



Byteman

Advanced Java Debugging & Testing



A Nate Hansberry Presentation



Byteman Discussion Overview

Intro - What is
Byteman?

Use cases &
Demos

Conclusion &
Discussion



What is Byteman?

Intro

What is ByteMan?

ByteMan is a bytecode manipulation tool which makes it simple to change the operation of Java applications either at load time or while the application is running. It works without the need to rewrite or recompile the original program. In fact, ByteMan can even be used to modify Java code which forms part of the Java virtual machine, classes such as String, Thread etc.

<https://downloads.jboss.org/byteman/latest/byteman-programmers-guide.html>

How is Byteman helpful?

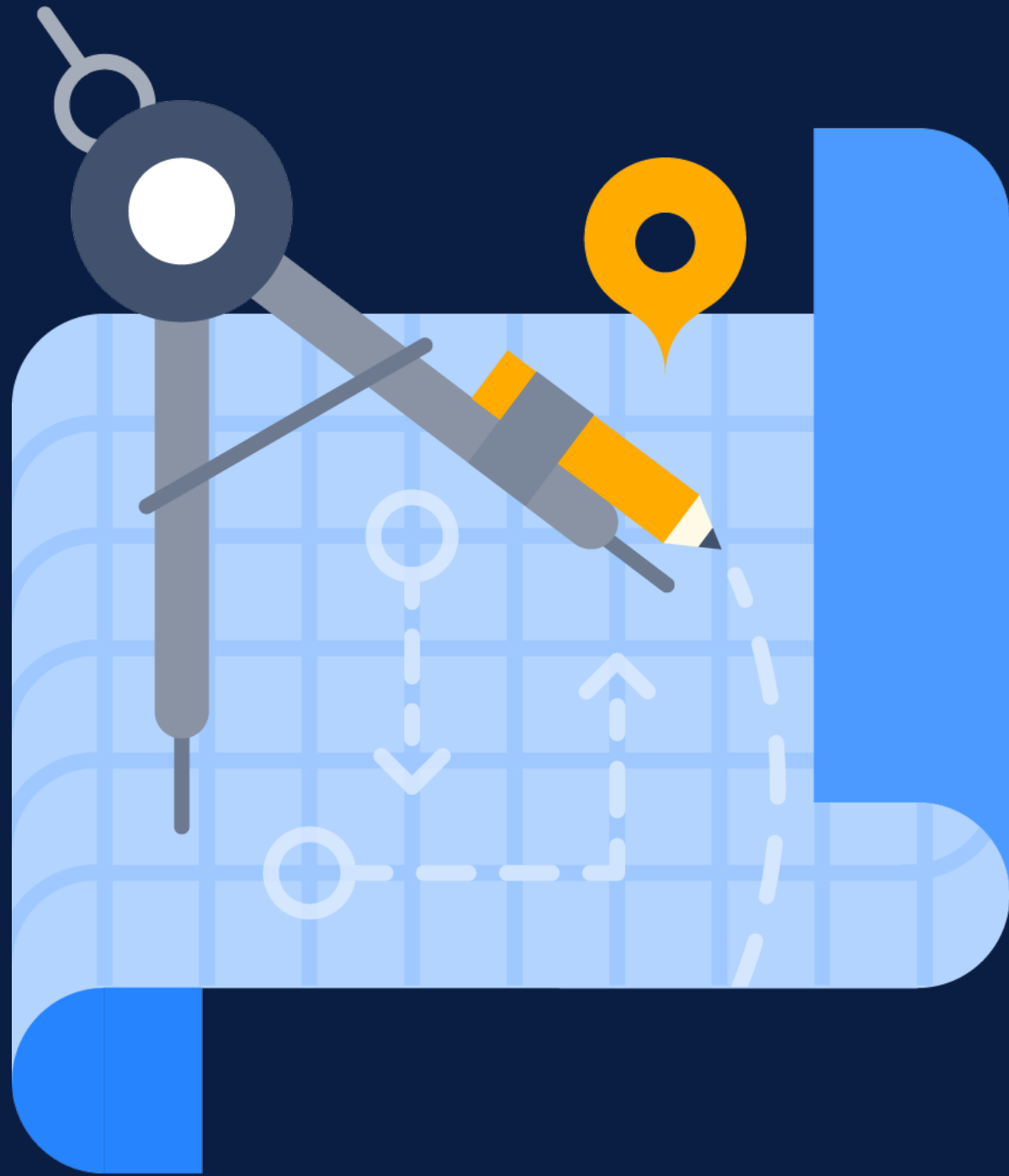


How is Byteman helpful?



Easily create custom logging for
products already released

How is Byteman helpful?



Easily create custom logging for products already released

Implement temporary fixes until patch is released



How is Byteman used?

Byteman uses a simple and easy-to-use Event Condition Action (ECA) rule language, based on Java.

The Byteman rule skeleton is:

RULE - arbitrary name for humans

CLASS - what is the fqcn for target class?

METHOD - what is the target method of target class?

AT - should we do something when we enter or exit the method?

