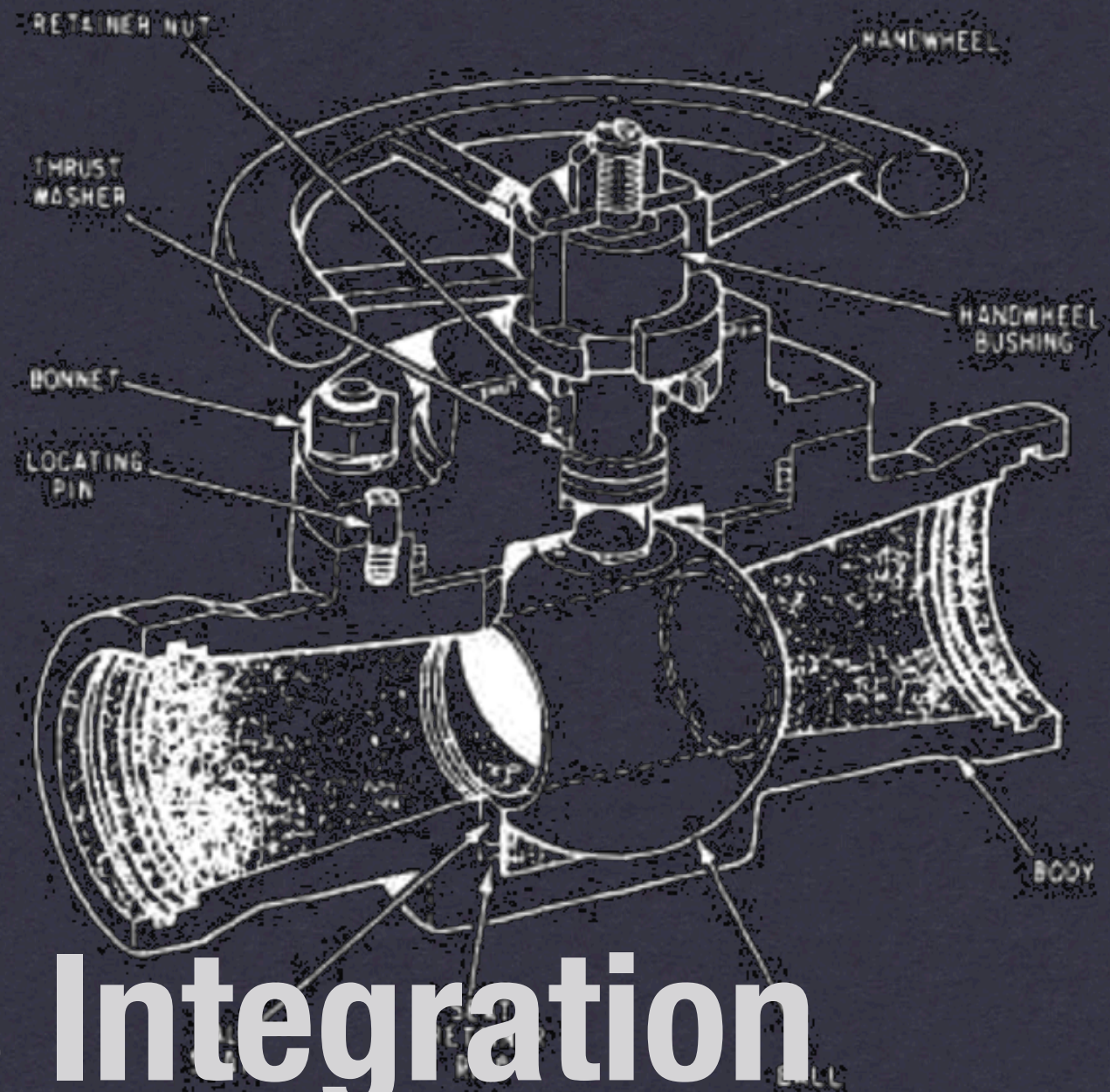


Massively Continuous Integration



A case study for Jenkins at cloud-scale

Thank you to our sponsors

Platinum
Sponsor



Gold
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Silver
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Bronze
Sponsors





- **Jesse Dowdle, Sr Manager of Development**

- **@dowdlemj**
- **linkedin.com/in/jessedowdle**
- **www.continuousdeliverist.com**

