Keeping Rails Applications on Track with Brakeman

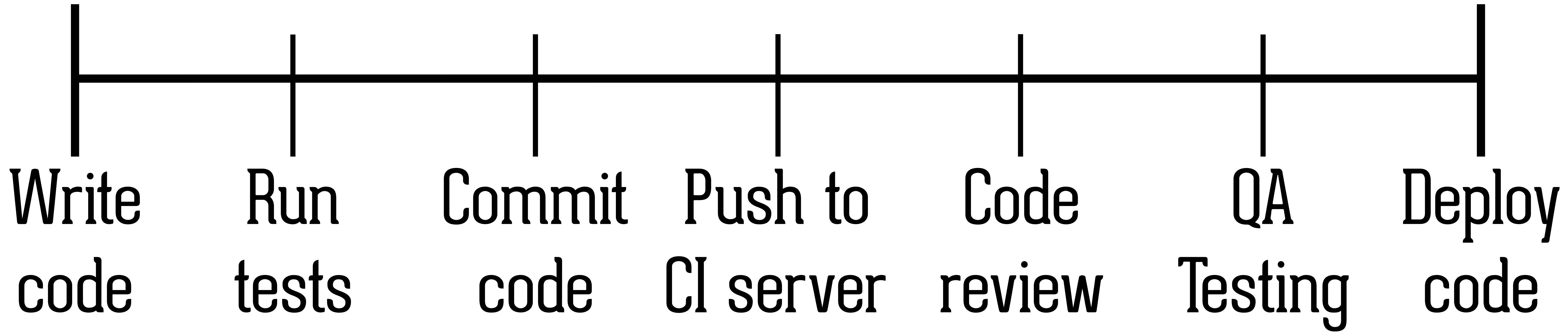
Justin Collins
@presidentbeef

RailsConf 2012

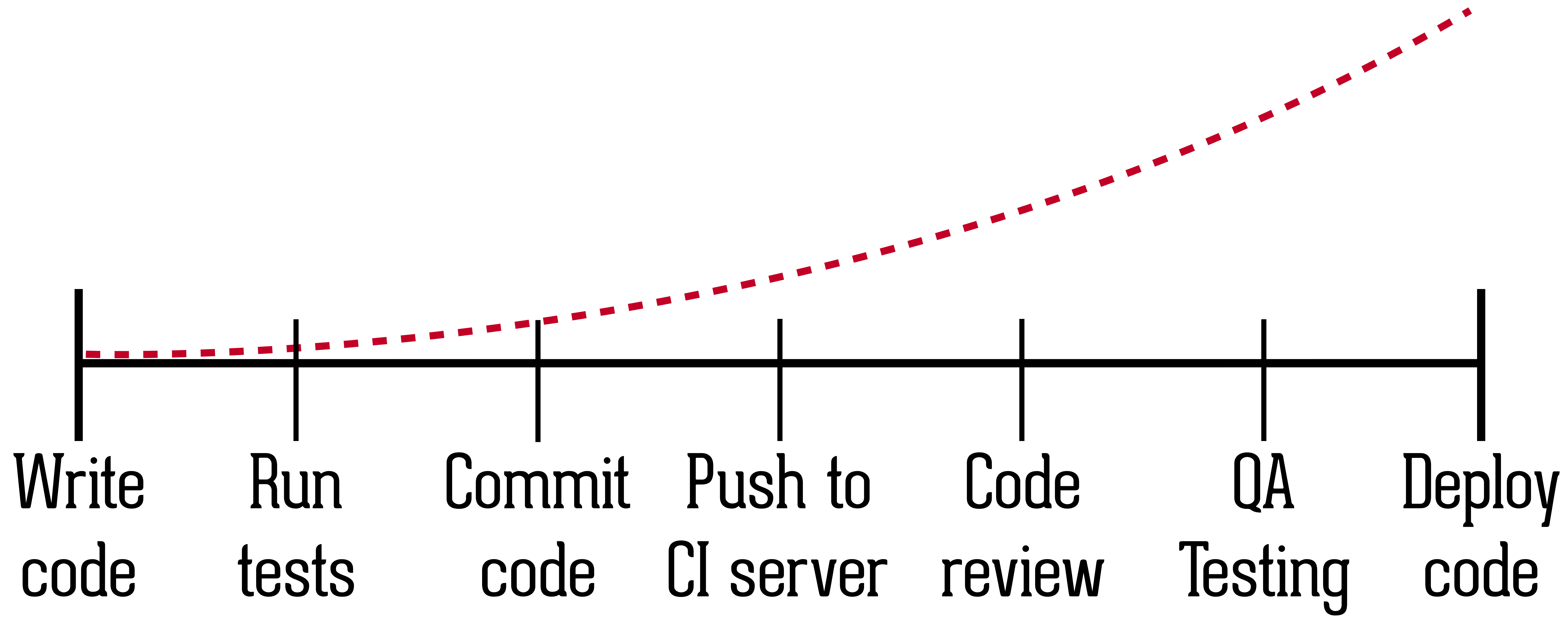
Everyone knows they “should” worry about security

But when should you worry?

Idealized Software Development



Cost to Fix Defects



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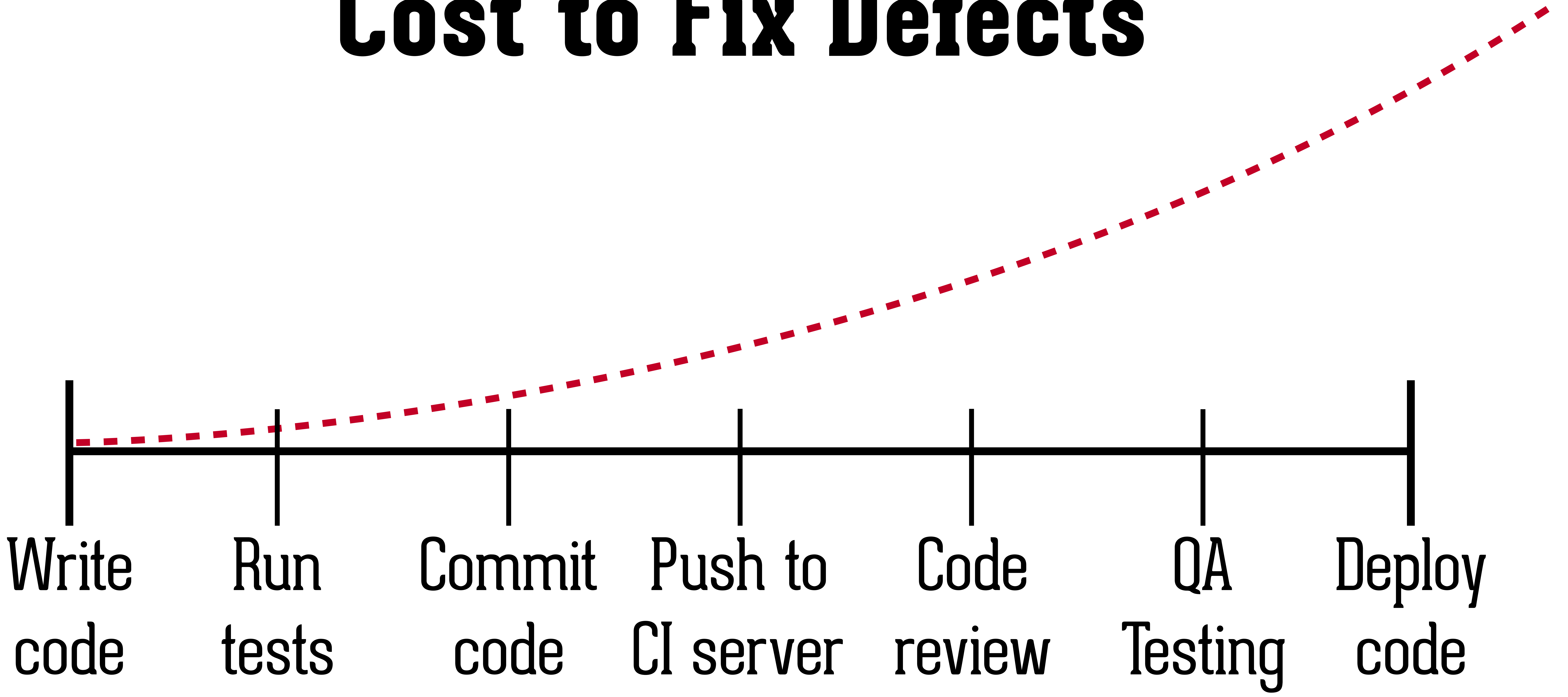

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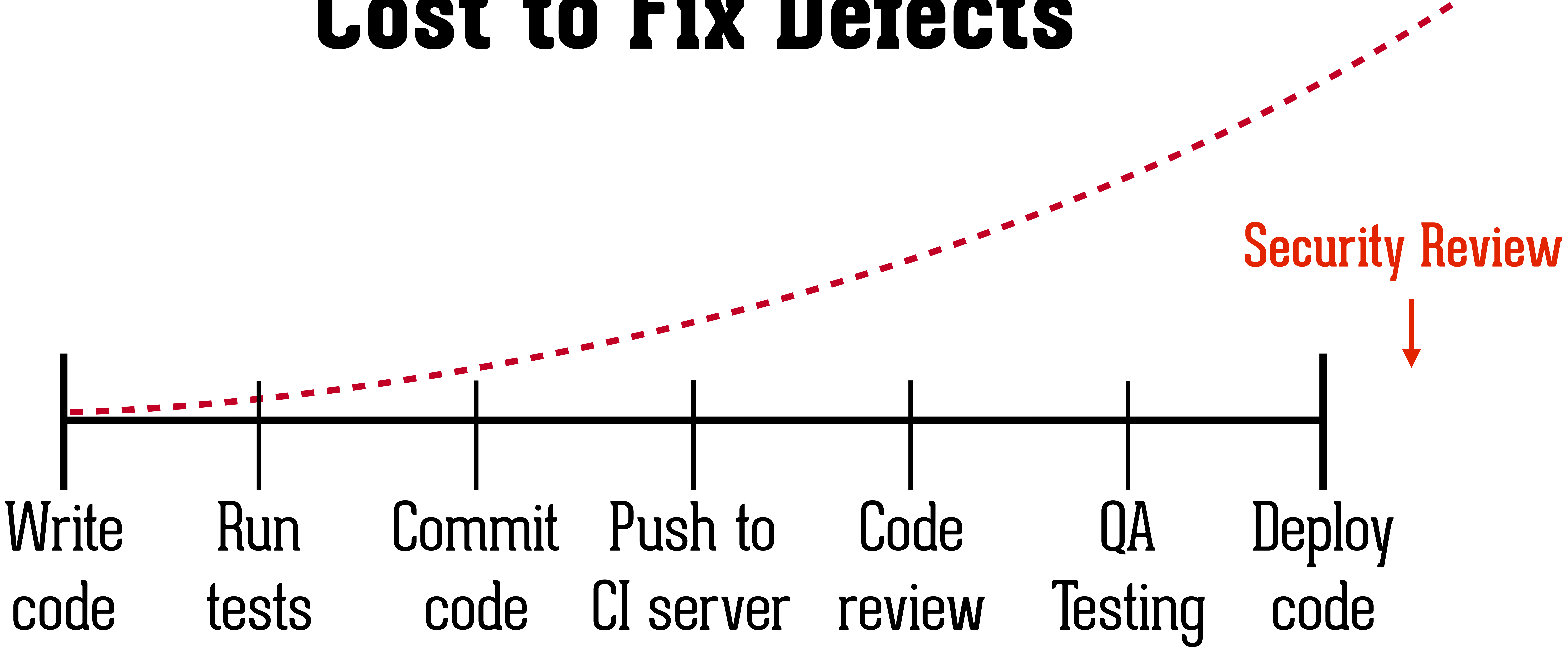