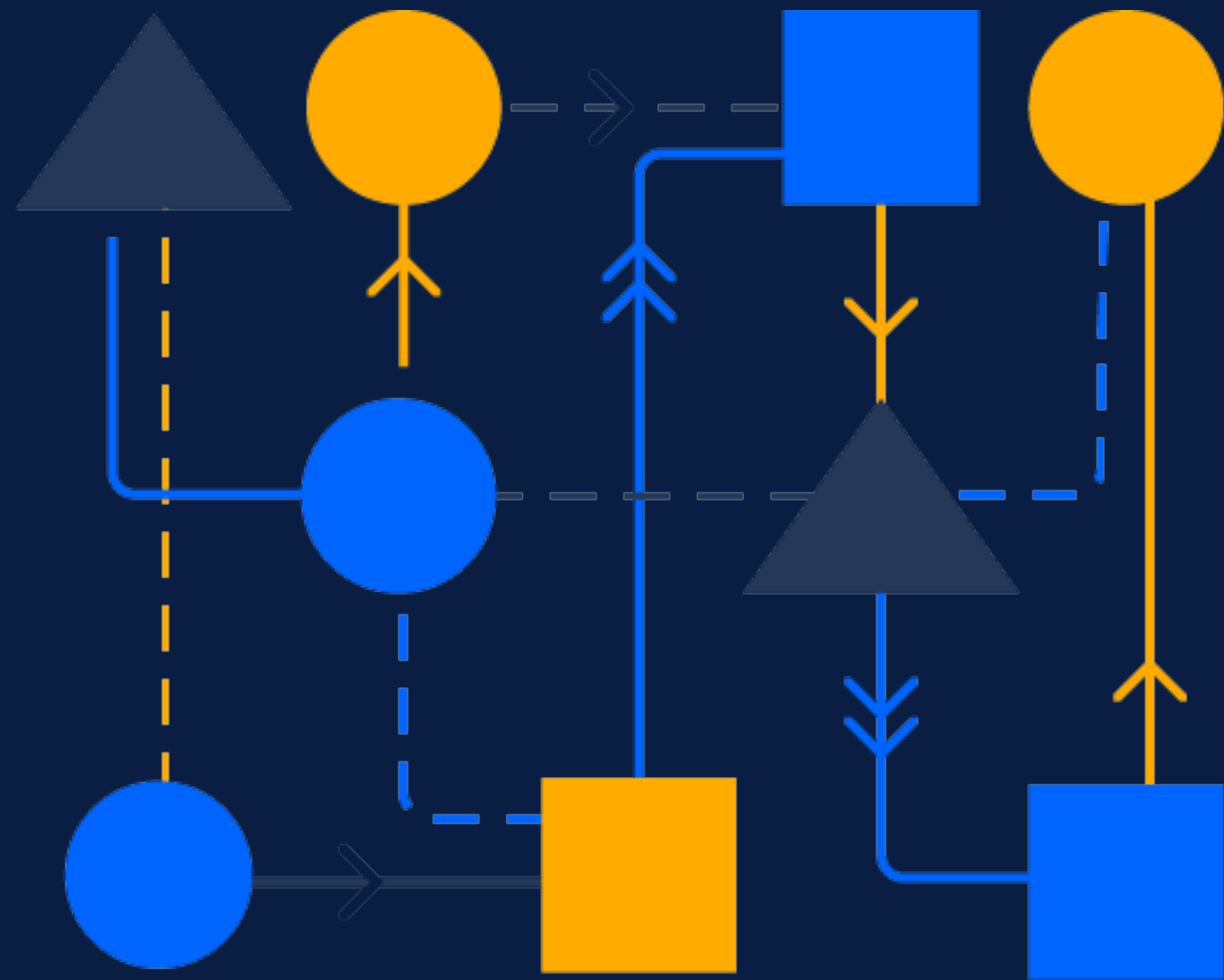
BIND - do we need variables?

IF - what condition are we waiting for?

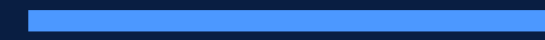
DO - how are we changing behaviour?

ENDRULE - end of rule so we can have multiple in one file





Use Case #1



Jira & Crucible
Application link

Applink
Issue

Customer

Jira Support

Crucible Support

Crucible DoS

Summary

Opens ticket with Jira Support

The issue describes a problem with the Jira UI. Specifically, when clicking on the review link in the dev panel, the view from Crucible does not load.

Applink
Issue

Customer

Jira Support

Fisheye Support

Fisheye DoS

Summary

Opens ticket with Jira Support

The issue describes a problem with the Jira UI. Specifically, when clicking on the review link in the dev panel, the view from Crucible does not load.

Responds to the ticket

After checking the Jira logs they do not see any issues so they send the ticket to Fisheye Support

Applink
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Responds to the ticket

After checking the Crucible logs they do not see any issues so they send the ticket to Crucible DoS

Applink Issue

Customer

Jira Support

Fisheye Support

Fisheye DoS

Summary

Opens ticket with Jira Support

The issue describes a problem with the Jira UI. Specifically, when clicking on the review link in the dev panel, the view from Crucible does not load.