- **Joel Johnson, Software Engineer, CI Guru**

- **@_joelj**
- **linkedin.com/in/joelrj**

ArtTask



Then

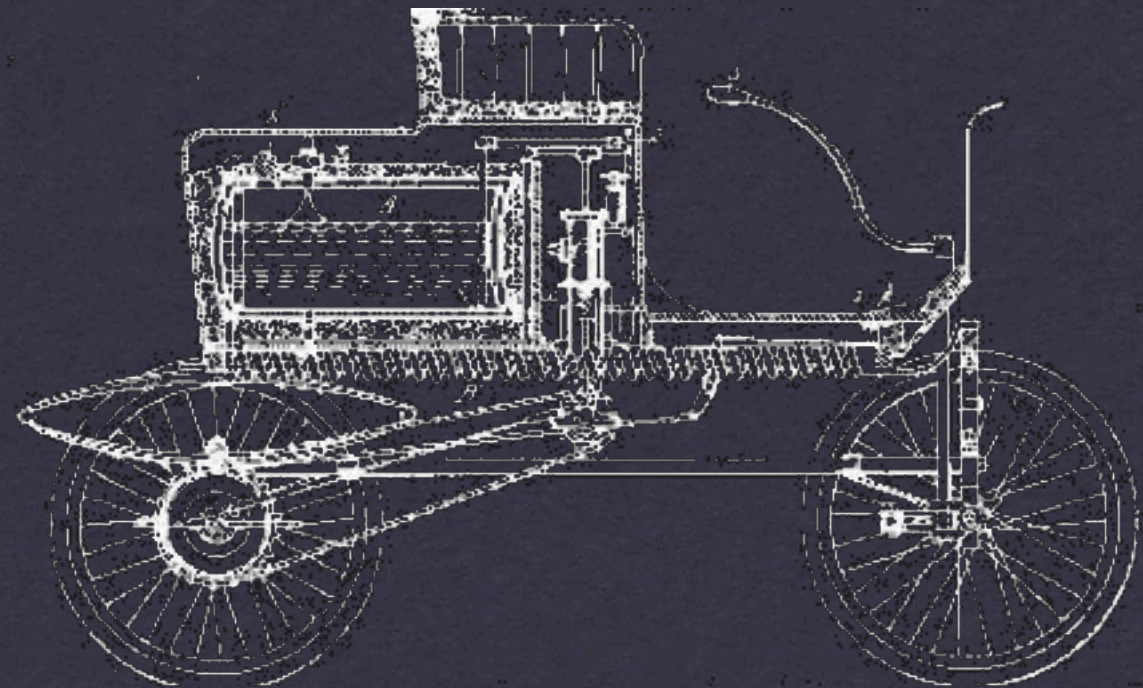
Scripted scenarios

Slow, brittle

Monthly Releases

3-5 days acceptance

Multiple CI tools



Now

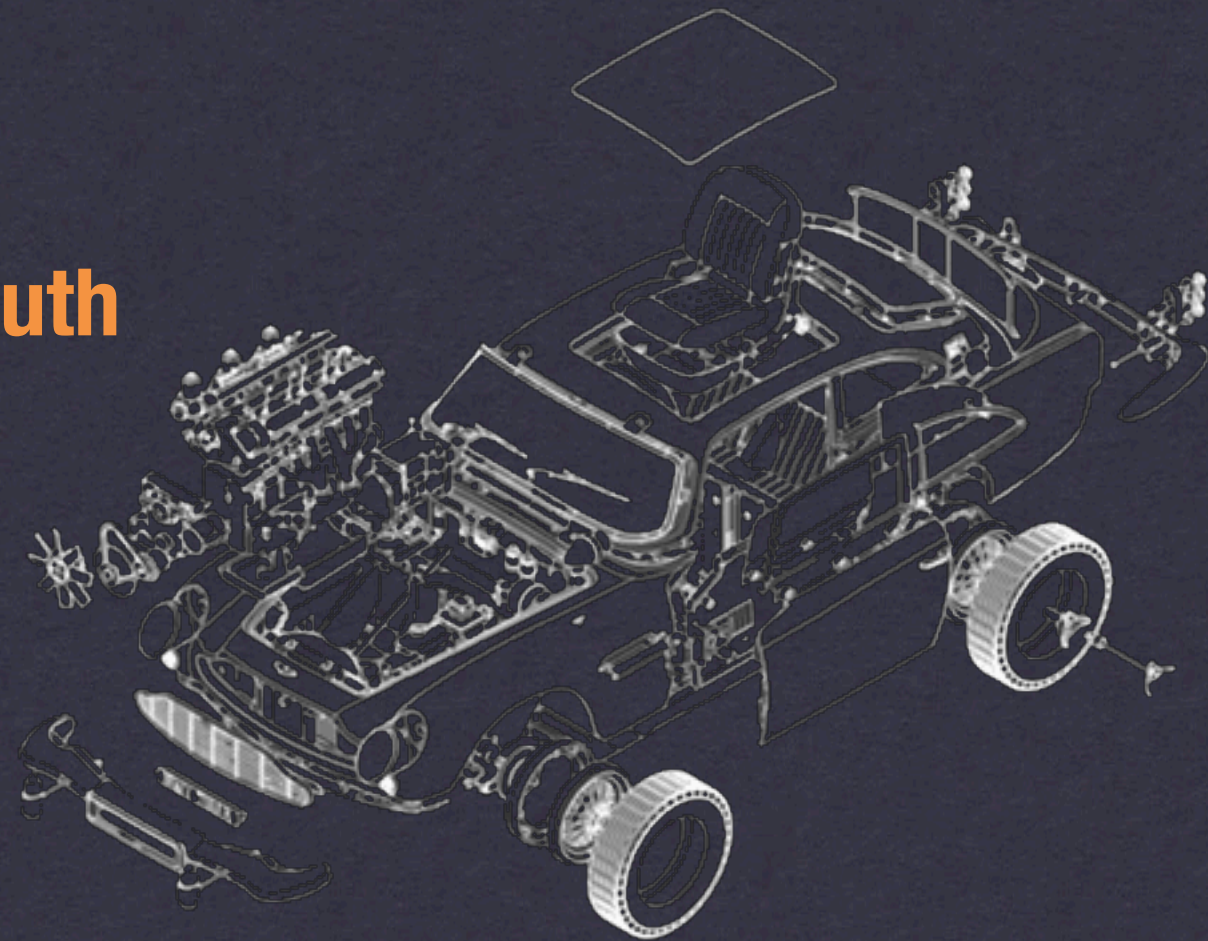
