
  - Write code
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  - Remove baseline results from latest analysis
  - Fix newly introduced bugs

PSALM BASELINE

```
vendor/bin/psalm --set-baseline=baseline.xml
```

Type	File	Count
InvalidNullableReturnType	src/Entity/Person.php	3
PossiblyNullReference	src/Entity/Shop.php	1
InvalidScalarArgument	src/Purchase/Begin.php	2

PSALM BASELINE

Type	File	Baseline count	New count
InvalidNullableReturn Type	src/Entity/ Person.php	3	4
PossiblyNullReference	src/Entity/Shop.php	1	1
InvalidScalarArgument	src/Purchase/ Begin.php	2	1

PSALM BASELINE

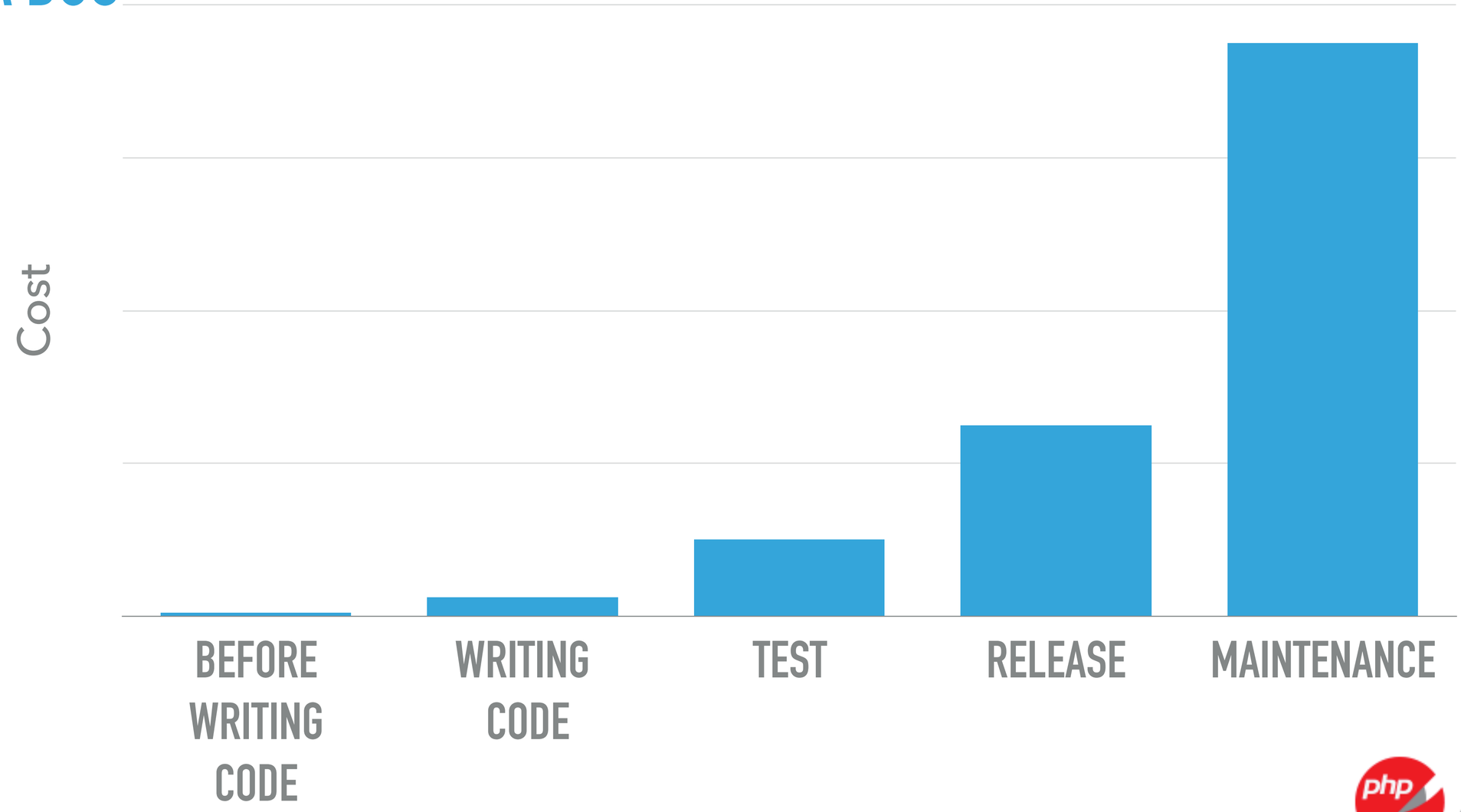
Type	File	Baseline count	New count
InvalidNullableReturn Type	src/Entity/ Person.php	3	4
PossiblyNullReference	src/Entity/Shop.php	1	1
InvalidScalarArgument	src/Purchase/ Begin.php	2	1