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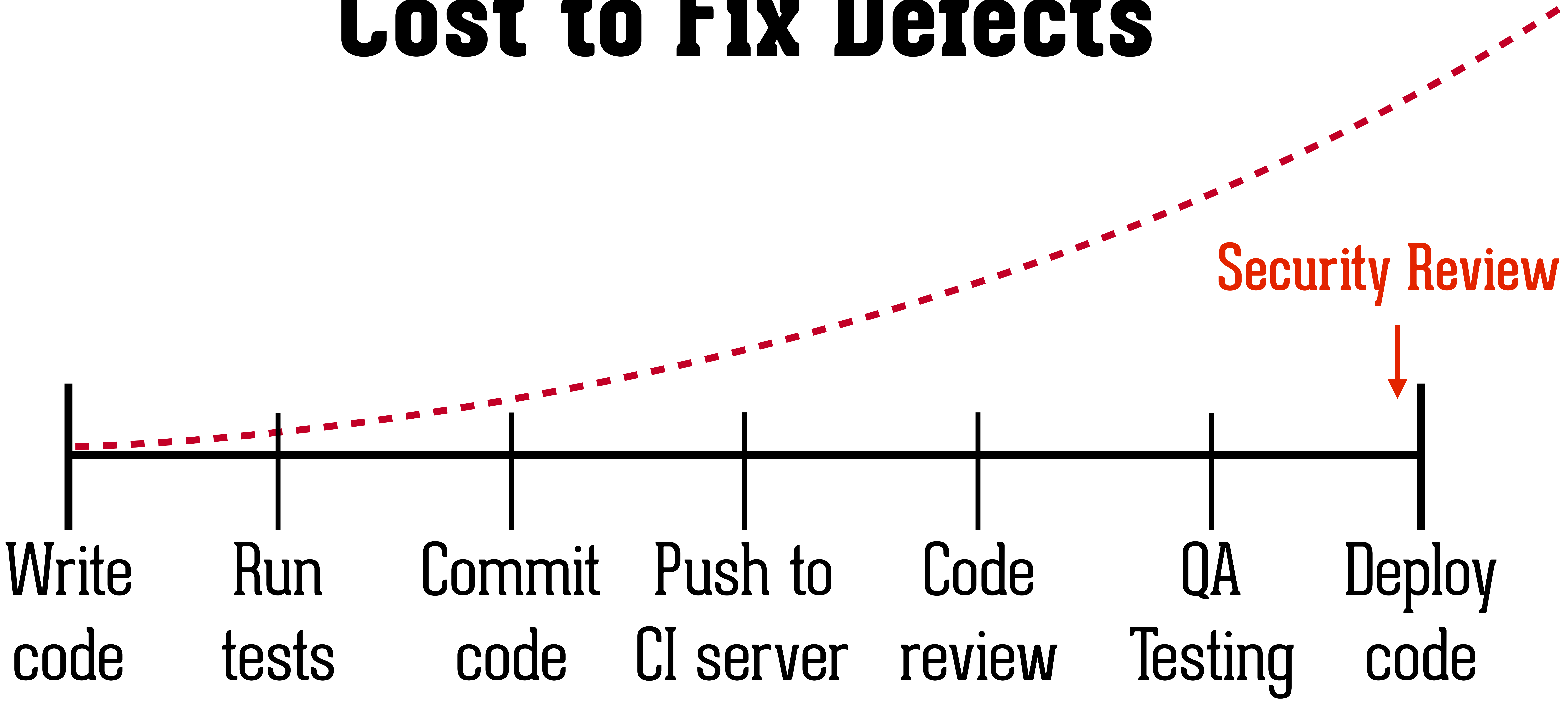

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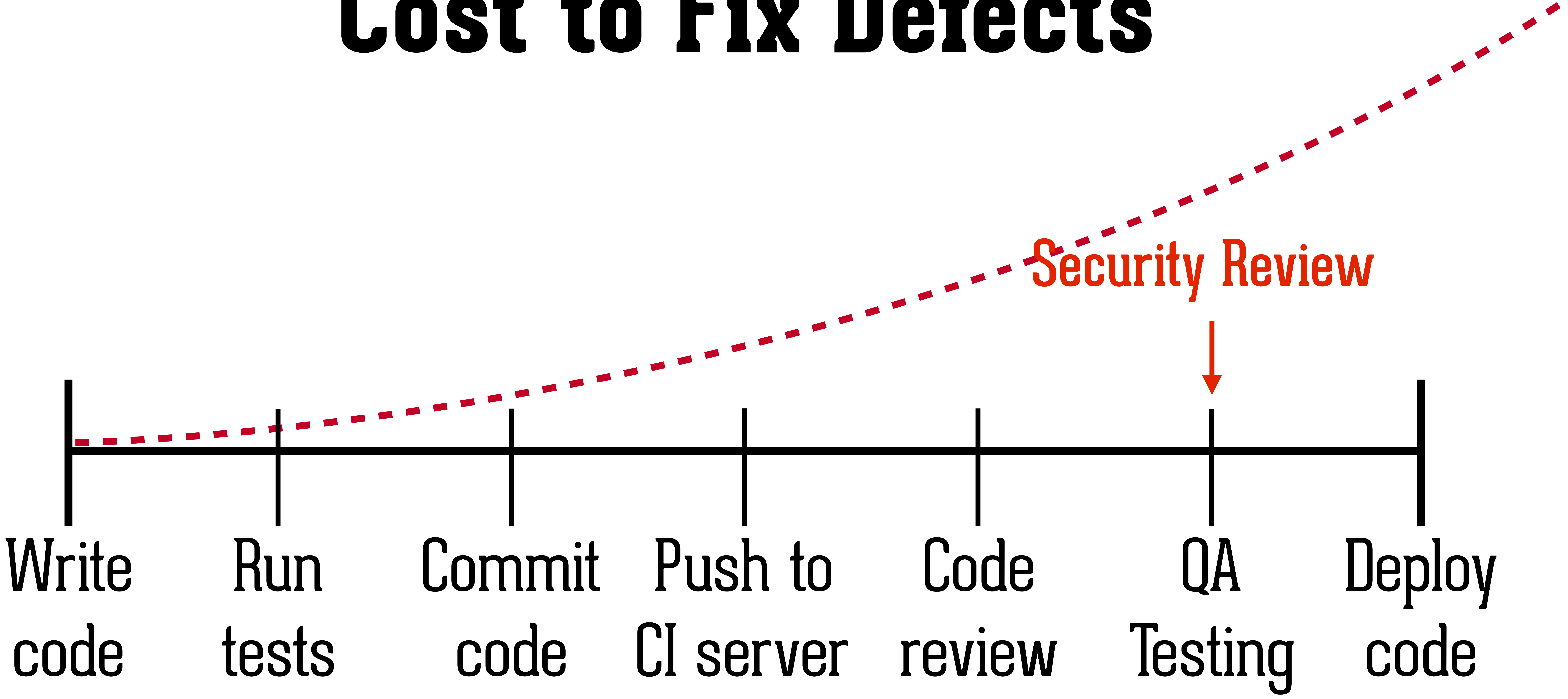

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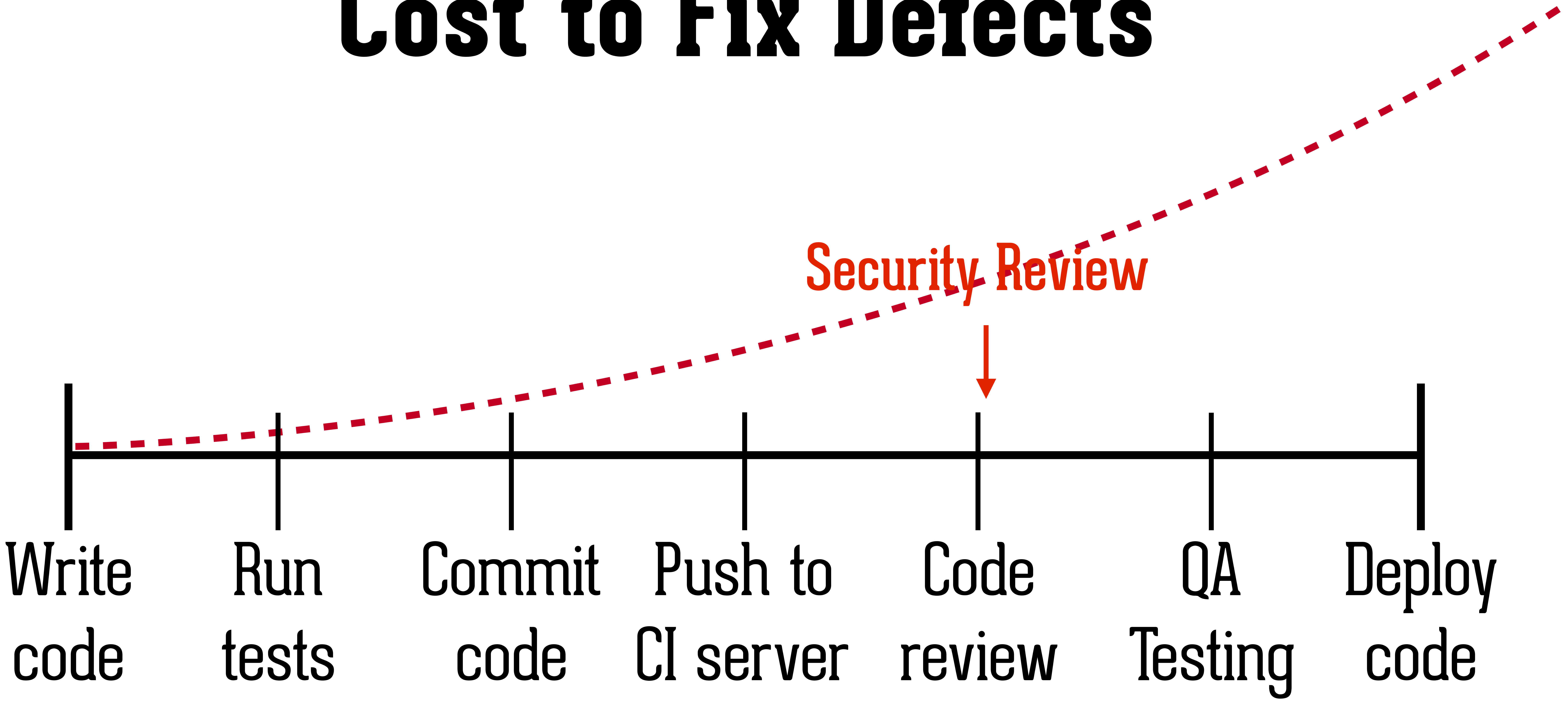

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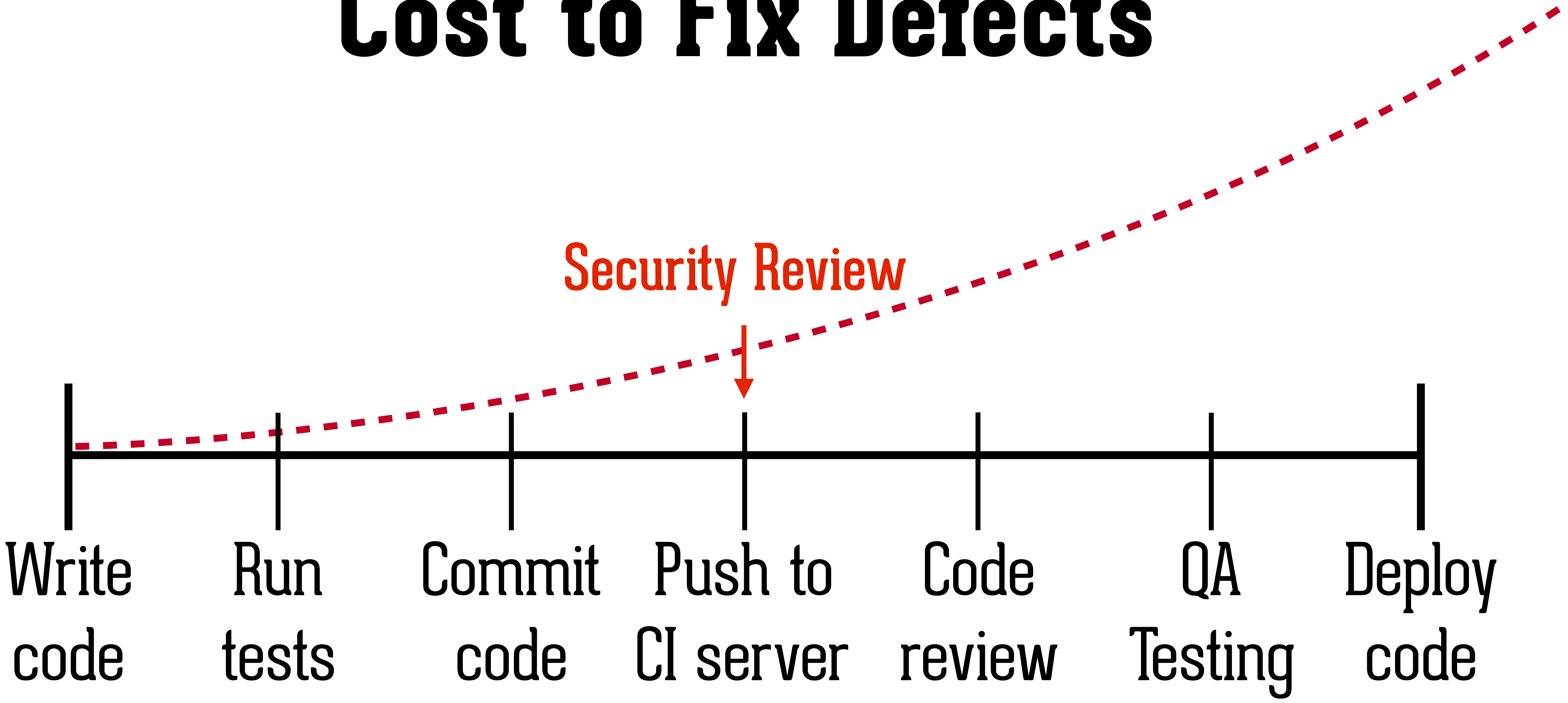