Tight unit-like UI tests

Fast, Robust

Daily releases

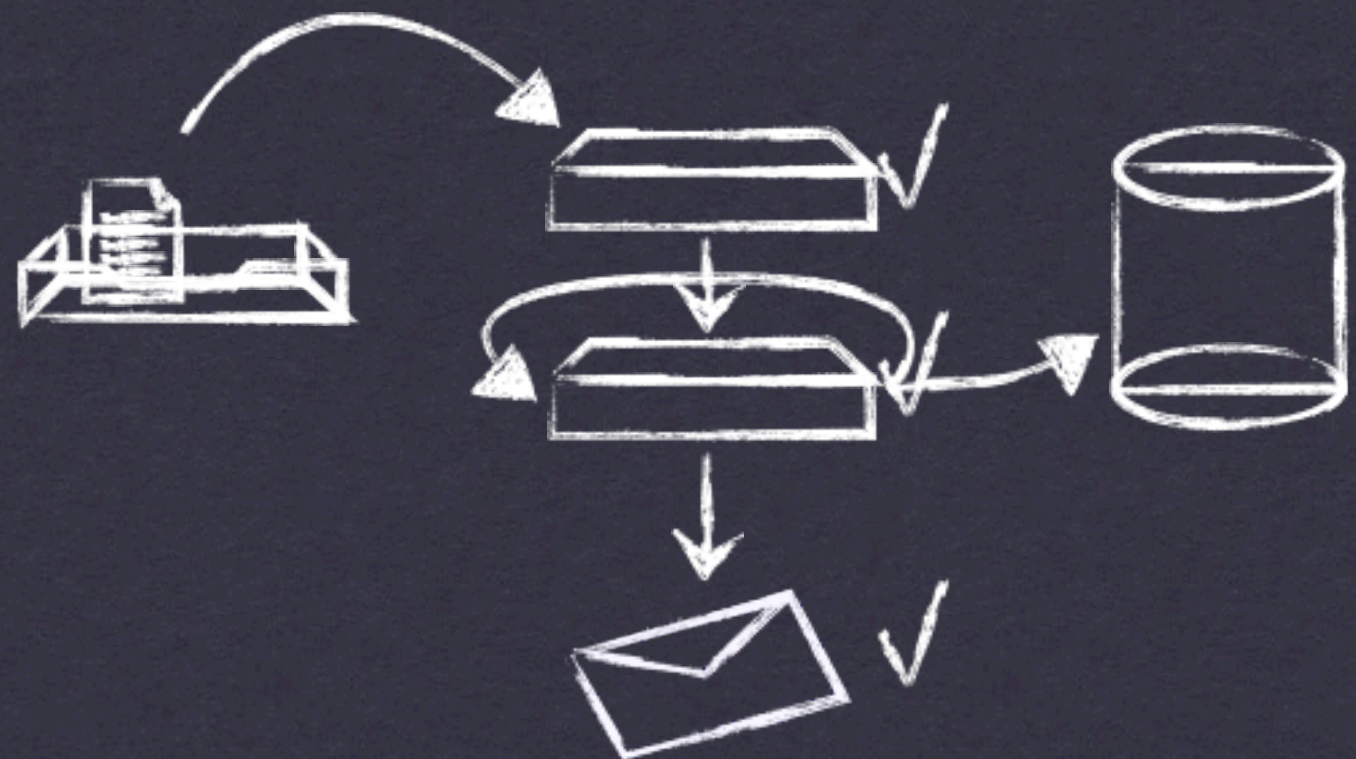
Jenkins is the source of truth

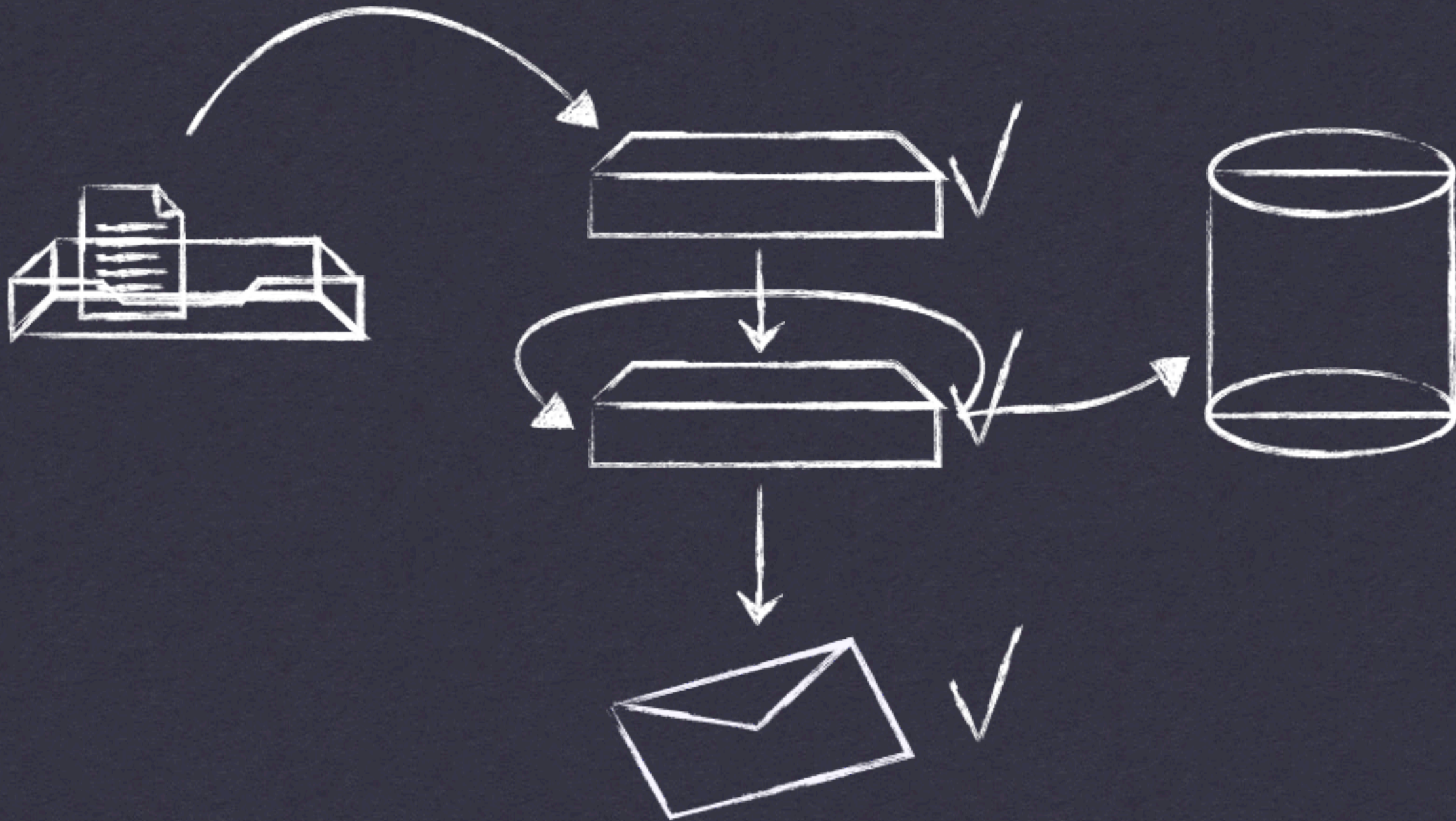
30-45 minutes



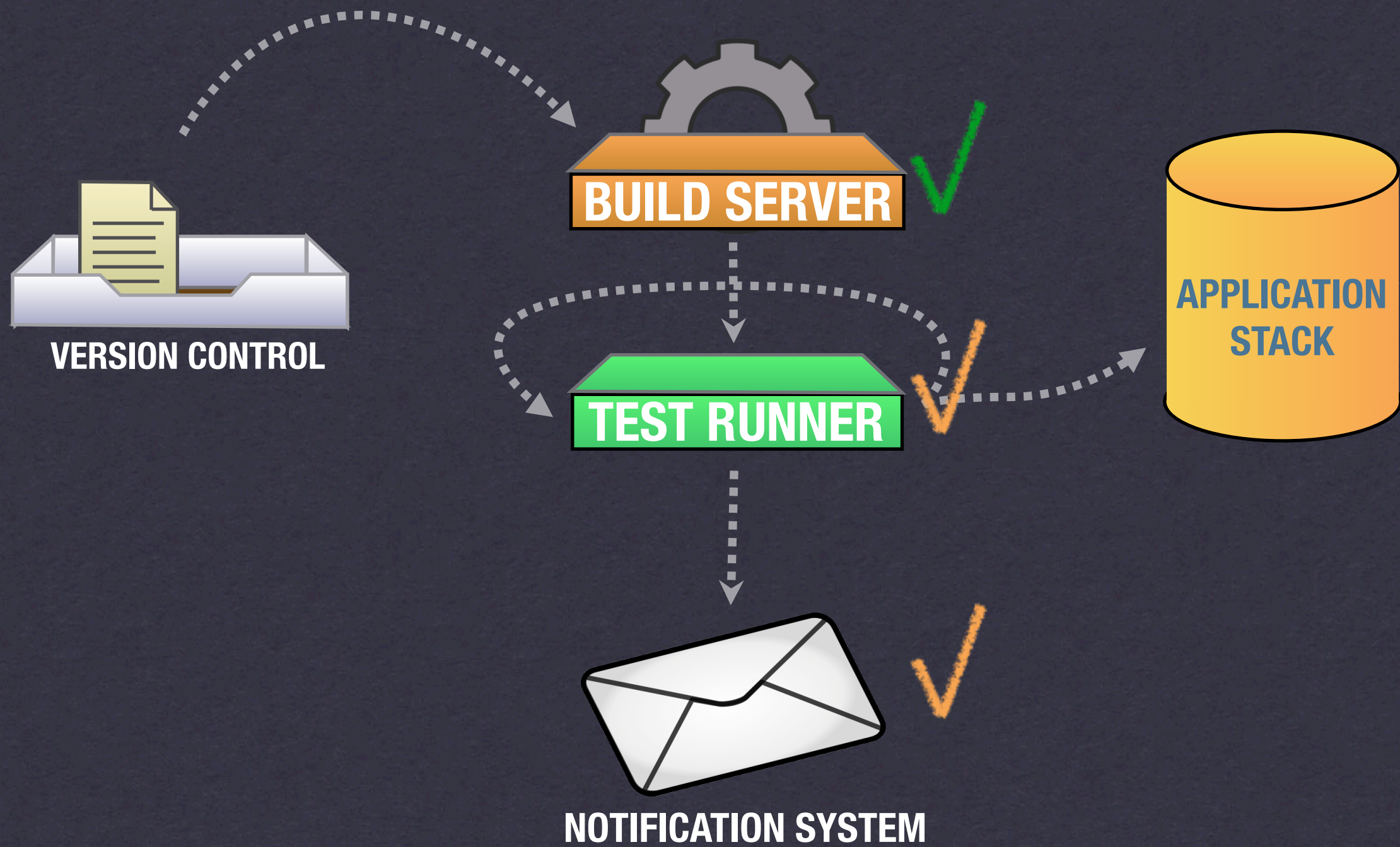
A basic automated test bed

- **Version Control triggers new action**
- **Build Server retrieves latest version, compiles, starts Application Stack**
- **Test Runner executes tests against Application Stack**
- **Results are collected and sent by notification**
- **Build Server is cleaned and restored.**