Responds to the ticket

After checking the Jira logs they do not see any issues so they send the ticket to Fisheye Support

Responds to the ticket

After checking the Crucible logs they do not see any issues so they send the ticket to Crucible DoS

Responds to the escalation

And decides to use byteman

Applinks Order of Events

User clicks
review link in
Jira UI



Applinks Order of Events

User clicks
review link in
Jira UI



Jira sends
request to
Crucible for
review data



Applinks Order of Events

User clicks
review link in
Jira UI

Jira sends
request to
Crucible for
review data

Crucible checks
internally for
review data



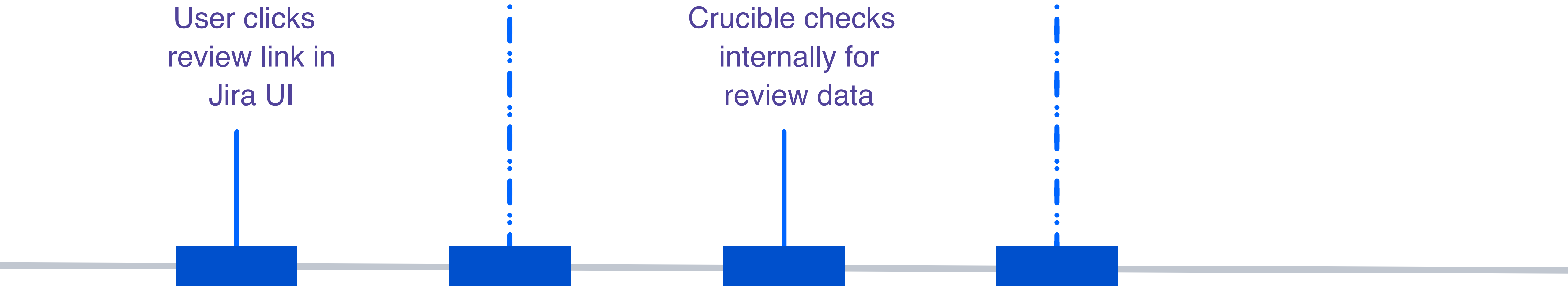
Applinks Order of Events

User clicks
review link in
Jira UI

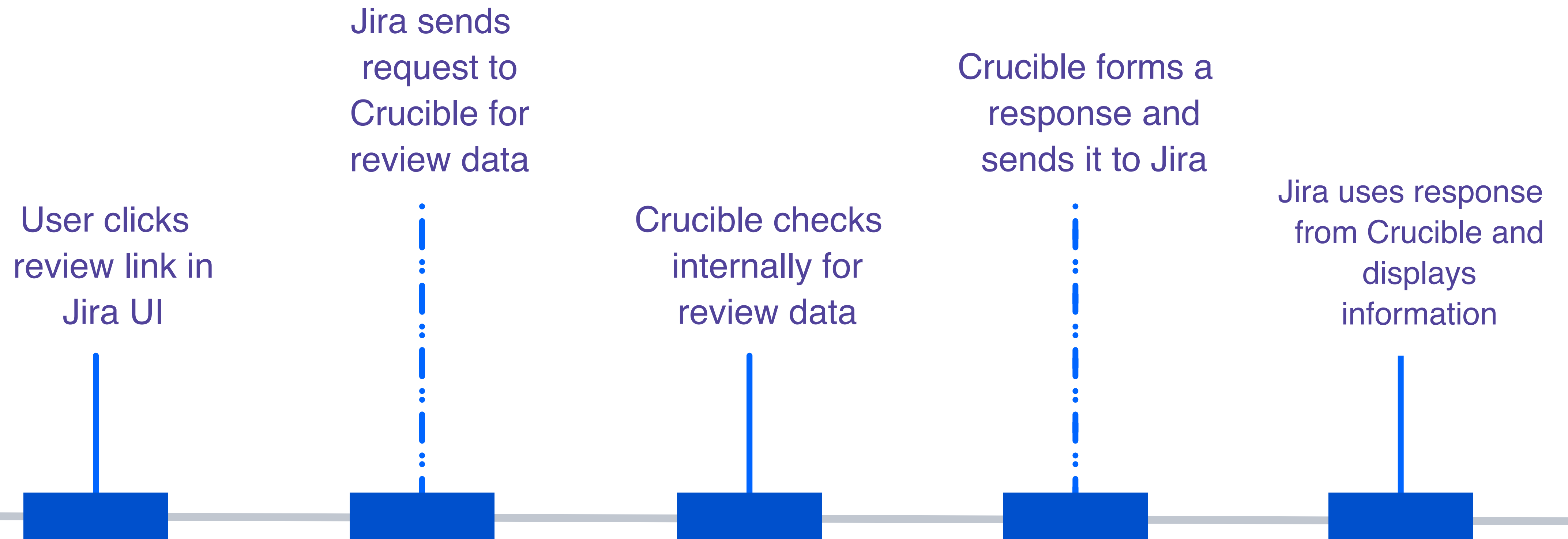
Jira sends
request to
Crucible for
review data