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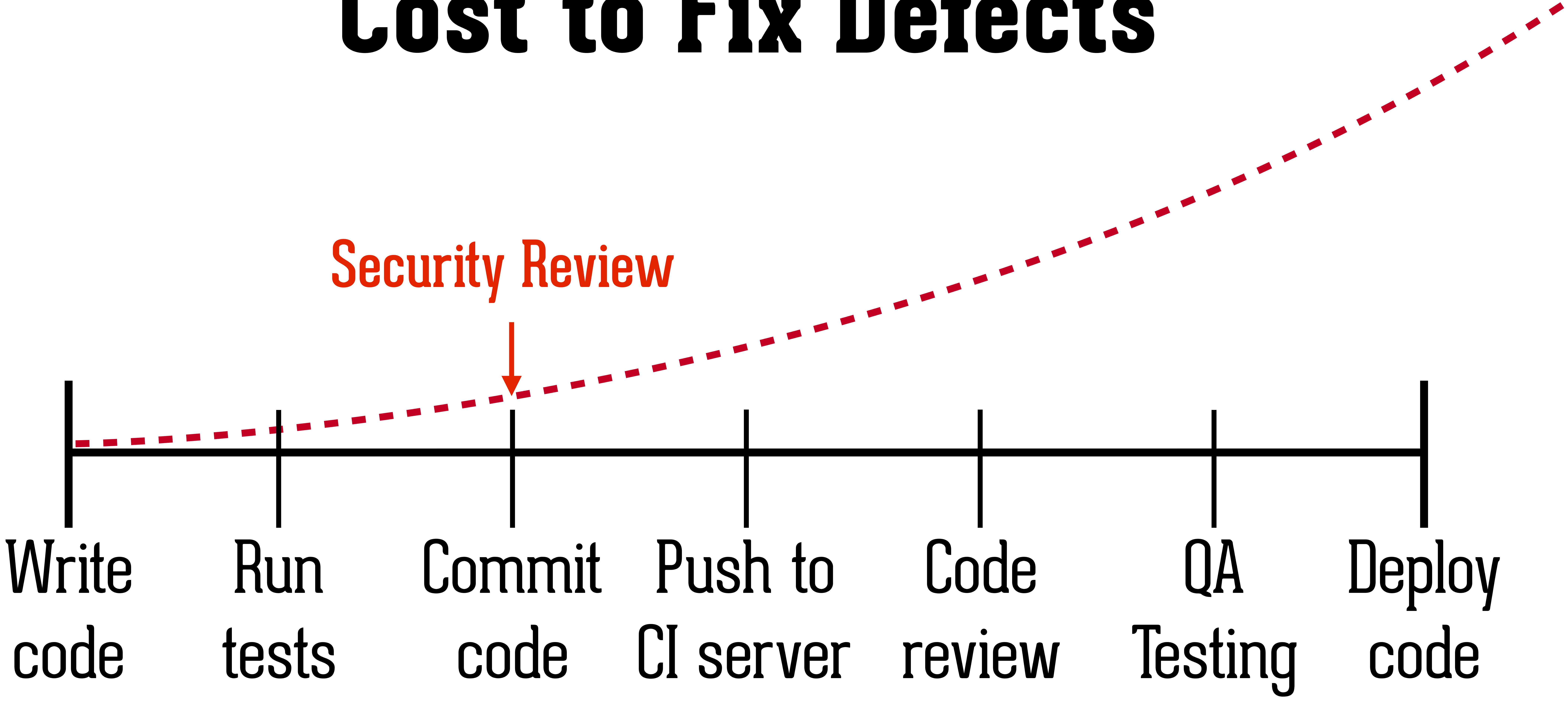

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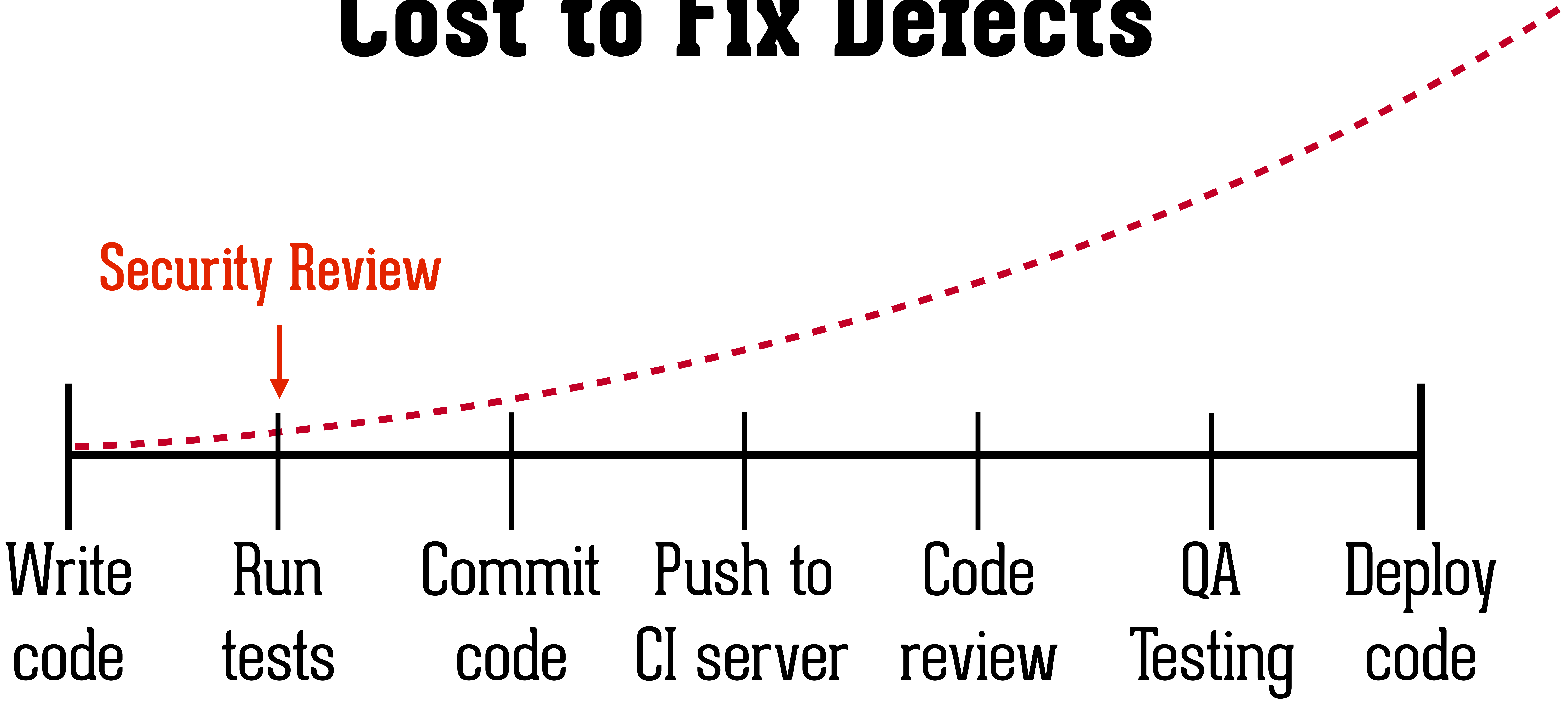

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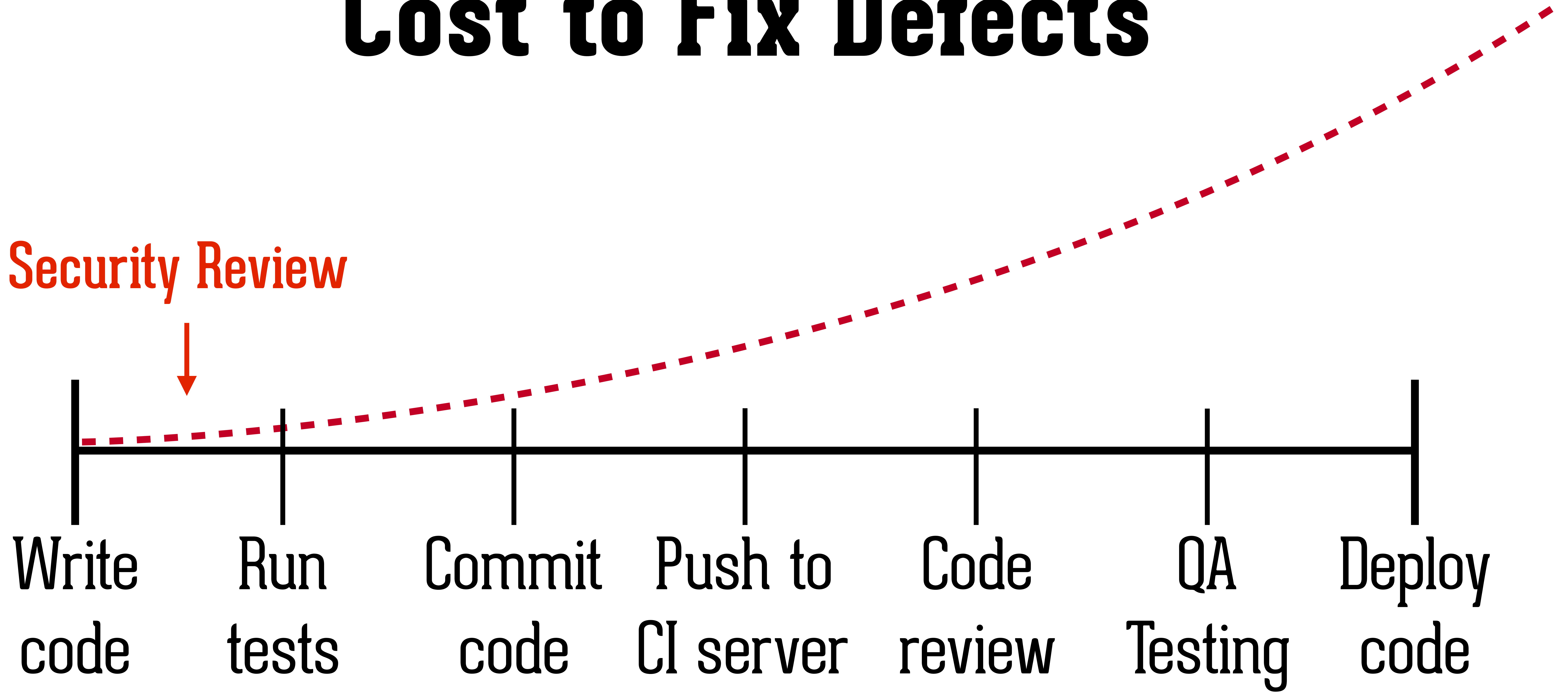

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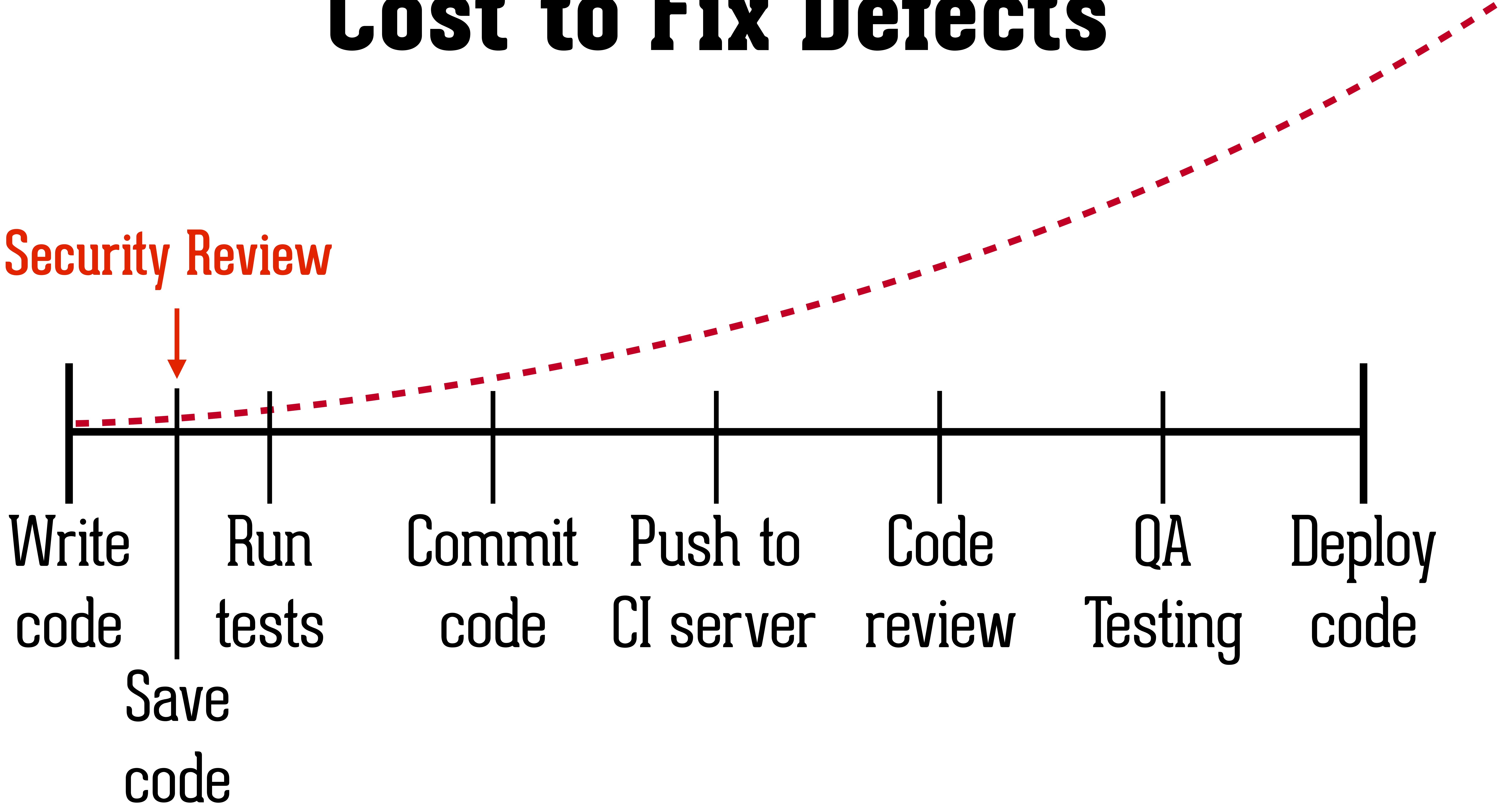