Basic Integration

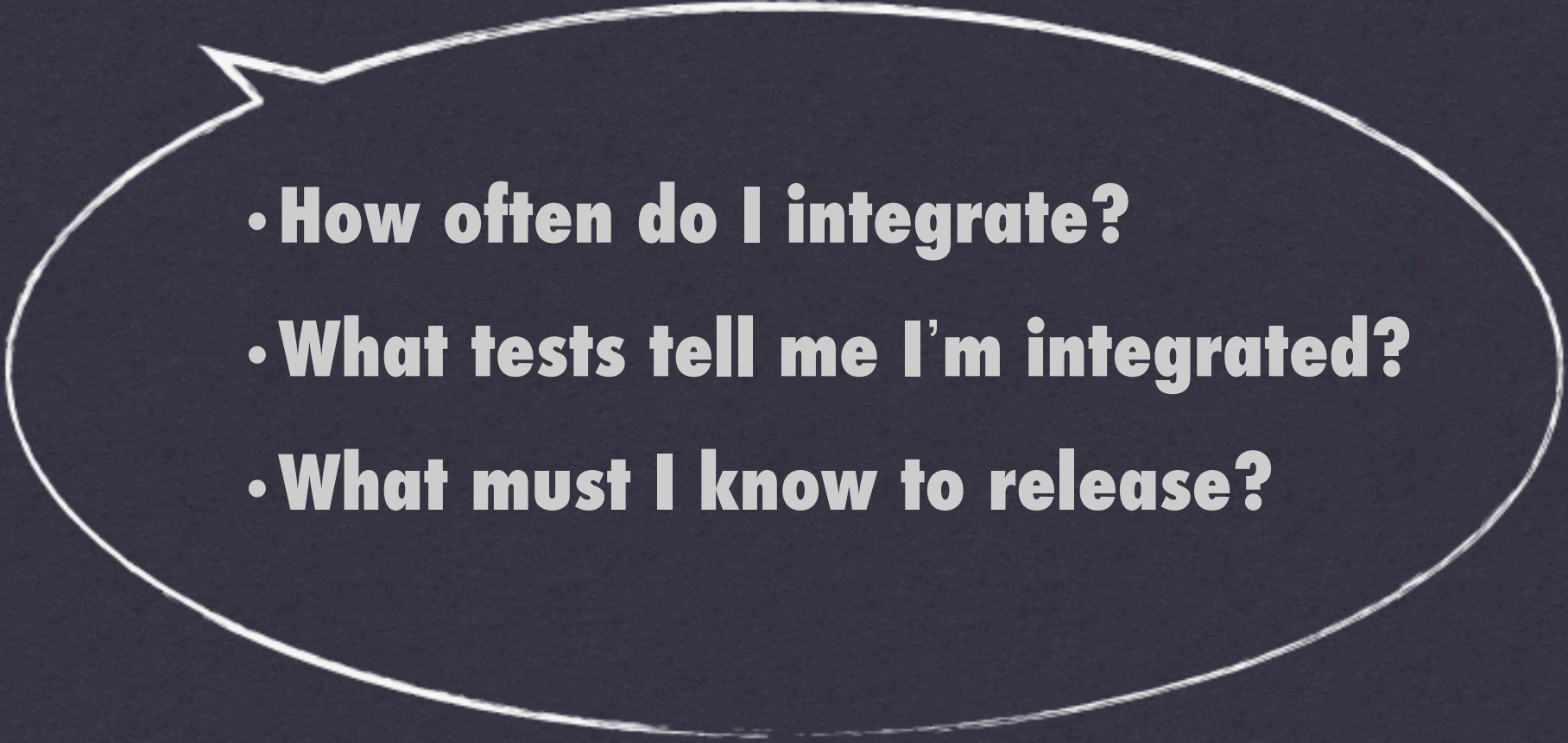


Basic Integration

AtTask Test Automation

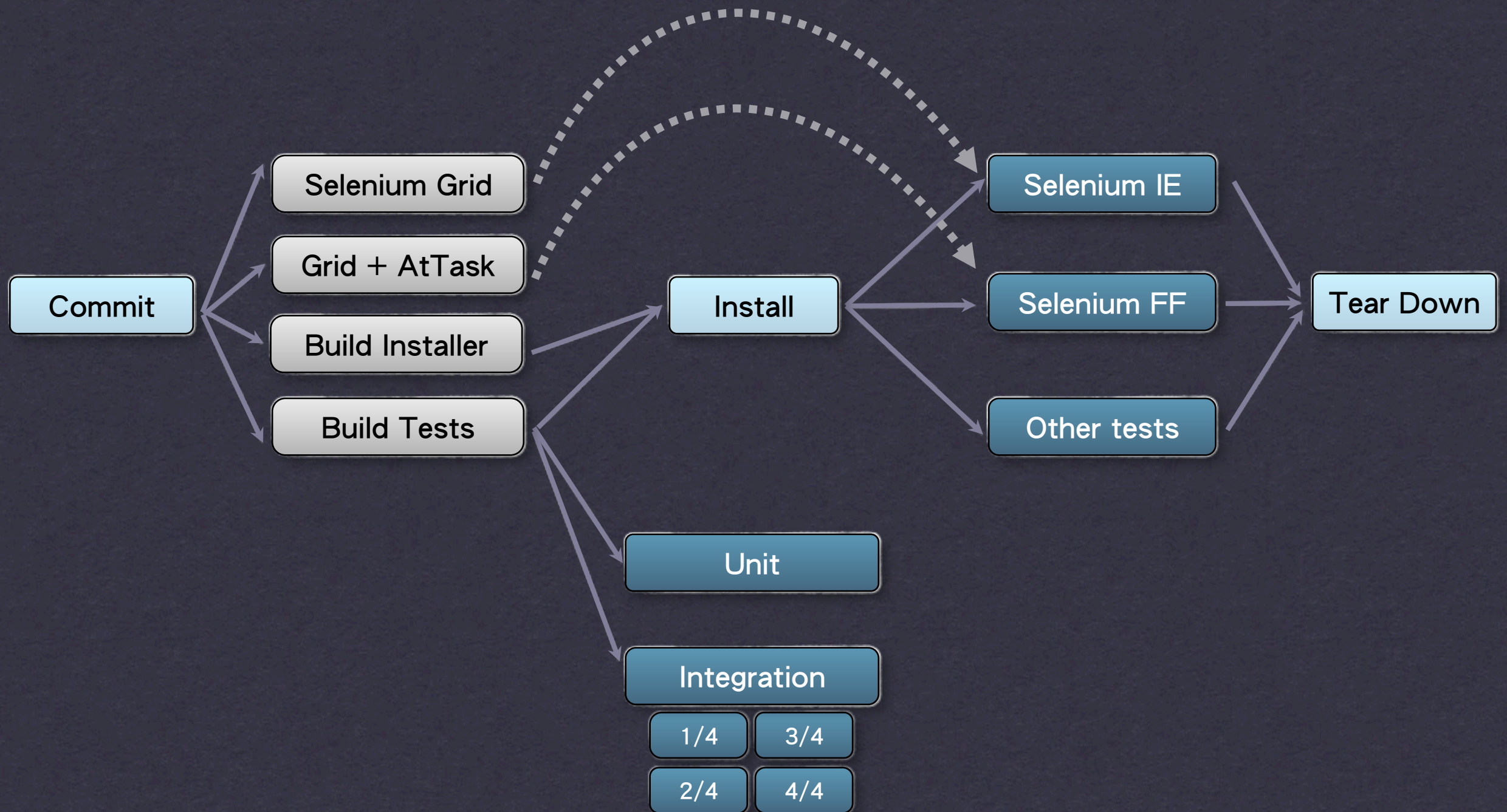
- **800 Unit tests**
- **3300 API tests**
- **2000 UI tests**
- **55,000 hours per month**
- **Release Acceptance + CI**

“True” Continuous Integration

- 
- **How often do I integrate?**
 - **What tests tell me I'm integrated?**
 - **What must I know to release?**

Pipeline Priorities

- **Performance (Cycle Time)**
- **Scalability**
- **Visibility**
- **Accountability**