Crucible checks
internally for
review data

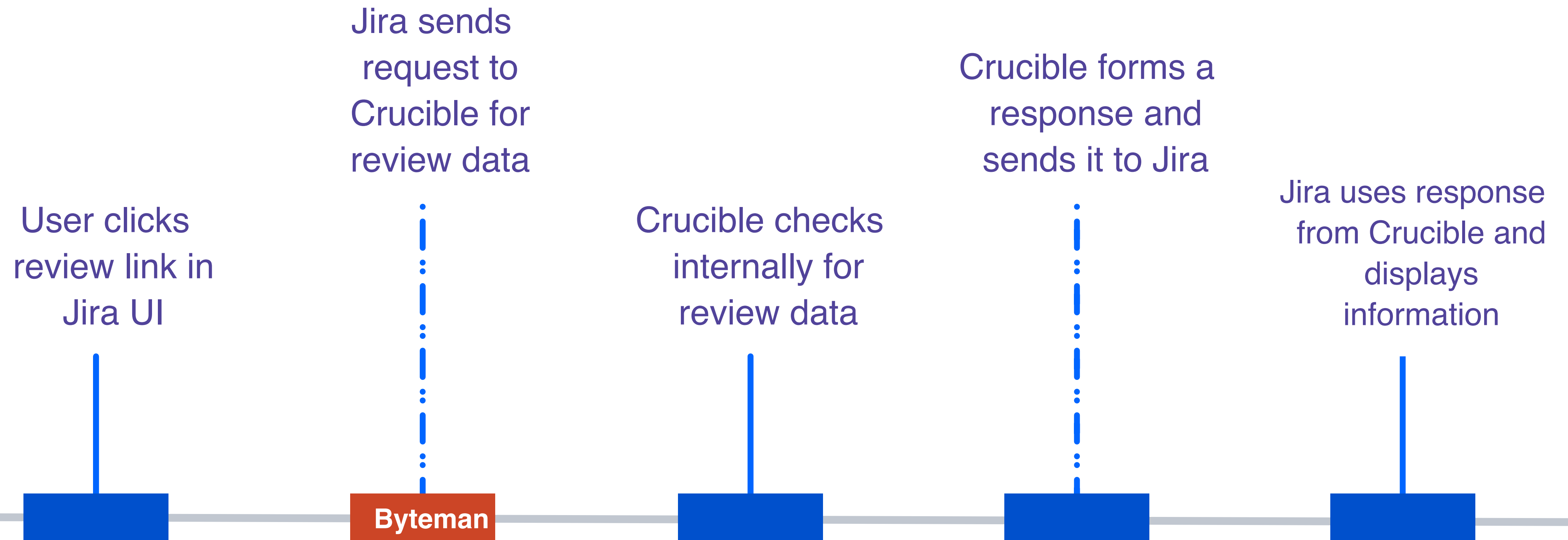
Crucible forms a
response and
sends it to Jira