BRAKEMAN

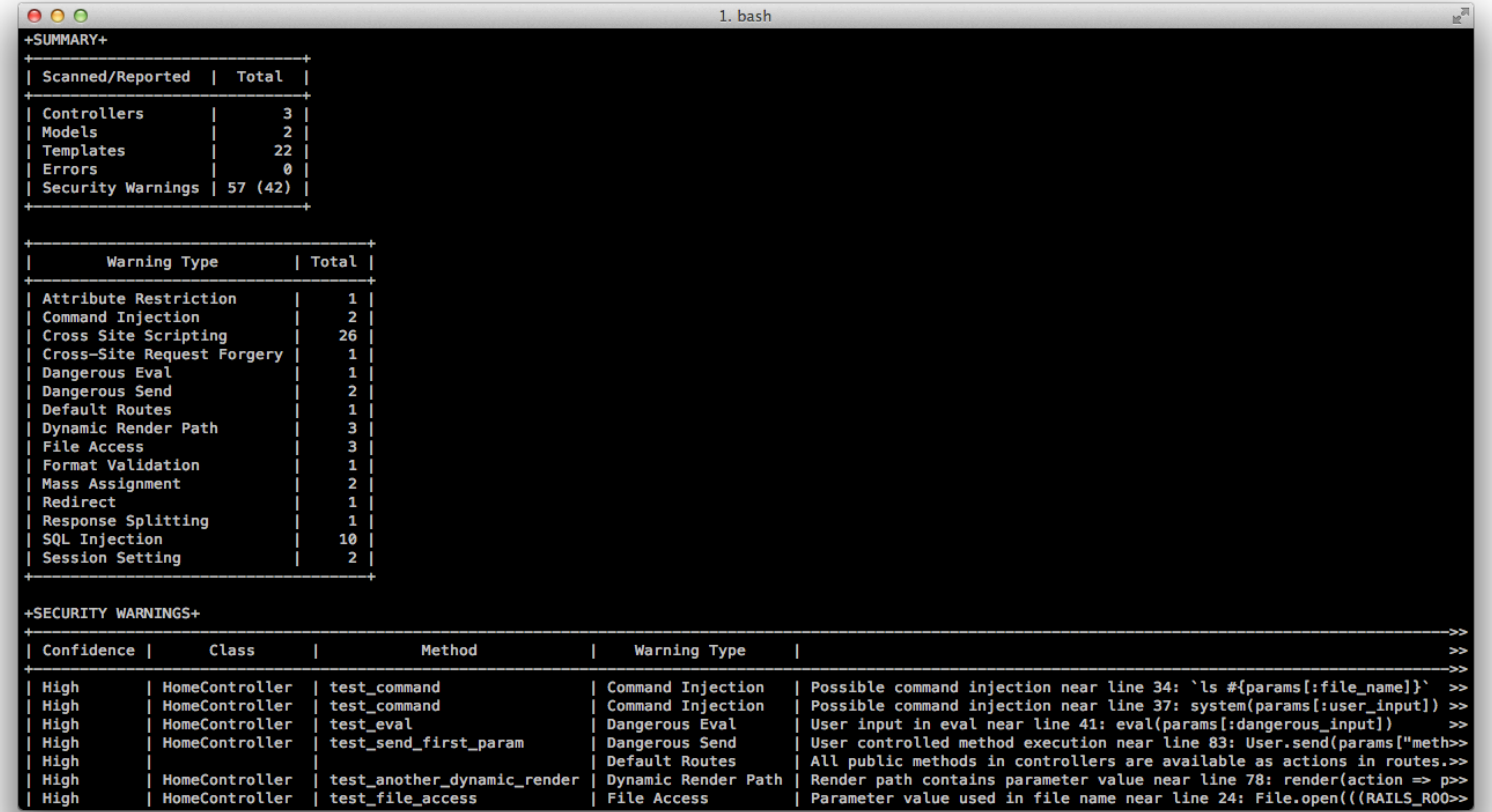
brakemanscanner.org

github.com/presidentbeef/brakeman

@brakeman

“zero configuration” security scanning

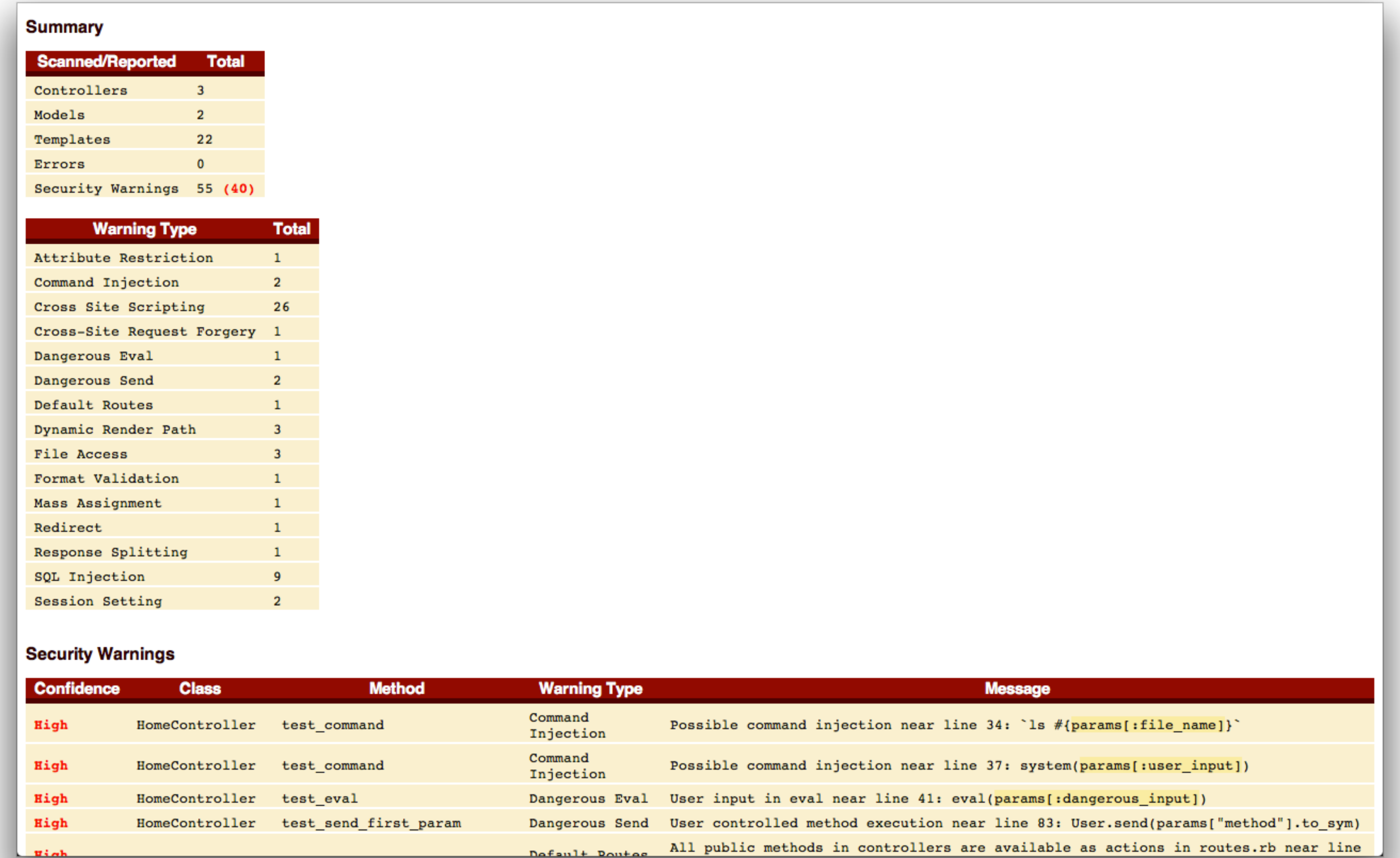
```
gem install brakeman
cd my_rails_app/
brakeman
```



```
+SUMMARY+
+----------------------------+
| Scanned/Reported  |  Total  |
+----------------------------+
| Controllers       |       3 |
| Models            |       2 |
| Templates         |      22 |
| Errors            |       0 |
| Security Warnings | 57 (42) |
+----------------------------+

+-------------------------------------+
|        Warning Type         | Total |
+-------------------------------------+
| Attribute Restriction       |     1 |
| Command Injection           |     2 |
| Cross Site Scripting        |    26 |
| Cross-Site Request Forgery  |     1 |
| Dangerous Eval              |     1 |
| Dangerous Send              |     2 |
| Default Routes              |     1 |
| Dynamic Render Path         |     3 |
| File Access                 |     3 |
| Format Validation           |     1 |
| Mass Assignment             |     2 |
| Redirect                    |     1 |
| Response Splitting          |     1 |
| SQL Injection               |    10 |
| Session Setting             |     2 |
+-------------------------------------+

+SECURITY WARNINGS+
+---------------------------------------------------------------------------------------------------------------------------------------------------------------->>
| Confidence |       Class      |            Method            |     Warning Type      |                                                                      >>
+---------------------------------------------------------------------------------------------------------------------------------------------------------------->>
| High       | HomeController   | test_command                 | Command Injection     | Possible command injection near line 34: `ls #{params[:file_name]}`  >>
| High       | HomeController   | test_command                 | Command Injection     | Possible command injection near line 37: system(params[:user_input]) >>
| High       | HomeController   | test_eval                    | Dangerous Eval        | User input in eval near line 41: eval(params[:dangerous_input])      >>
| High       | HomeController   | test_send_first_param        | Dangerous Send        | User controlled method execution near line 83: User.send(params["meth>>
| High       |                  |                              | Default Routes        | All public methods in controllers are available as actions in routes.>>
| High       | HomeController   | test_another_dynamic_render  | Dynamic Render Path   | Render path contains parameter value near line 78: render(action => p>>
| High       | HomeController   | test_file_access             | File Access           | Parameter value used in file name near line 24: File.open(((RAILS_ROO>>
gem install brakeman
cd my_rails_app/
brakeman -o report.html
```



Summary

Scanned/Reported	Total
Controllers	3
Models	2
Templates	22
Errors	0
Security Warnings	55 (40)

Warning Type	Total
Attribute Restriction	1
Command Injection	2
Cross Site Scripting	26
Cross-Site Request Forgery	1
Dangerous Eval	1
Dangerous Send	2
Default Routes	1
Dynamic Render Path	3
File Access	3
Format Validation	1
Mass Assignment	1
Redirect	1
Response Splitting	1
SQL Injection	9
Session Setting	2