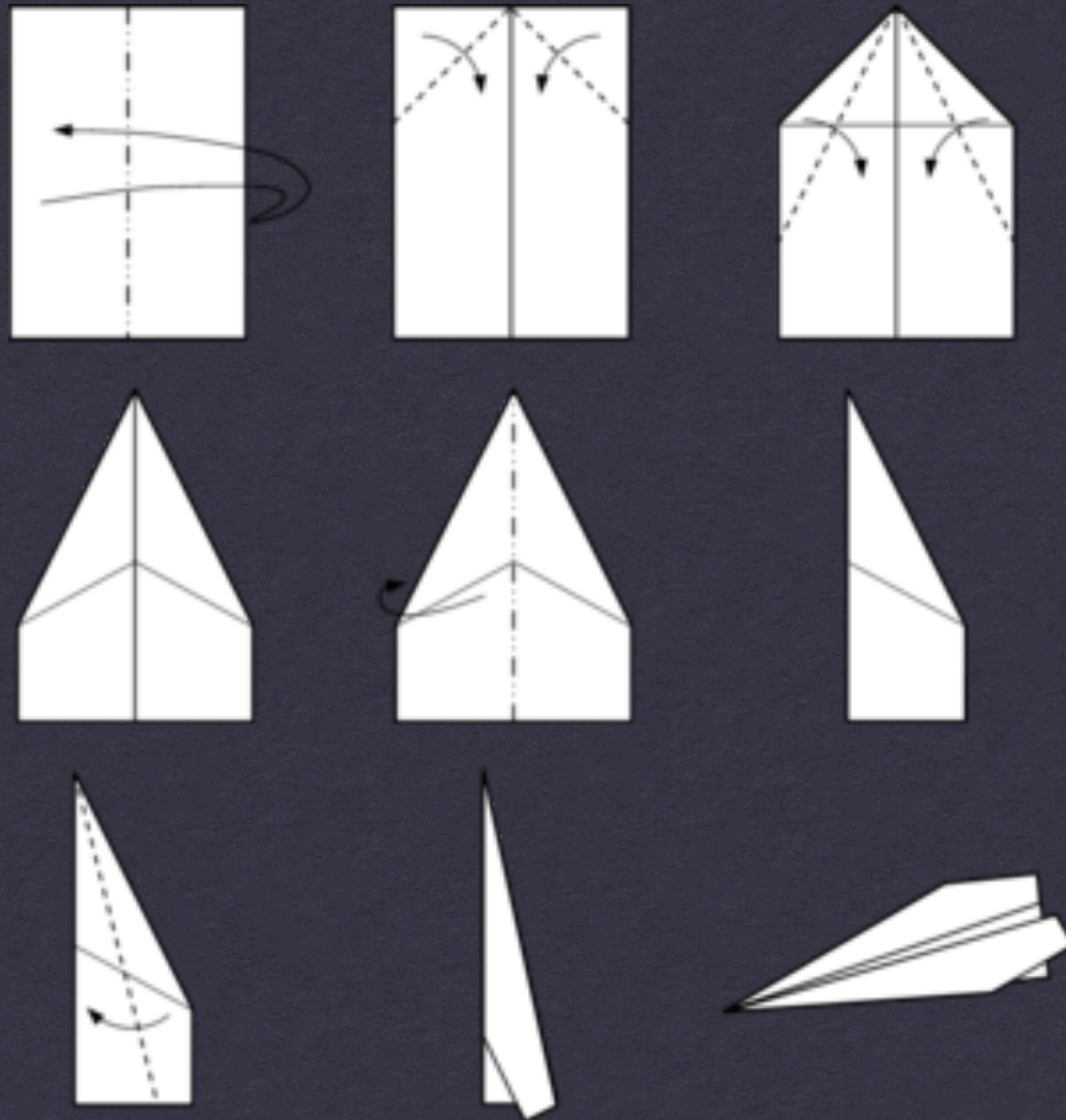


AtTask's Pipe

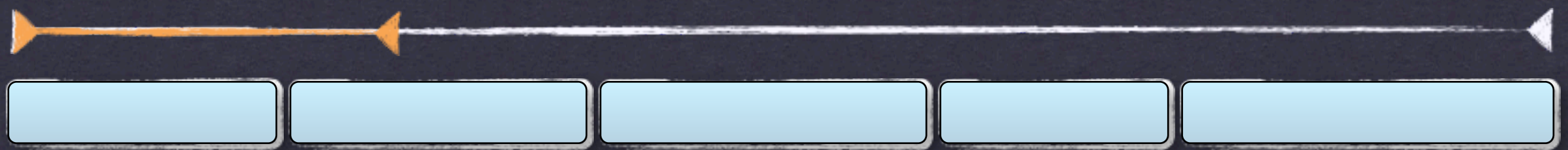
Build -- Deploy -- Test -- Destroy

Performance

- **Eliminate technology as a barrier to performance.**
- **Jenkins server farm**
- **Selenium framework improvements**
 - **Page objects**
 - **Reusability - architecting test framework**



How to make a paper airplane
or, queueing theory as expressed by a folded projectile



CYCLE TIME

CI Vendors

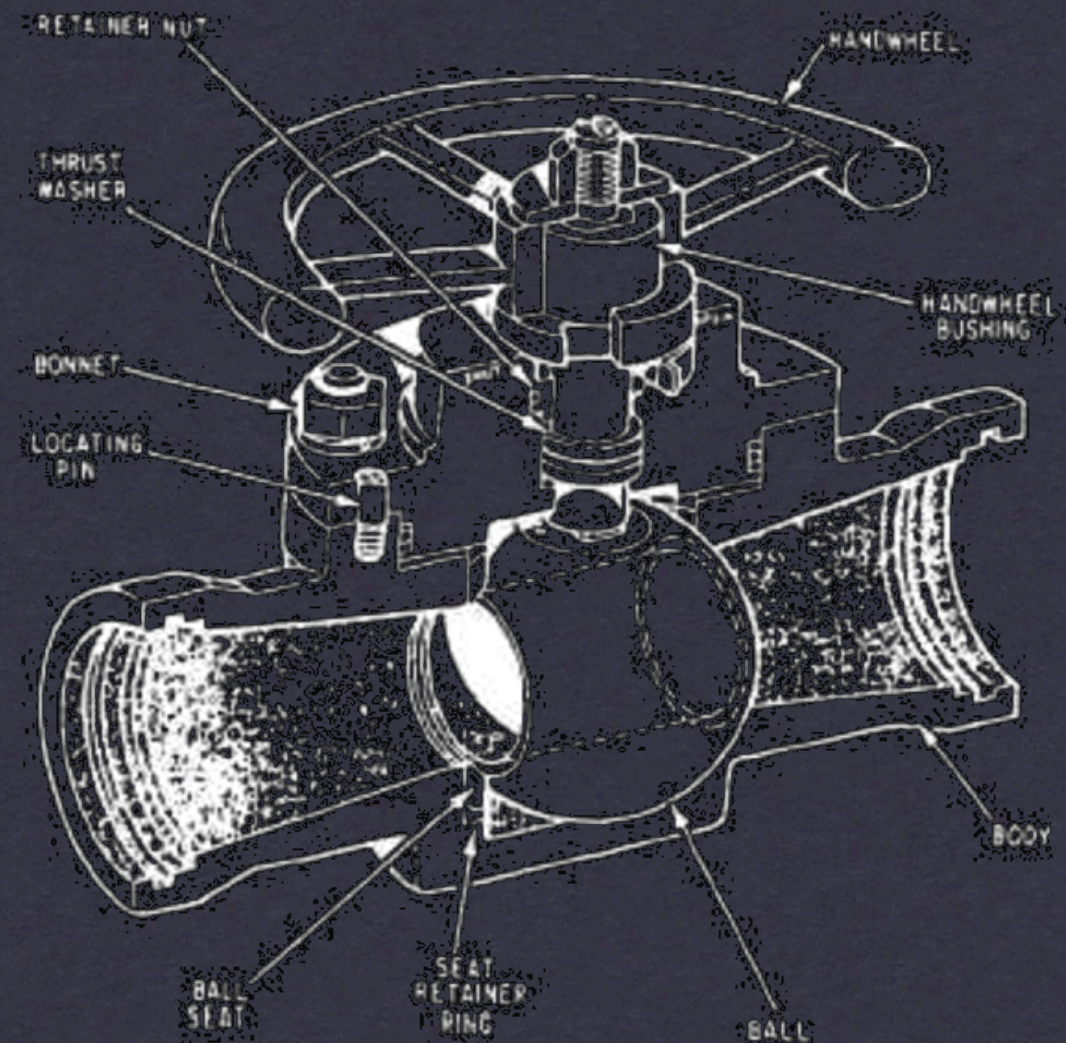
CruiseControl

Jenkins (Hudson)