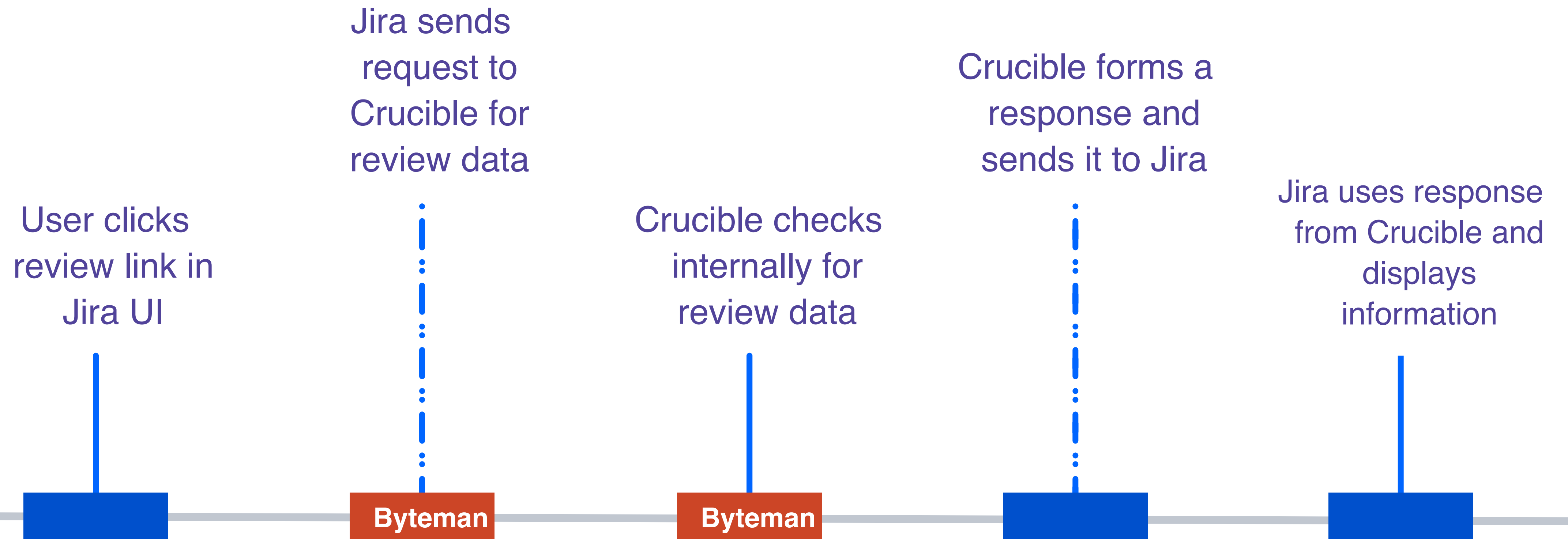
Applinks Order of Events



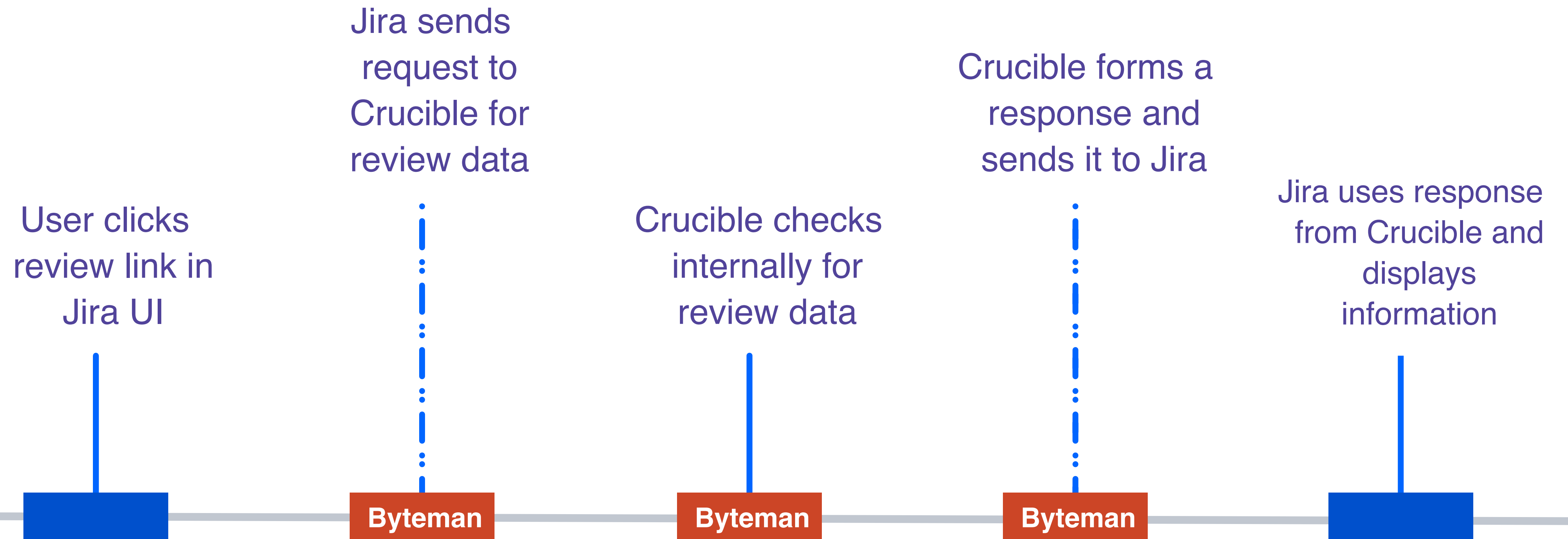
Applinks Order of Events



Applinks Order of Events



Applinks Order of Events



Byteman Script

Rule 1

Rule 2

Rule 3

We know we got something from Jira if we search with data

```
# this should log the directory where the Lucene index in Crucible is located
```

```
# As a result of Jira asking for data to populate the dev panel
```

```
RULE org.apache.lucene.search.IndexSearcher#search entry
```

```
CLASS org.apache.lucene.search.IndexSearcher
```

```
METHOD search(org.apache.lucene.search.Query,  
org.apache.lucene.search.Collector)
```

```
AT EXIT
```

```
BIND rosr : org.apache.lucene.index.ReadOnlySegmentReader = $0.subReaders[0];
```

```
IF $1.toString().contains("<UPDATE-JIRA-ISSUEKEY-HERE>")
```

```
DO org.slf4j.LoggerFactory.getLogger("Byteman").info("->  
org.apache.lucene.search.IndexSearcher#search({}, {})", $1,  
rosr.singleNormStream)
```

```
ENDRULE
```


Byteman Script

Rule 1

Rule 2

Rule 3

Next we check to see how many hits we get in the index

```
# this will return the number of search results the jira summary service  
uses to build the review response
```

```
RULE
```

```
com.atlassian.fecru.plugin.jira.summary.service.DefaultReviewDetailsService  
#getReviewDetails exit
```

```
CLASS
```

```
com.atlassian.fecru.plugin.jira.summary.service.DefaultReviewDetailsService
```

```
METHOD getReviewDetails
```

```
AFTER WRITE $searchResults
```

```
IF TRUE
```

```
DO org.slf4j.LoggerFactory.getLogger("Byteman").info("-  
>com.atlassian.fecru.plugin.jira.summary.service.DefaultReviewDetailsServic  
e#getReviewDetails; number of searchResults: {}",  
String.valueOf($searchResults.size()))
```

```
ENDRULE
```