Security Warnings

Confidence	Class	Method	Warning Type	Message
High	HomeController	test_command	Command Injection	Possible command injection near line 34: `ls #{params[:file_name]}`
High	HomeController	test_command	Command Injection	Possible command injection near line 37: system(params[:user_input])
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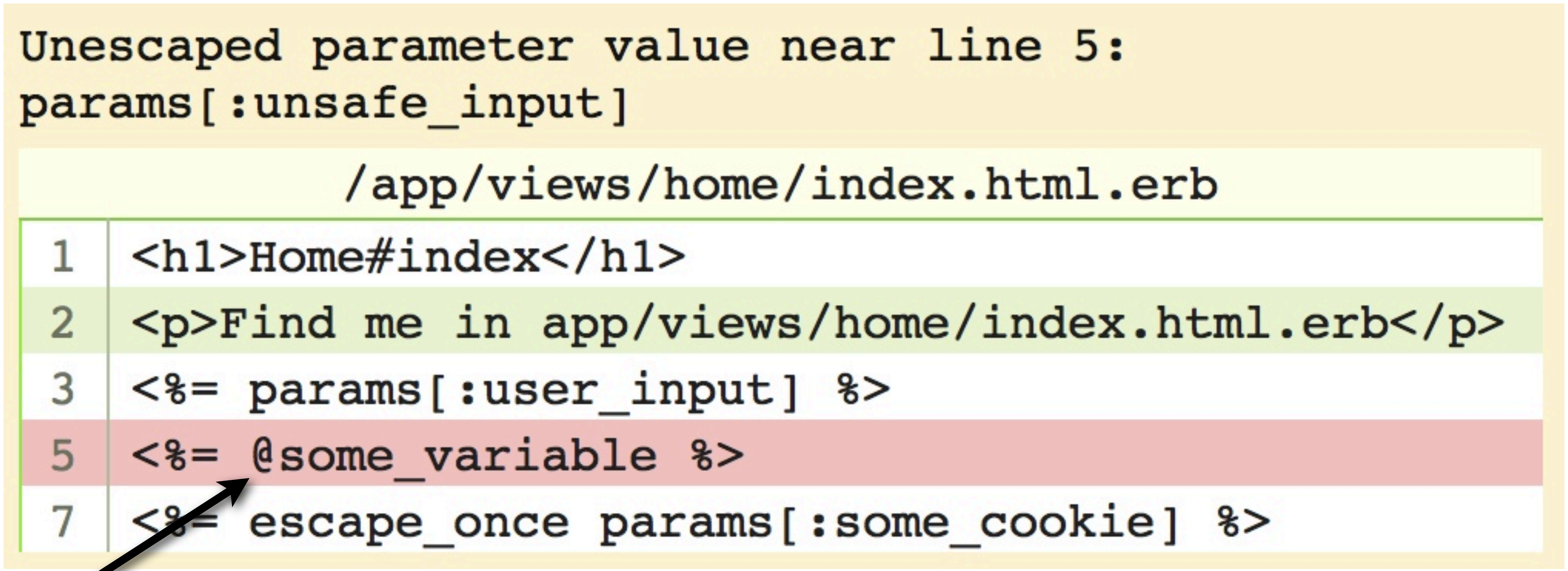
High	HomeController	test_send_first_param	Dangerous Send	User controlled method execution near line 83: User.send(params["method"].to_sym)
High			Default Routes	All public methods in controllers are available as actions in routes.rb near line

"Confidence"
View
Warning Type
Render Location
Line Number
Code Snippet

High	home/index (HomeController#test_render)	Cross Site Scripting	Unescaped parameter value near line 5: params[:unsafe_input]



```
Unescaped parameter value near line 5:
params[:unsafe_input]
```

```
/app/views/home/index.html.erb

1  <h1>Home#index</h1>
2  <p>Find me in app/views/home/index.html.erb</p>
3  <%= params[:user_input] %>
5  <%= @some_variable %>
7  <%= escape_once params[:some_cookie] %>
```

Line 5

Static Analysis Detour

Static Analysis

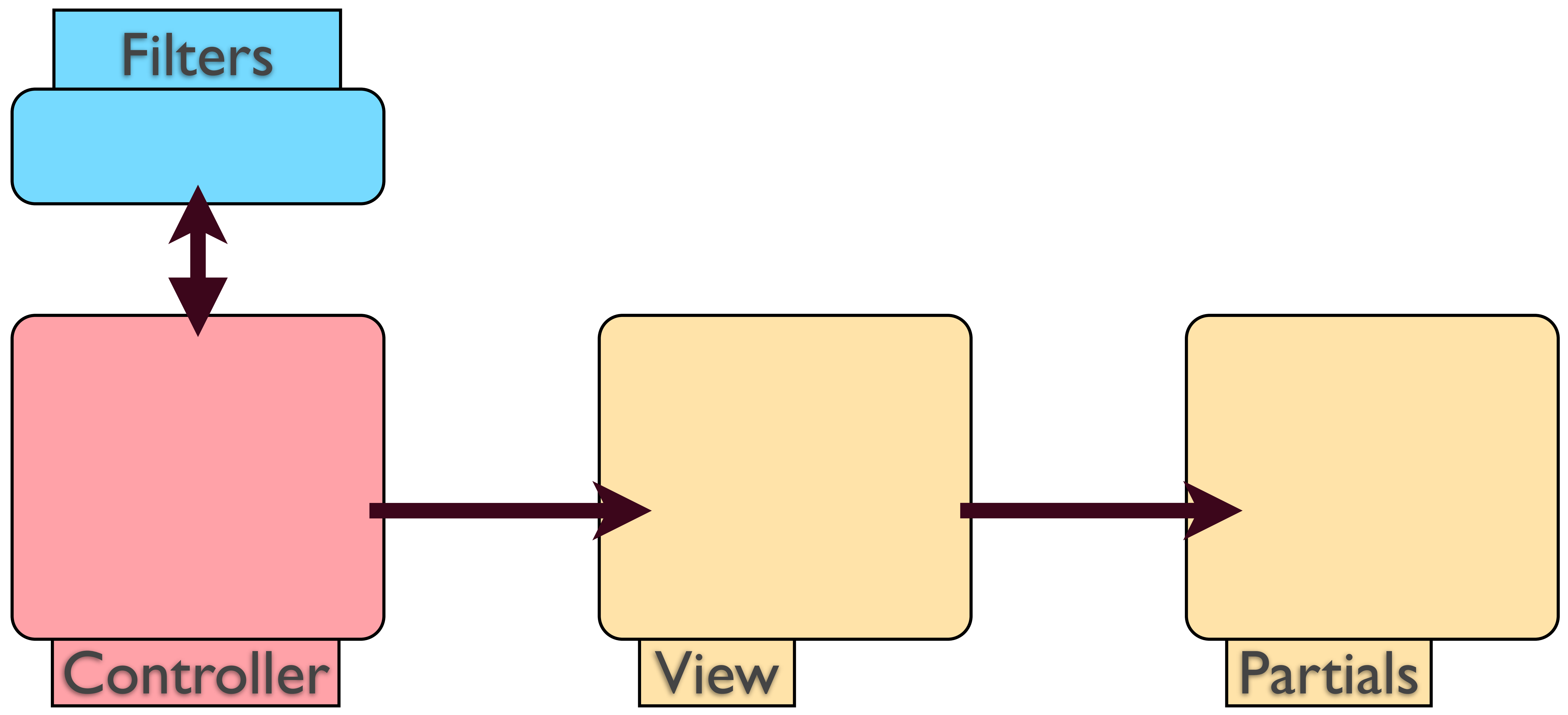
Anything that can be determined about a program without actually executing it

“But Ruby is way too dynamic for that!”

```
eval(File.read(gets.strip))
```

We don’t have to know everything

Most of the Action Happens Here



Start Simple:
User Input in Views

```
<%= params[:user][:name] %>
```

View

Next: From Controllers to Views

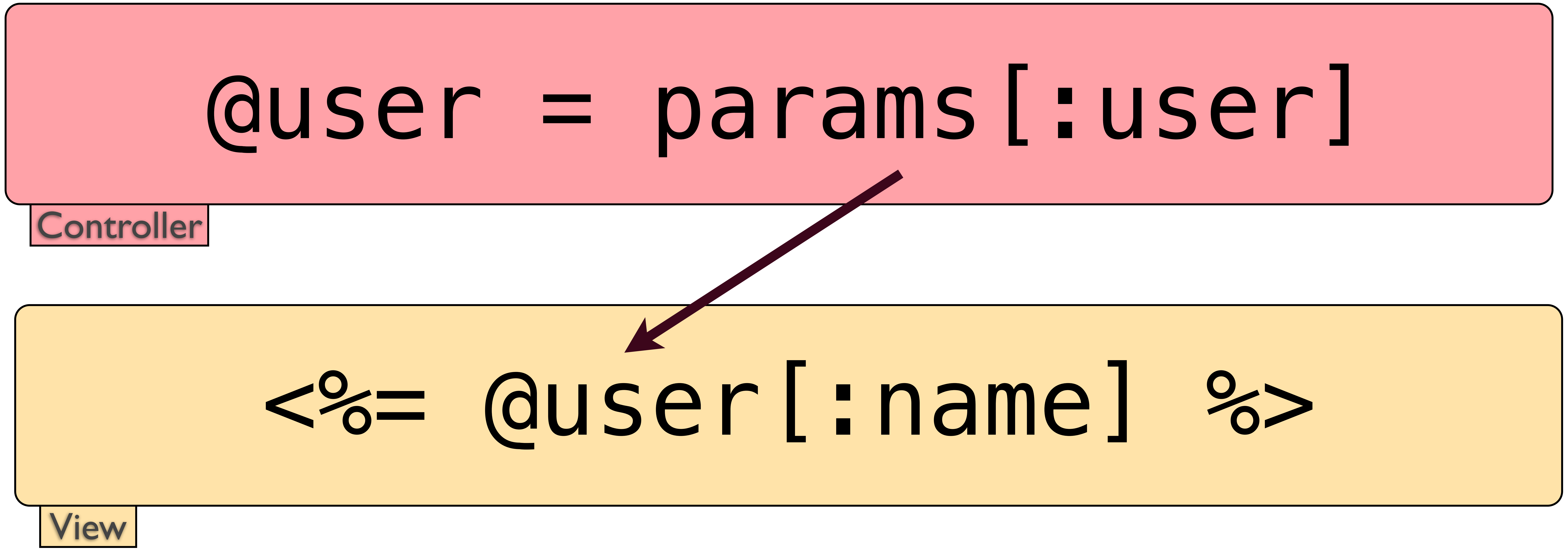
```ruby
@user = params[:user]
```

Controller

```erb
<%= @user[:name] %>
```

View

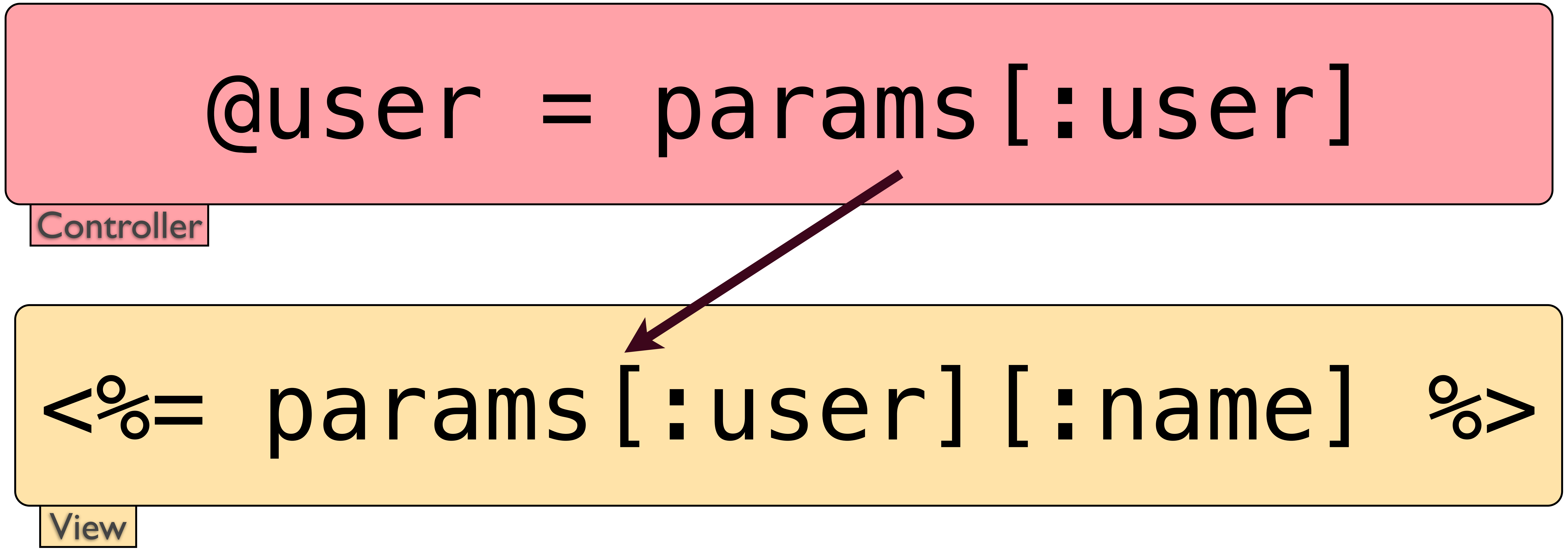
Next: From Controllers to Views



```
@user = params[:user]
```

```
<%= @user[:name] %>
```

Next: From Controllers to Views



```
@user = params[:user]
```

```
<%= params[:user][:name] %>
```