TeamCity

Go

Team Foundation Server



Cloud Vendors

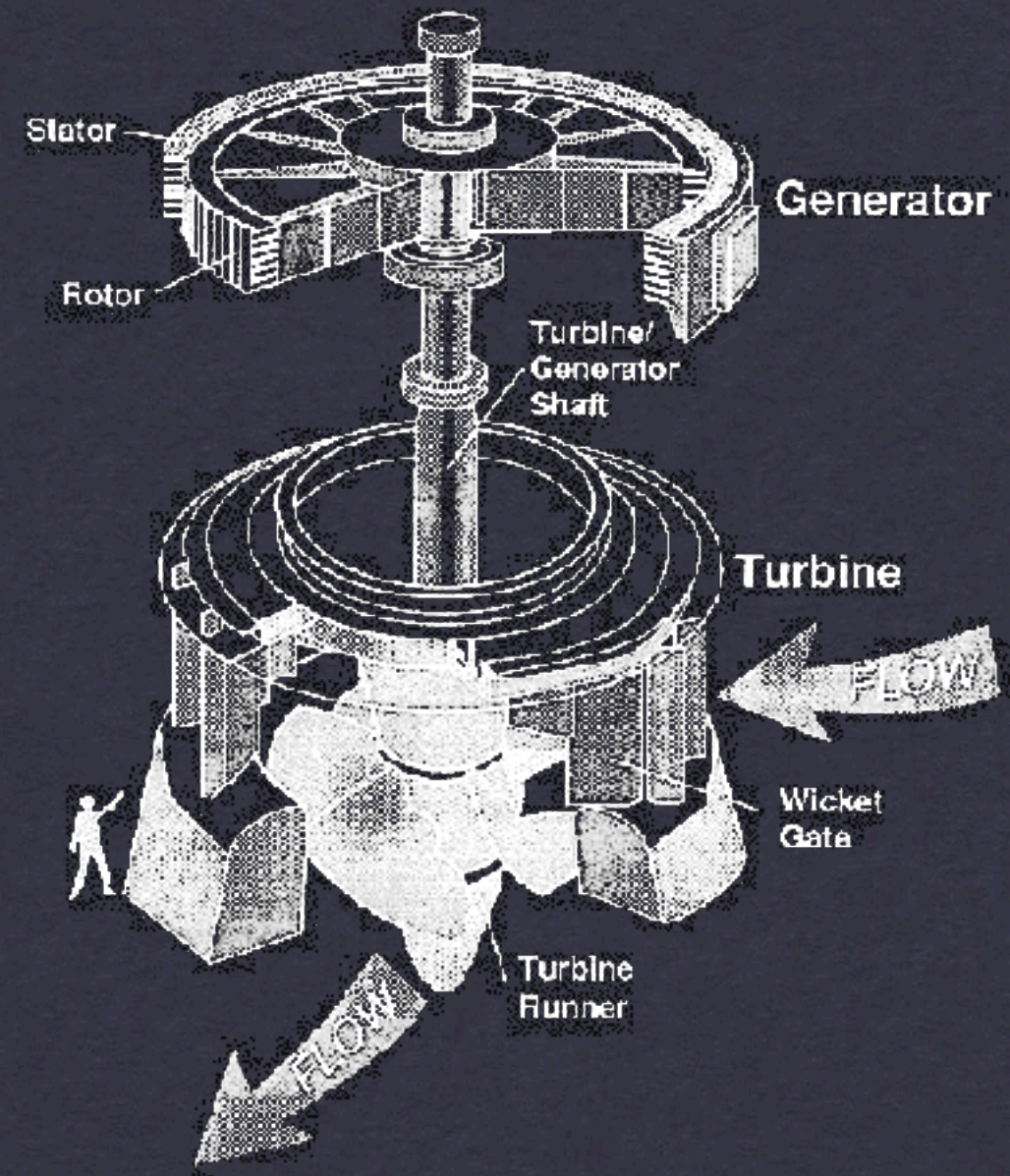
Amazon Web Services

OpenStack

Rackspace

Skytap

SauceLabs





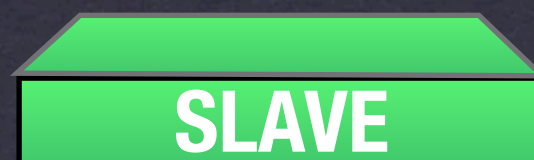
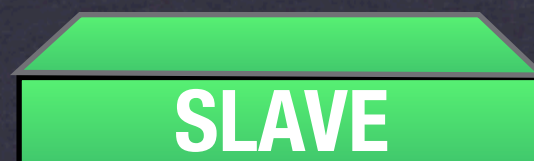
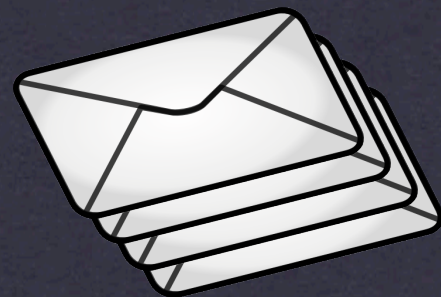
Jenkins