Byteman Script

Rule 1

Rule 2

Rule 3

Last we check the response being sent back to the requester

```
# this will log the json payload being sent back from fecru (by way of  
atlassian-rest-common plugin) to jira
```

```
RULE
```

```
com.atlassian.plugins.rest.common.interceptor.impl.DispatchProviderHelpe  
r$TypeOutInvoker#_dispatch exit
```

```
CLASS
```

```
com.atlassian.plugins.rest.common.interceptor.impl.DispatchProviderHelpe  
r$TypeOutInvoker
```

```
METHOD _dispatch
```

```
AT EXIT
```

```
IF TRUE
```

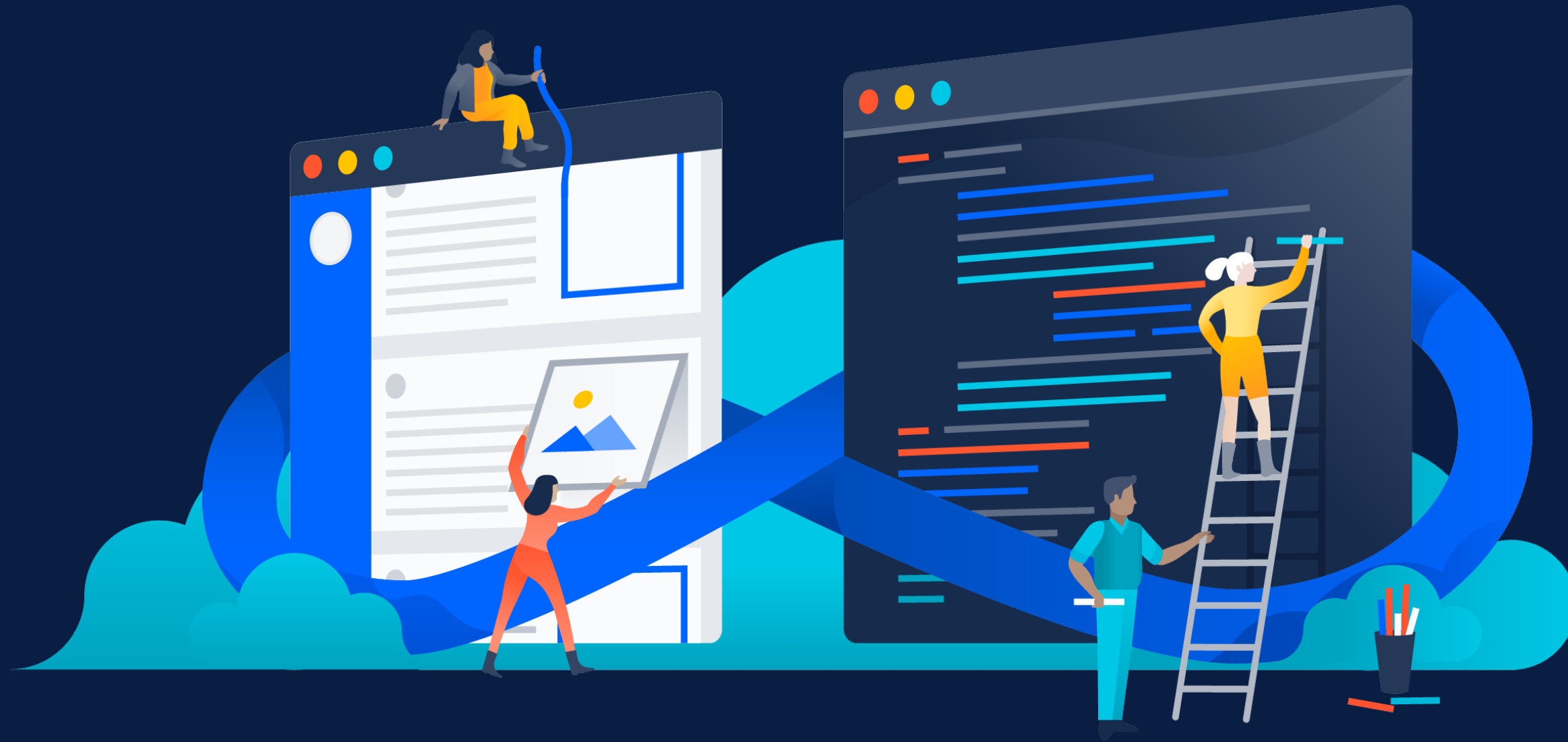
```
DO org.slf4j.LoggerFactory.getLogger("Byteman").info("->  
com.atlassian.plugins.rest.common.interceptor.impl.DispatchProviderHelpe  
r$TypeOutInvoker#_dispatch; response: {}", $2.getResponse().getEntity())
```

```
ENDRULE
```