AGENDA

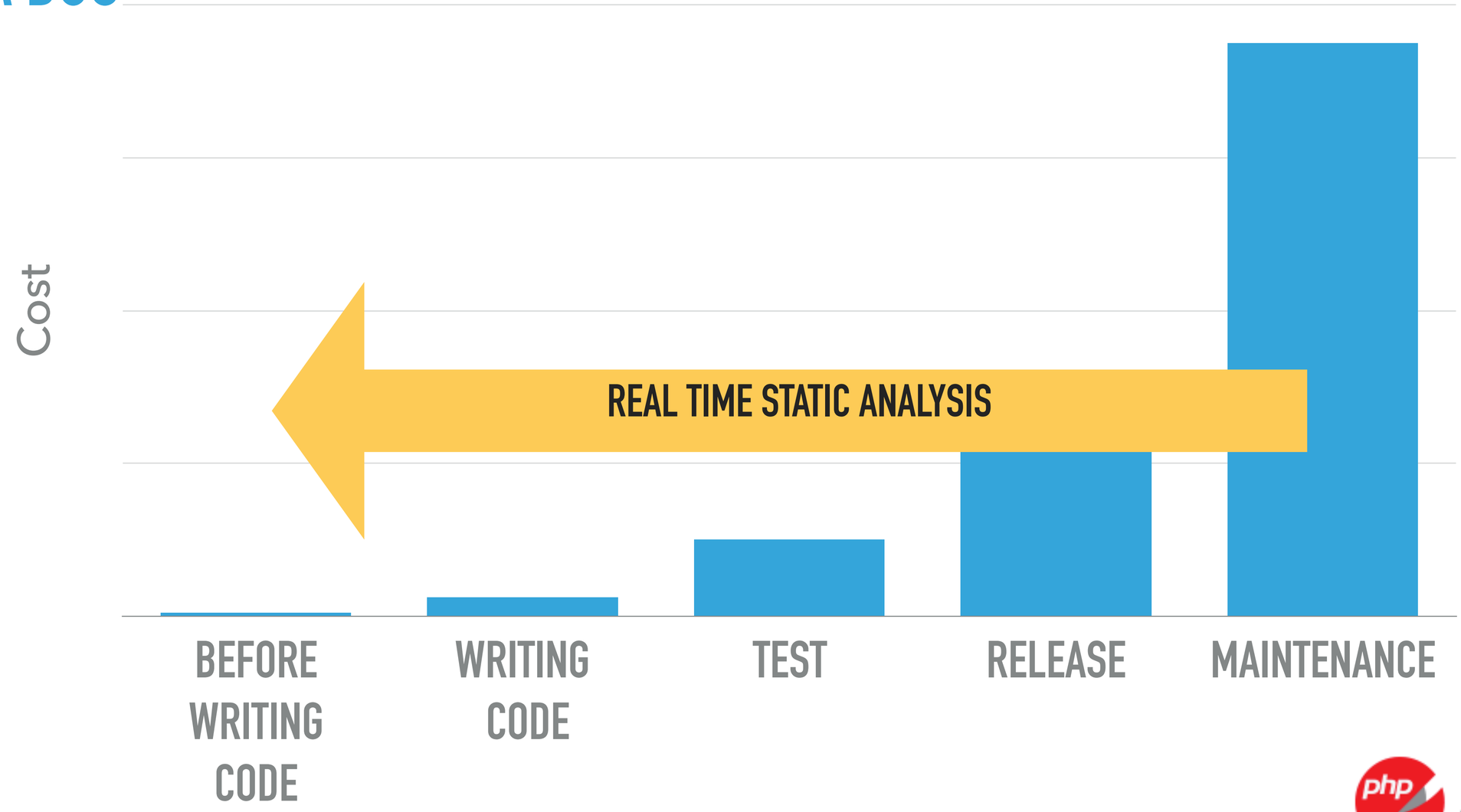
SUMMARY

APPROPRIATE APPLICATION OF STATIC ANALYSIS REDUCES THE OVERALL COST OF SOFTWARE DEVELOPMENT.

COST OF A BUG


Cost
BEFORE WRITING CODE
WRITING CODE
TEST
RELEASE
MAINTENANCE