Really Simple Data Flow

```
user = params[:user]
user_id = user[:id]
@current_user = User.find(user_id)
@current_user.update_attributes(user)
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```

$\uparrow$

Mass

Assignment

Brakeman Can Detect...

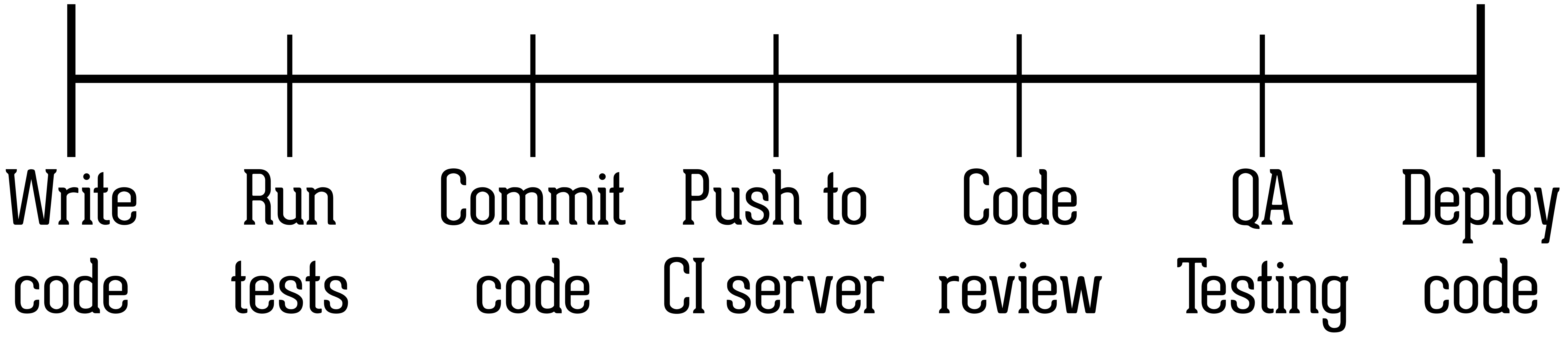
- Cross site scripting
- SQL injection
- Command injection
- Unrestricted mass assignment
- Unprotected redirects
- Unsafe file access
- Insufficient model validation
- Version-specific security issues
- Dangerous use of eval
- Dangerous use of send
- Default routes
- Dynamic render paths
- ...and more!

Performance

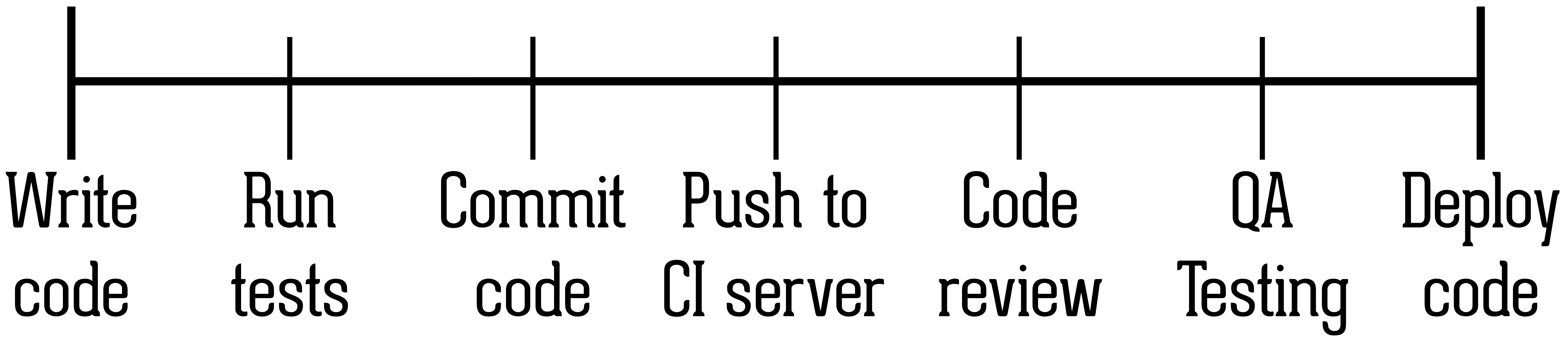
Twitter Main App	< 2m
nventory [66c, 58m, 688t]	~1m
Redmine [50c, 77m, 256t]	~20s
Typo [34c, 47m, 113t]	~5s

Brakeman 1.6.0, Ruby 1.9.3-p125

Back to SDLC


Write code
Run tests
Commit code
Push to CI server
Code review
QA Testing
Deploy code

Run Brakeman Anytime



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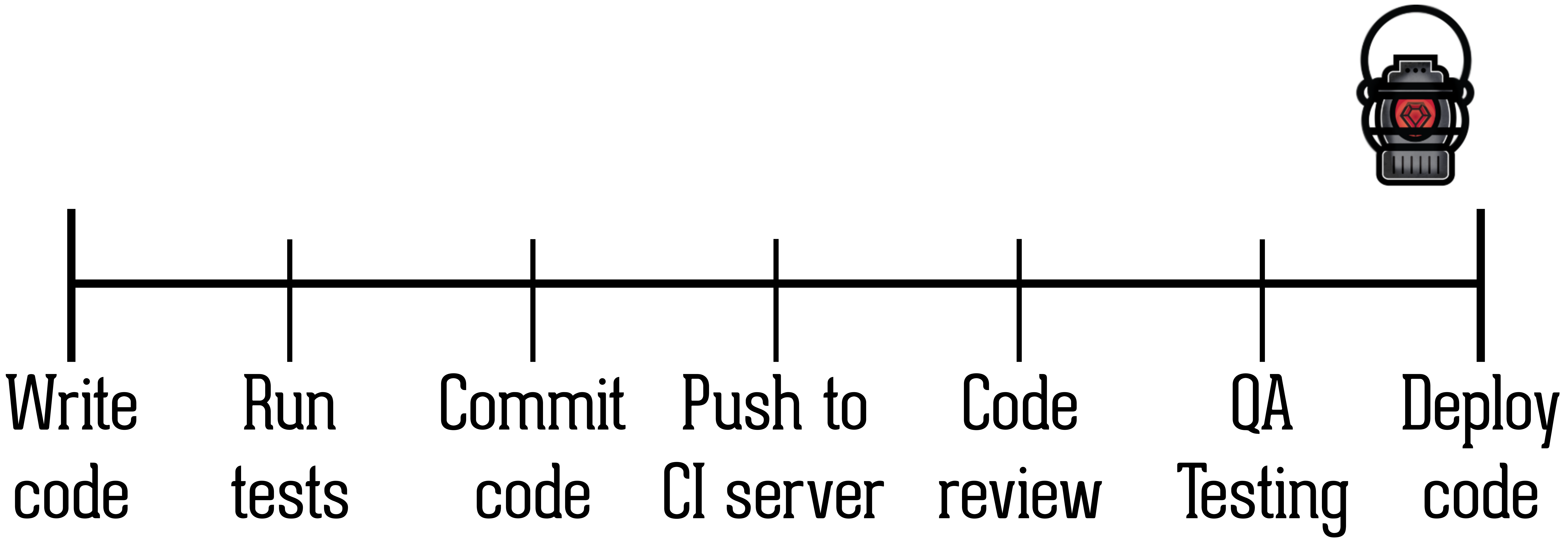

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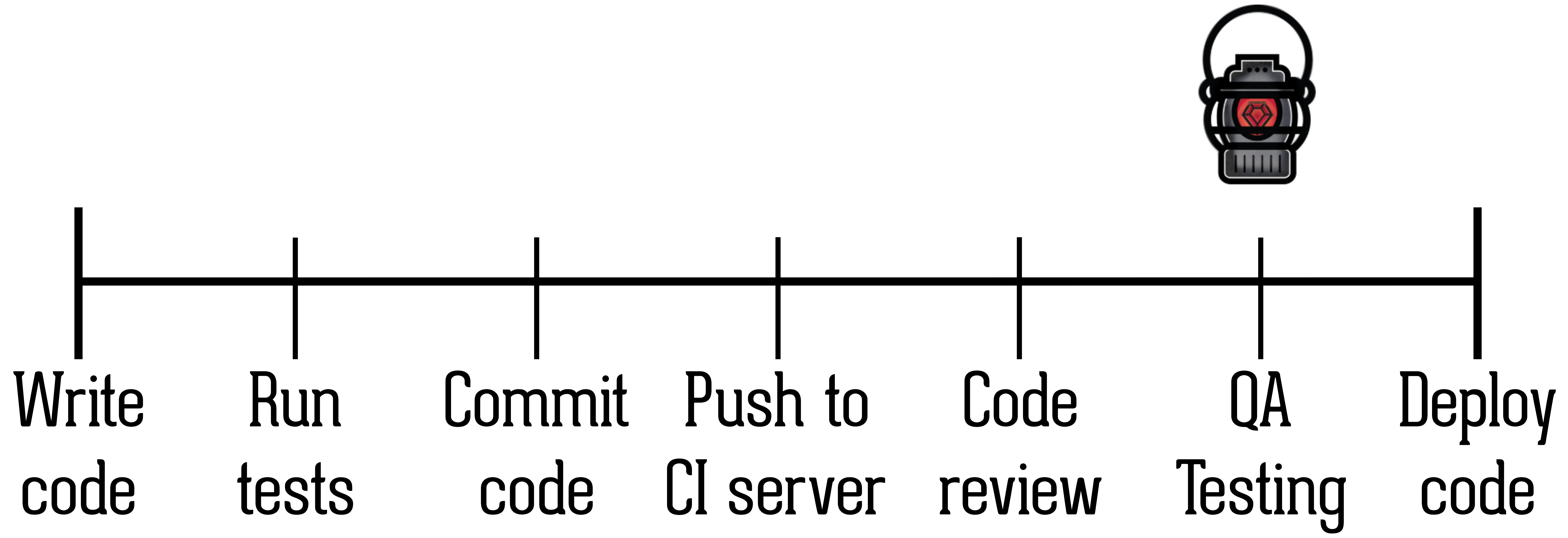

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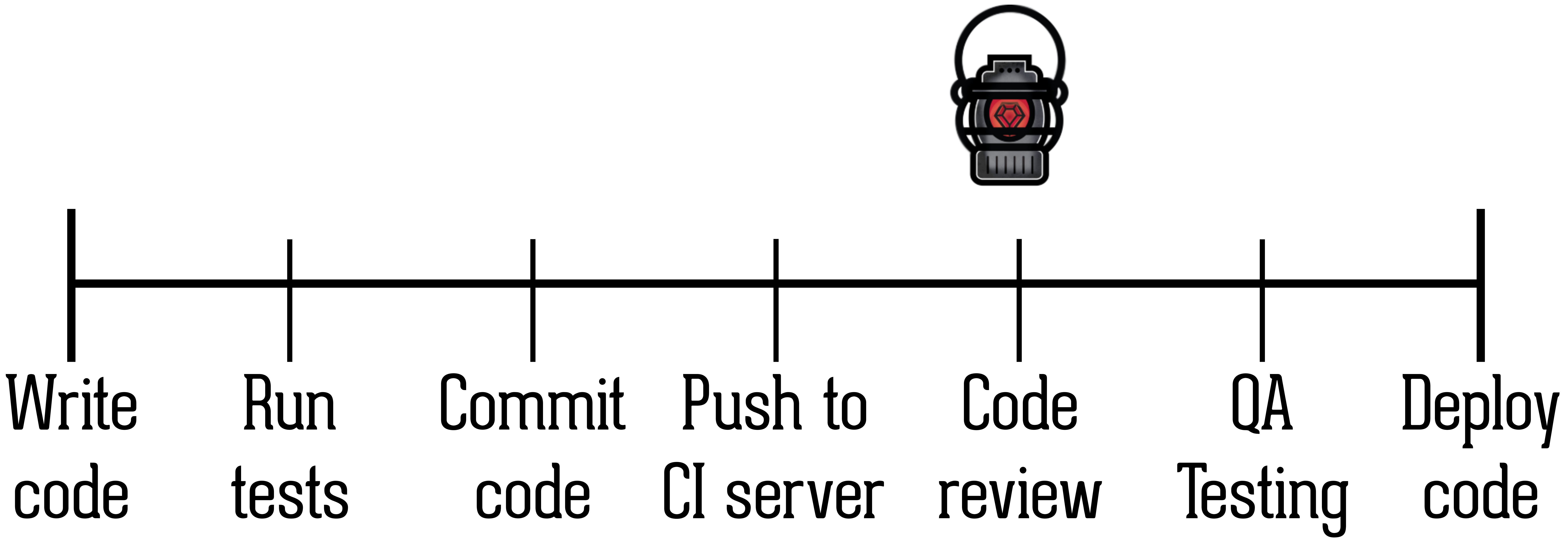

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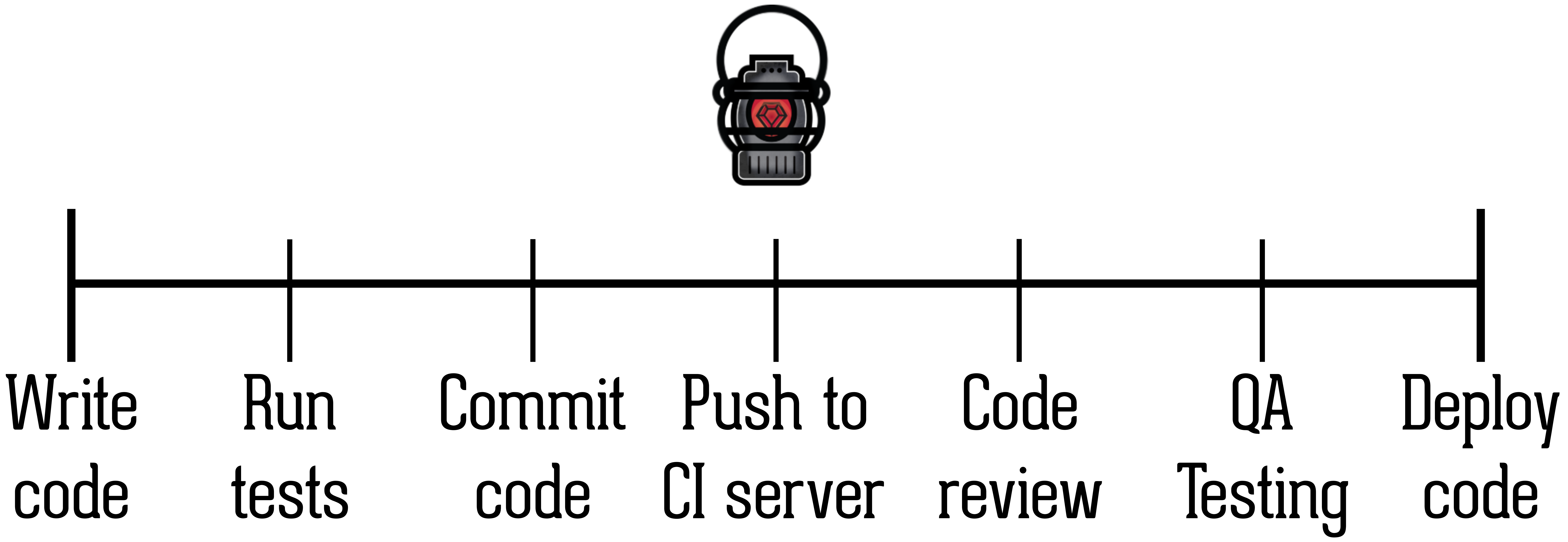
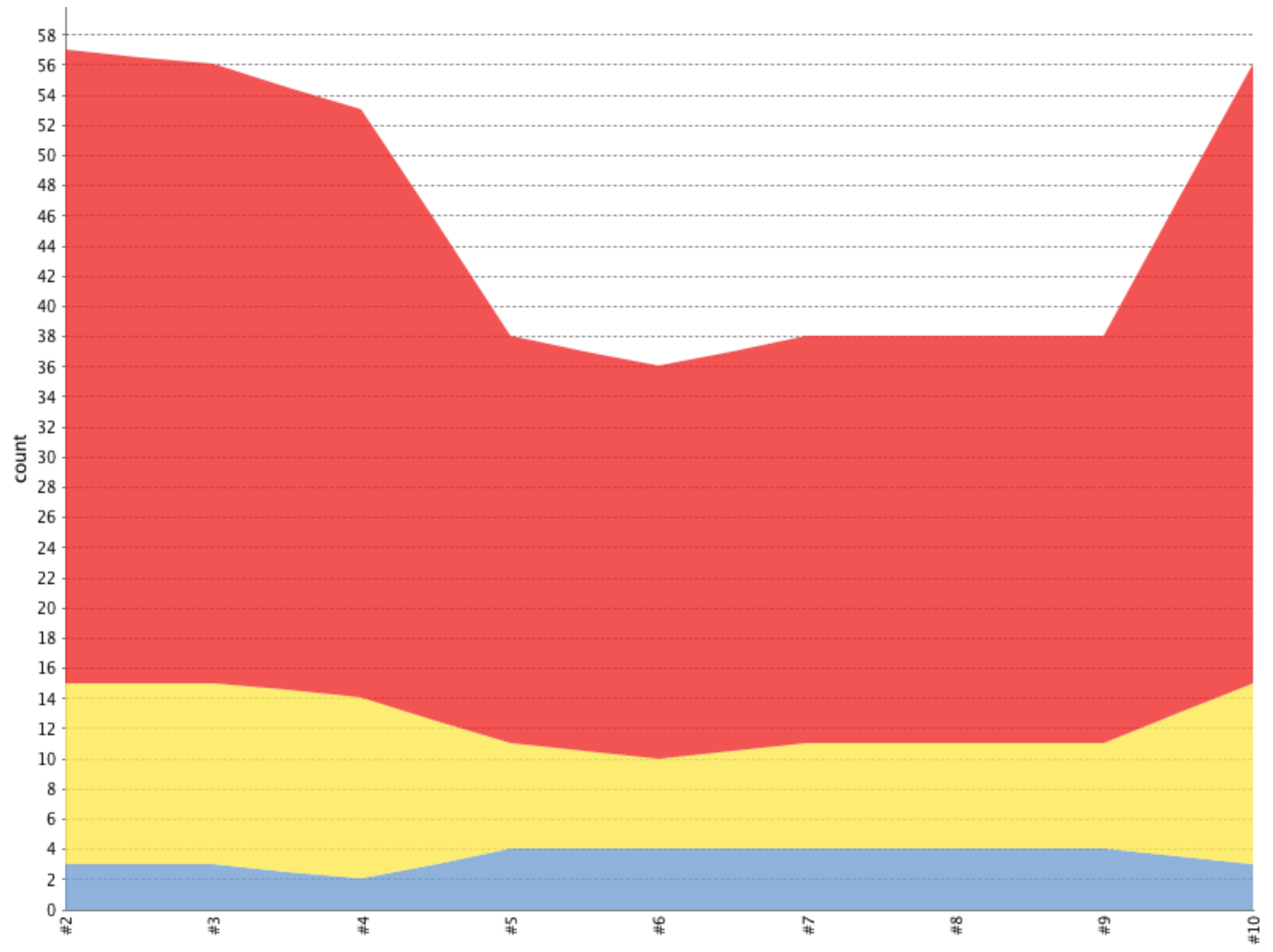


Brakeman + Jenkins

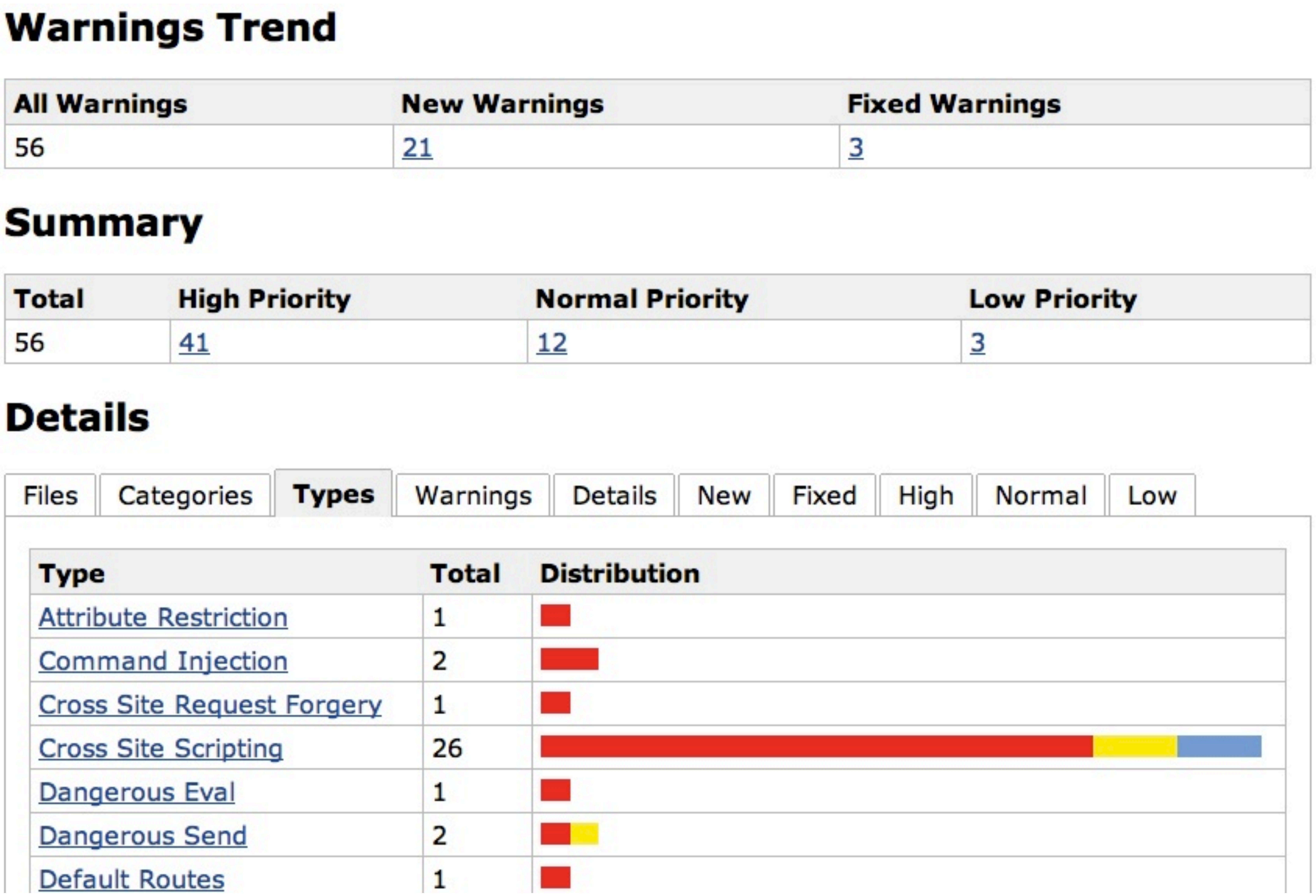
jenkins-ci.org

open source CI server

Brakeman + Jenkins



Brakeman + Jenkins



Warnings Trend

All Warnings	New Warnings	Fixed Warnings
56	21	3

Summary

Total	High Priority	Normal Priority	Low Priority
56	41	12	3

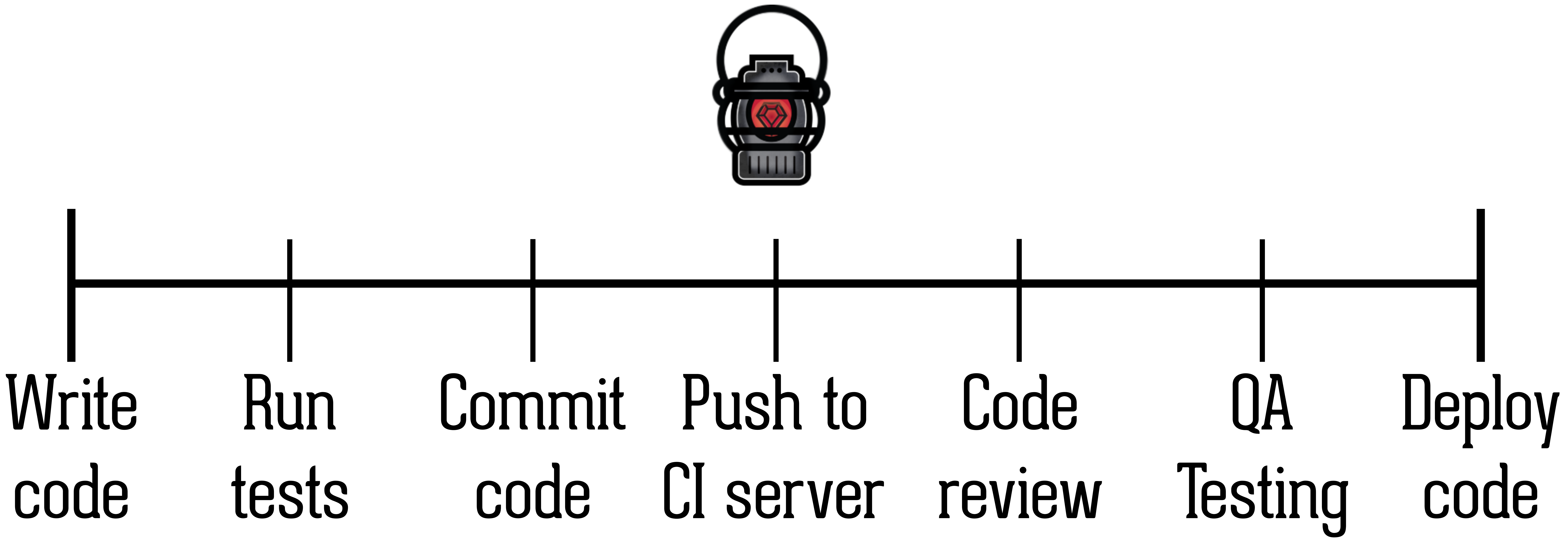
Details

Type	Total	Distribution
Attribute Restriction	1	🟥
Command Injection	2	🟥
Cross Site Request Forgery	1	🟥
Cross Site Scripting	26	🟥🟨🟦
Dangerous Eval	1	🟥
Dangerous Send	2	🟥🟨
Default Routes	1	🟥

Brakeman Programatically