Demo Time

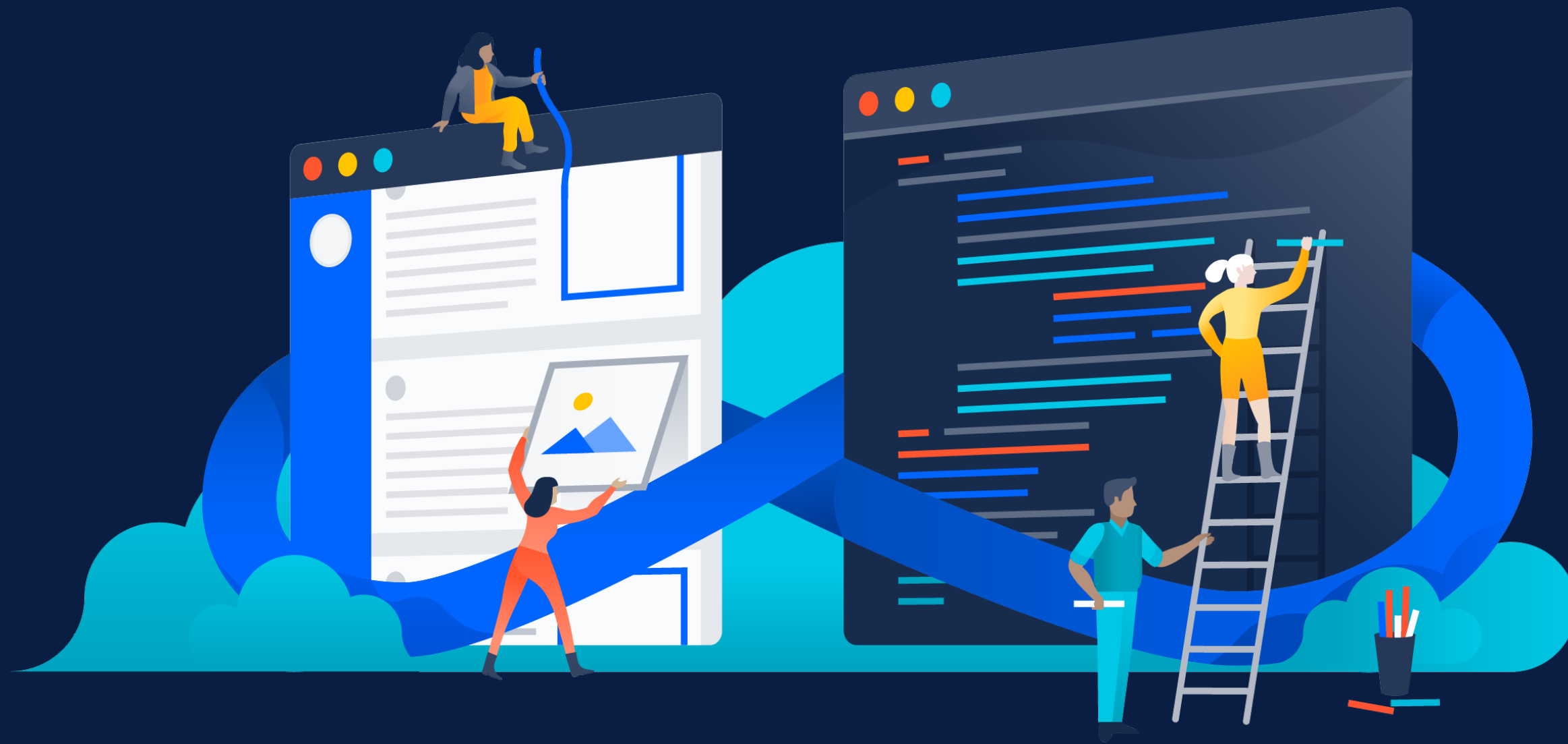


Custom Logging



Demo Time

Custom Logging and Temporary Patching





Advanced Topics Testing

Byteman and JUnit

Maven

Test Class Option 1

Test Class Option 2

To include dependencies using Maven add the following elements to the main pom.xml in your project

```
<dependency>
  <groupId>org.jboss.byteman</
groupId>
  <artifactId>byteman</artifactId>
  <scope>test</scope>
  <version>${byteman.version}</
version>
</dependency>
<dependency>
  <groupId>org.jboss.byteman</
groupId>
  <artifactId>byteman-submit</
artifactId>
  <scope>test</scope>
  <version>${byteman.version}</
version>
</dependency>
<dependency>
  <groupId>org.jboss.byteman</
groupId>
  <artifactId>byteman-install</
artifactId>
  <scope>test</scope>
  <version>${byteman.version}</
version>
</dependency>
<dependency>
  <groupId>org.jboss.byteman</
groupId>
  <artifactId>byteman-bmunit</
artifactId>
  <scope>test</scope>
  <version>${byteman.version}</
version>
</dependency>
```

Byteman and JUnit

Maven

Test Class Option 1

Test Class Option 2

Add annotation to specify configuration and location

```
@RunWith(org.jboss.byteman.contrib.bmunit.  
BMUnitRunner.class)  
@BMUnitConfig(loadDirectory="target/test-  
classes")  
@BMScript(value="check.btm")
```