COST OF A BUG


Cost
REAL TIME STATIC ANALYSIS
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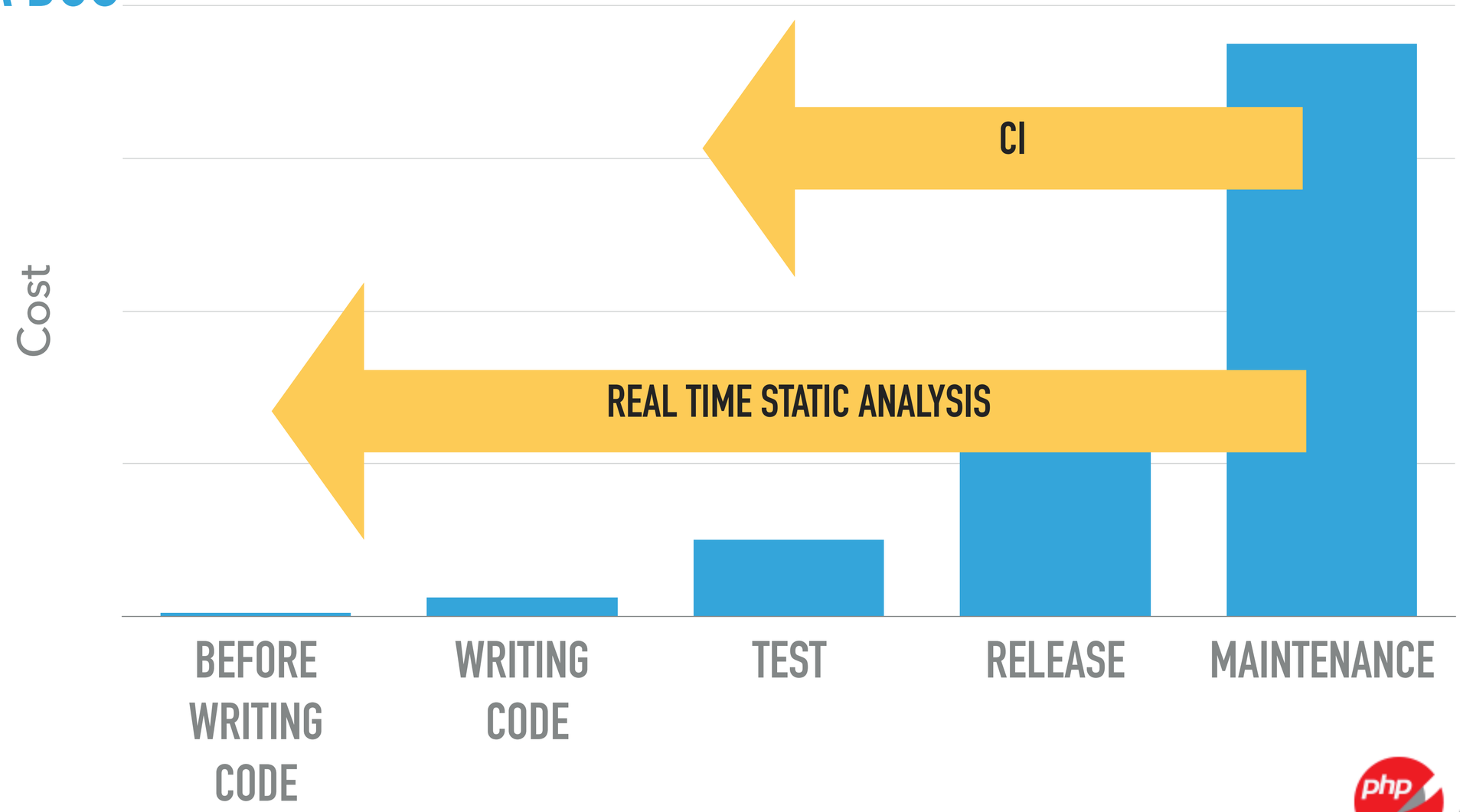
Cost
CI
REAL TIME STATIC ANALYSIS
BEFORE WRITING CODE
WRITING CODE
TEST
RELEASE
MAINTENANCE