```
require “brakeman”
Brakeman.run “myapp”
```

Run Brakeman Anytime



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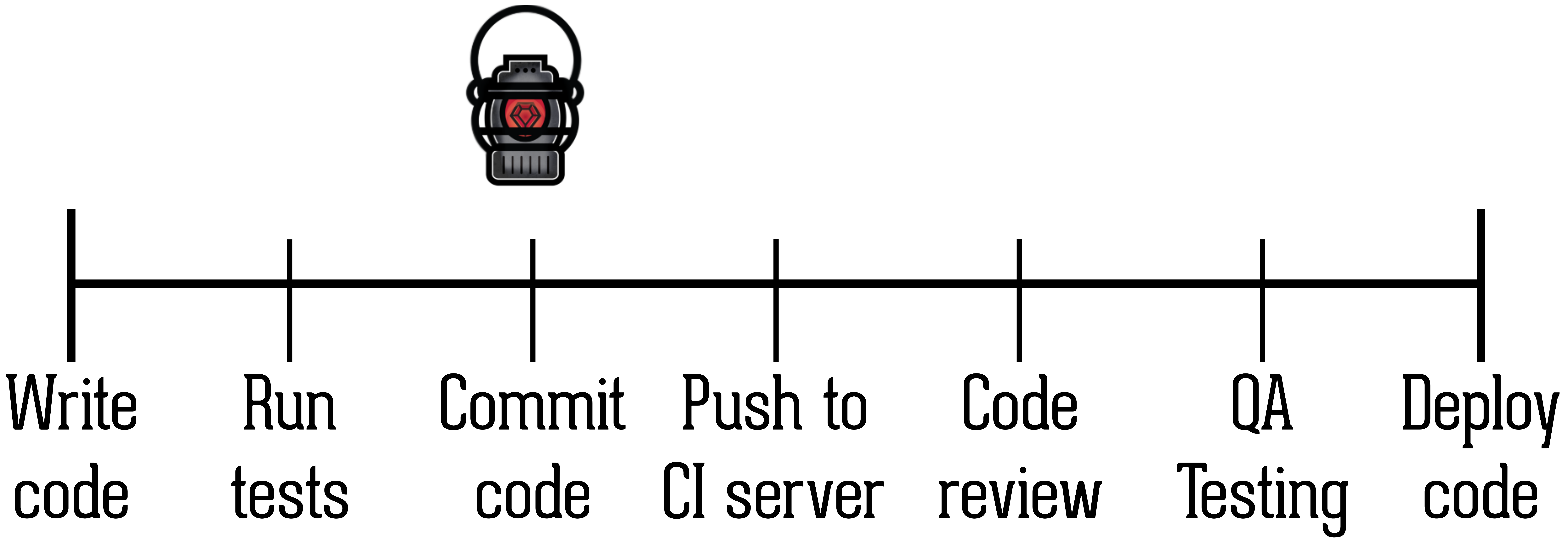
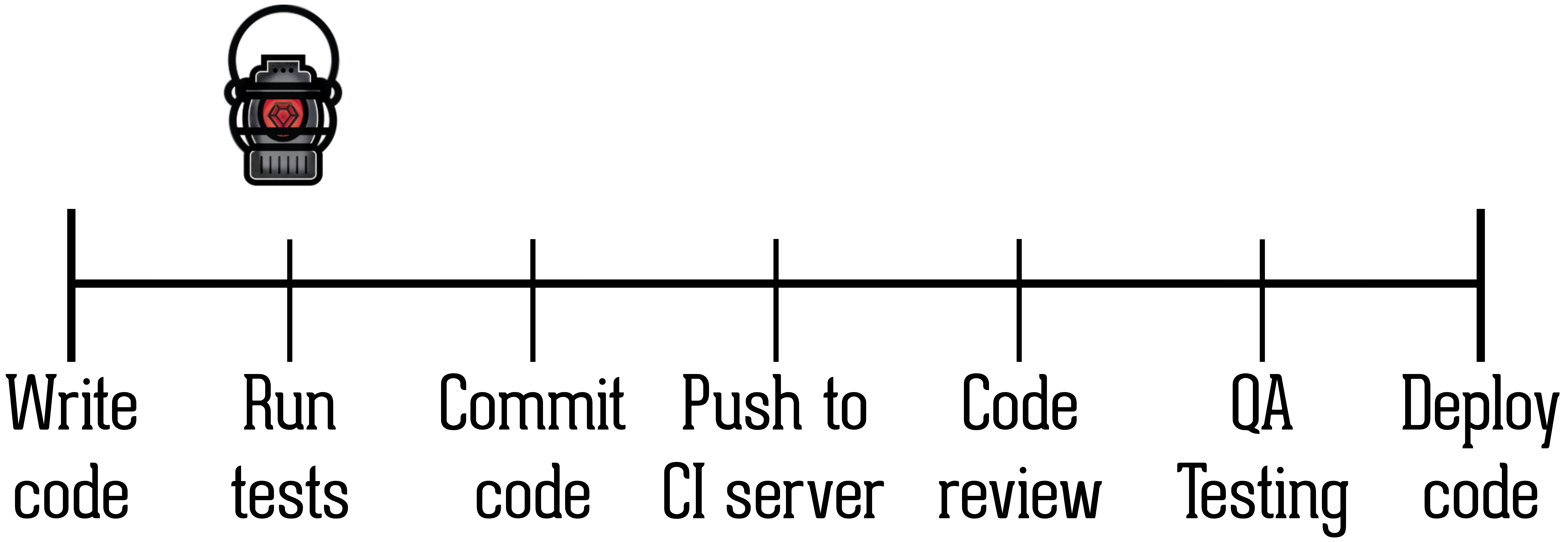


Run Brakeman Anytime



Brakeman + Rake