Byteman and JUnit

Maven

Test Class Option 1

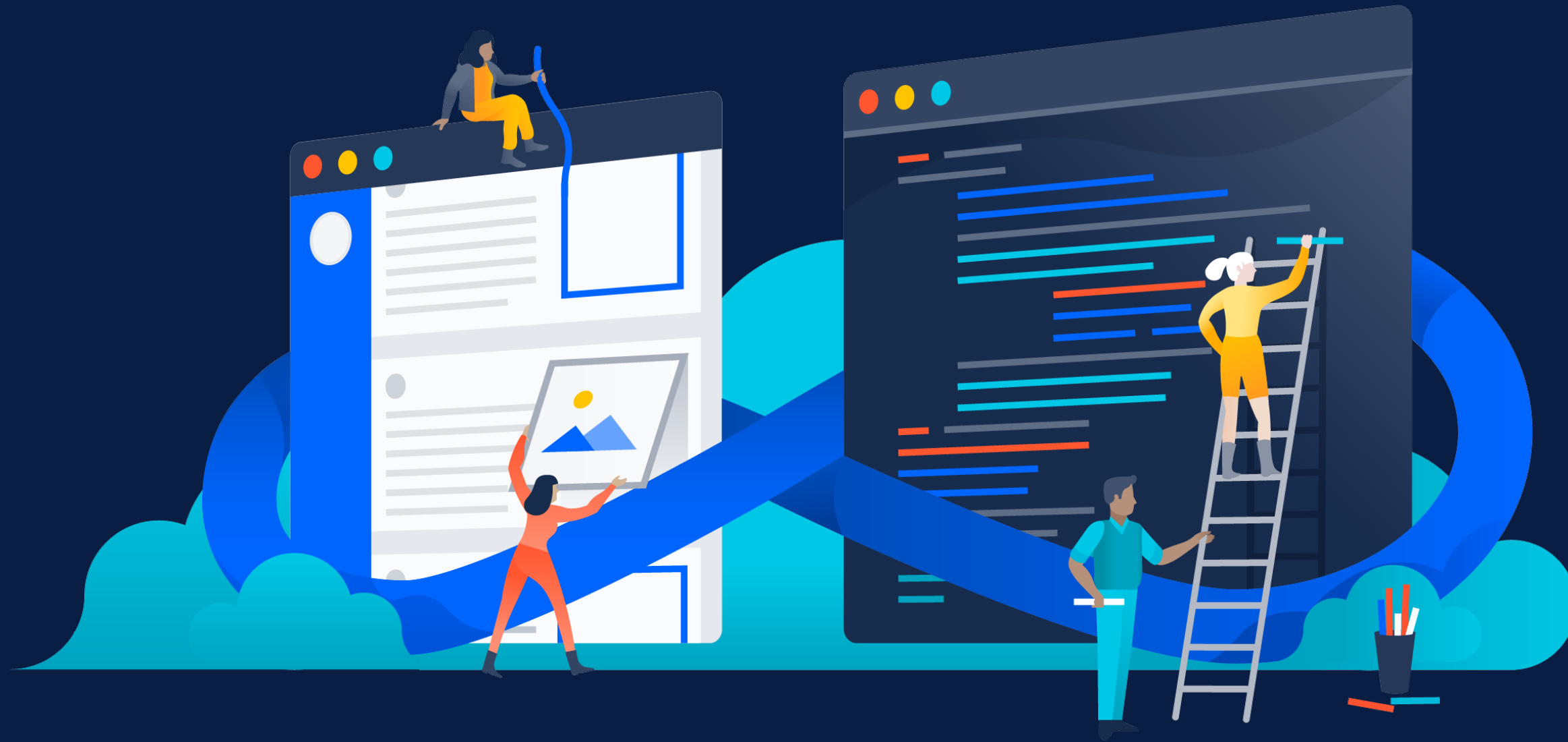
Test Class Option 2

Provide rule in annotation instead of separate script

```
@BMRule(name = "handle file not found",  
        targetClass =  
        "FileOutputStream",  
        targetMethod = "<init>(File)",  
        action = "throw new  
FileNotFoundException( \"Ha ha Byteman  
fooled you again!\" )"  
)
```

Demo Time

Running JUnit and Byteman





Advanced Topics

Offline Testing

What happens when
the code is changed?



Helpful Resource Links

[Byteman Tutorial](#)

[https://
developer.jboss.org/docs/
DOC-17213](https://developer.jboss.org/docs/DOC-17213)

[BMUnit Tutorial](#)

[https://
developer.jboss.org/docs/
DOC-52953#top](https://developer.jboss.org/docs/DOC-52953#top)

[BM Rule Check](#)

[https://
developer.jboss.org/docs/
DOC-48911](https://developer.jboss.org/docs/DOC-48911)



Conclusions & Discussion

For pdf version of this
presentation go to:

[https://github.com/
dark3rMatt3r/
bytemanPresentation](https://github.com/dark3rMatt3r/bytemanPresentation)

Or scan this QR





Thank you :)



This has been A Nate Hansberry Presentation