CI TOOLSET

- Composer validate: `composer validate --strict`
- Parallel lint: `jakub-onderka/php-parallel-lint`
- PHP CS fixer: `friendsofsymfony/php-cs-fixer`
- Var dump checker: `jakub-onderka/php-var-dump-checker`
- Security checker: `sensiolabs/security-checker`

PHP bible for static analysis tools: https://github.com/exakat/php-static-analysis-tools

REQUIREMENTS FOR REAL TIME STATIC ANALYSIS TOOL (IDE)

- Understand entire codebase (including vendor directory)
- Highlight errors in real time
- Suggest / autocomplete based on context
- Refactoring (e.g. rename, move, extract)

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- Suggest / autocomplete based on context
- Refactoring (e.g. rename, move, extract)

USE ADVANCED STATIC ANALYSIS TOOLS IN CI

```php
<?php

function foo(string $s) : void {
    return "bar";
}

$a = ["hello", 5];
foo($a[1]);
foo();

if (rand(0, 1)) $b = 5;
echo $b;

$c = rand(0, 5);
if ($c) {} elseif ($c) {}
```

```
Psalm output (using commit add7c14):

ERROR: InvalidReturnStatement - 4:5 - No return values are expected for foo

INFO: UnusedParam - 3:21 - Param $s is never referenced in this method

ERROR: InvalidReturnType - 3:27 - The declared return type 'void' for foo is incorrect, got 'string'
```

↗ Shrink Get link

Dave Liddament

Lamp Bristol

Organise PHP-SW and Bristol PHP Training

Author of Static Analysis Results Baseliner (SARB)

17 years of writing software (C, Java, Python, PHP)

@daveliddament

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SUMMARY

REFERENCES

- [1] Mika V. Mantyla and Casper Lassenius “What Types of Defects Are Really Discovered in Code Reviews?” IEEE Transactions on Software Engineering
- [2] Harvey Siy, Lawrence Votta “Does The Modern Code Inspection Have Value?”
- [3] R.K. Bandi, V.K. Vaishnavi, and D.E. Turk, “Predicting Maintenance Performance Using Object-Orientated Design Complexity Metrics”

LINKS

- Static Analysis tools: https://github.com/exakat/php-static-analysis-tools
- Sample CircleCI project: https://github.com/DaveLiddament/skeleton-ci-project
- Psalm https://getpsalm.org/
- Phan: https://github.com/phan/phan
- PHPStan https://github.com/phan/phan
- Parallel lint https://github.com/JakubOnderka/PHP-Parallel-Lint
- PHP CS fixer https://github.com/FriendsOfPHP/PHP-CS-Fixer
- Var dump checker https://github.com/JakubOnderka/PHP-Var-Dump-Check
- Security checker https://security.sensiolabs.org/
- Rector https://github.com/rectorphp/rector/