```
brakeman --rake
rake brakeman:run
```

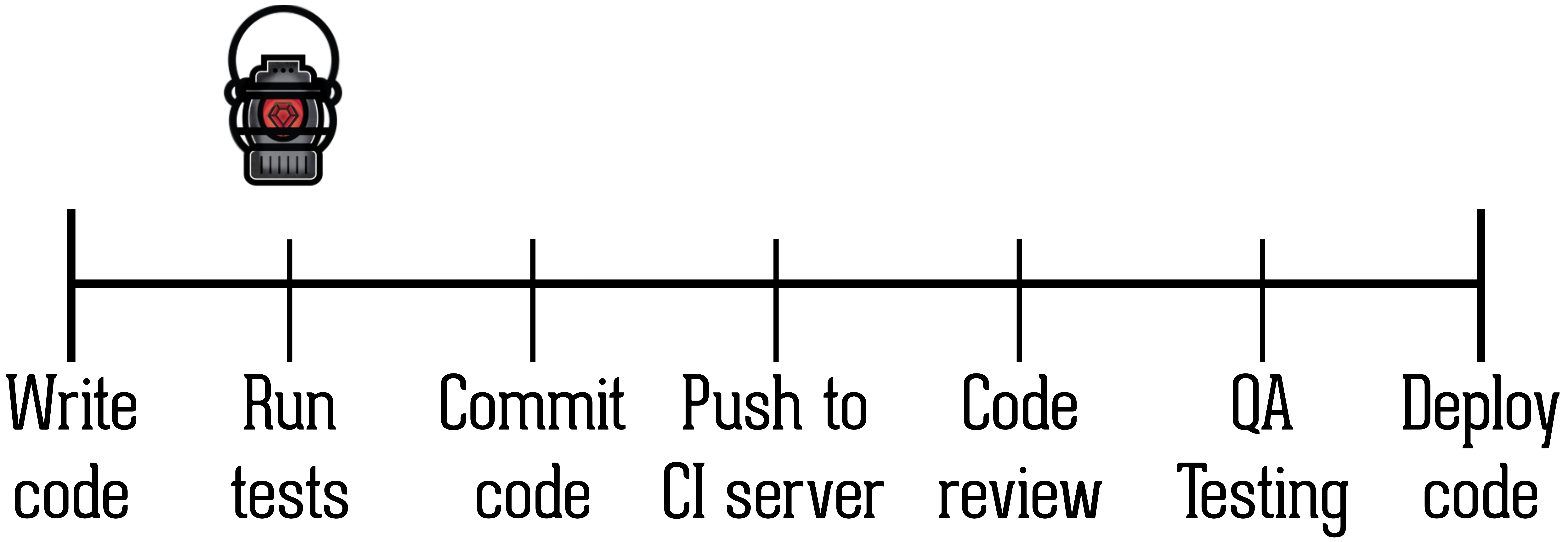
Hardcore Mode

```
brakeman -z
```

Comparing Brakeman Results

```
brakeman -o report.json
brakeman --compare report.json
```

Brakeman...All the Time?



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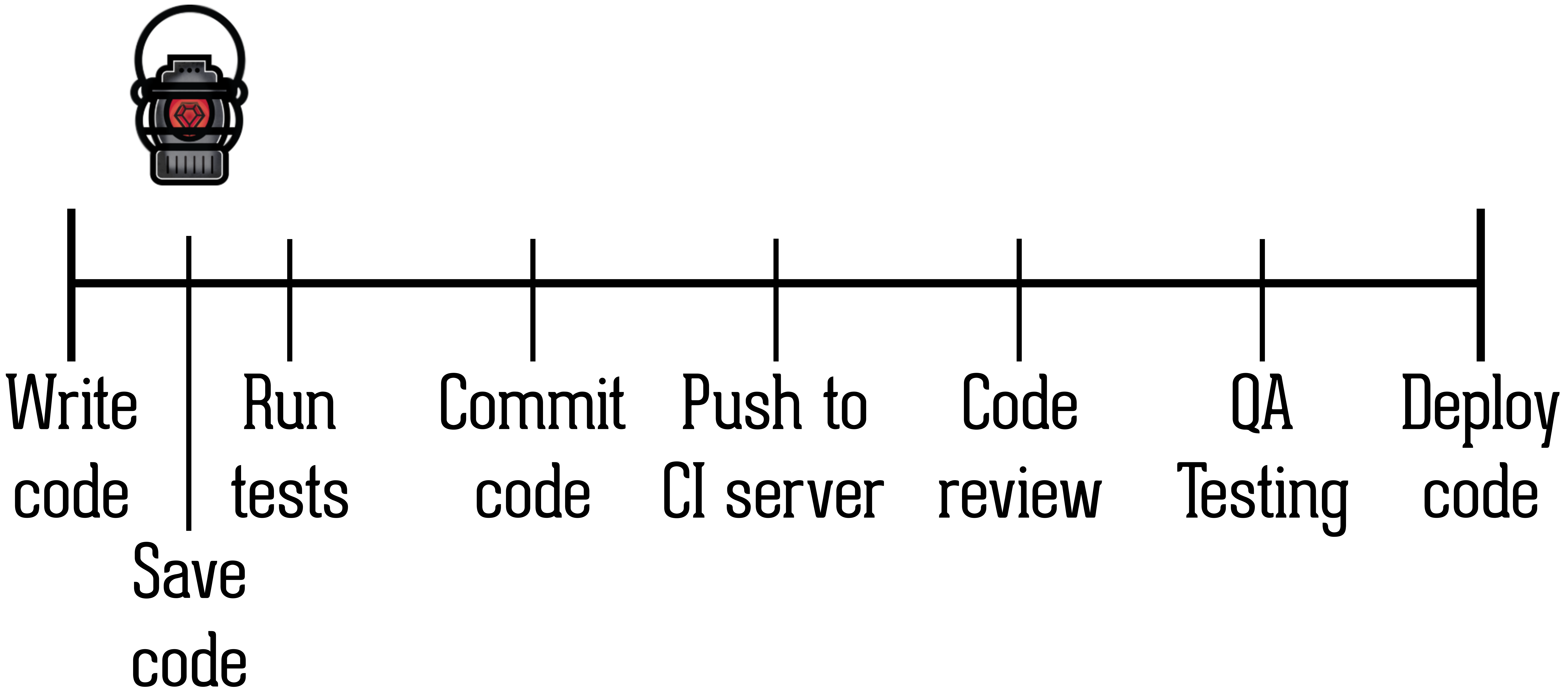

Fast Rescanning

Brakeman supports fast rescanning of changed files*

Fast Rescanning

*If scan is kept in memory

Brakeman + Guard

```
group :development do
  gem 'guard-brakeman'
end
```

Brakeman + Guard

```
guard init brakeman
guard
```

Brakeman + Guard Demo

http://www.youtube.com/watch?v=CMgYcr9_0Ns

Caveats

warnings != vulnerabilities

zero warnings does not mean zero vulnerabilities

Brakeman is not omniscient

Supports

- Rails 2.x & 3.x
- Ruby 1.8.7 & 1.9.x
- JRuby

brakemanscanner.org

github.com/presidentbeef/brakeman

@brakeman