AtTask

Jenkins, EC2, and AtTask

A match made in heaven





Jenkins dynamic slave allocation

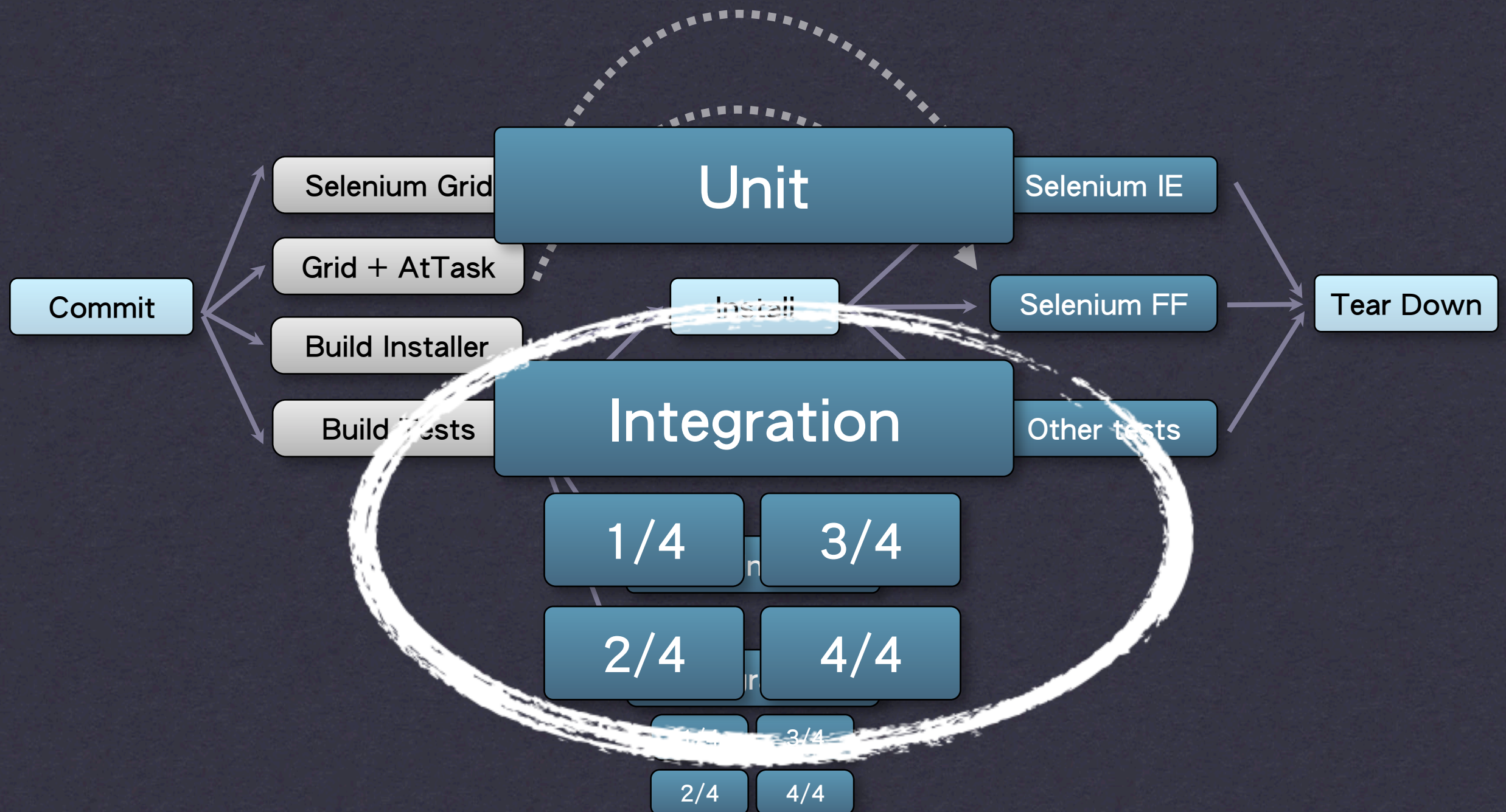
Scalability

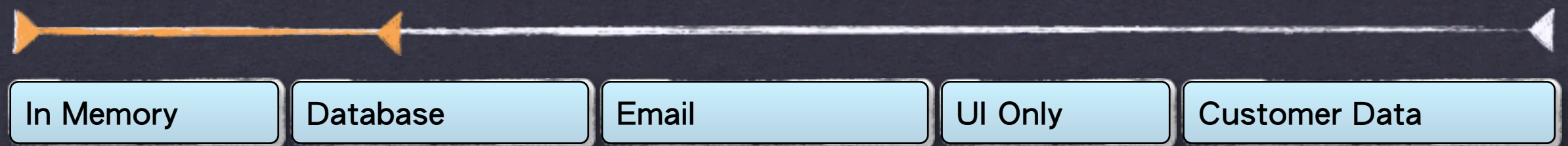
- **Taking the Test Suite to massive scale**
- **To the cloud with Amazon Cloud Formations**
 - **Dynamic Selenium Grids**
 - **Dynamic AtTask Environments**

Divide and Conquer

- **Module separation will allow for scale**
- **Test Suites should support sharding**
- **Run tests with different dependencies in parallel**

Divide and Conquer





PARALLEL BY DEPENDENCIES

**From 3 days to 30 minutes
with Selenium 2**

SELENIUM 1 (1800 TESTS)



4 HOURS

SLOW

BRITTLE

Sometimes the tests need to change


```
// enter reply note
selenium().type("val(noteText)", "Take it back now!");
// submit
selenium().clickAndWait("sectiontimesheetnotesearchlistnotedetail");
// make sure the new one is displayed
assertTrue(selenium().isTextPresent("RE: this is a timesheet"));
selenium().verifyTabNotPresent("Recent Notes");
selenium().verifyTabPresent("Search Results");

selenium().clickAndWait("//a[contains(@href, \"timesheetThreadView\")]");
selenium().type("sectiontimesheetthreadlistreplytosub", "thread 1");
selenium().type("sectiontimesheetthreadlistnotebox", "thread text ");
selenium().clickAndWait("sectiontimesheetthreadlistnotedetail");
assertTrue(selenium().isTextPresent("thread 1"));
selenium().verifyTabNotPresent("Recent Notes");
selenium().verifyTabPresent("Threaded Notes");
```

```
selenium().verifyTabNotPresent("Recent Notes");
selenium().verifyTabPresent("Search Results");

selenium().clickAndWait("//a[contains(@href, \"timesheetThreadView\")]");
selenium().type("sectiontimesheetthreadlistreplytosub", "thread 1");
selenium().type("sectiontimesheetthreadlistnotebox", "thread text ");
selenium().clickAndWait("sectiontimesheetthreadlistnotedetail");
assertTrue(selenium().isTextPresent("thread 1"));
selenium().verifyTabNotPresent("Recent Notes");
selenium().verifyTabPresent("Threaded Notes");

//add a third note
selenium().clickMenuAndWait("New Note");
selenium().type("val(subject)", "note 3");
selenium().type("val(noteText)", "text ");
selenium().clickAndWait("action.save");
assertTrue("Third note not found", selenium().isTextPresent("note 3"));

//add a forth note from alternate list view
selenium().type("val(subject)", "note 4");
selenium().type("val(noteText)", "note 4 body text");
selenium().clickAndWait("sectiontimesheetnotesearchlistnotedetail");
assertTrue("fourth note not found", selenium().isTextPresent("note 4"));

selenium().clickTab("Search Fields");
selenium().type("field(quicksearch)", "note 4");
selenium().clickAndWait("action.search");
assertTrue("fourth note not found in search", selenium().isTextPresent("note 4"));

// I don't have to delete because tearDown() will delete timesheet
// notes, so well...
```

@Test

@Tags({Tag.TypeAhead})

```
public void typeAheadMultiObjects() throws Exception {
    String user3NewFirstName = "Paaaa";
    String user3NewLastName = "Son";
    String roleName = "Paaaa";
```

```
getStreamAPI().edit(getHandle(), "ROLE", roleID, map("name", roleName));
getStreamAPI().edit(getHandle(), "USER", userID3, map("firstName", user3NewFirstName,
```

```
TypeAheadPage typeAheadPage = getPageFactory().open(TypeAheadPage.class);
TypeAhead typeAhead = typeAheadPage.getTypeAhead("composite");
typeAhead.type("Paaa");
PickList pickList = typeAheadPage.getPickList();
assertEquals("PickList has wrong number of items", 2, pickList.getSize());
pickList.clickItem(roleName);
assertEquals("TypeAhead value isn't the role", roleName, typeAhead.getText());
}
```

```
keyInfo "Requirements:"
1. Create user1 with first name of "周" and last name of "路路"<br/>
2. Create user2 with first name of "路" and last name of "周周"<br/>

keyNote "Steps:"
1. Open user typeahead<br/>
2. Type user1's first name in text-box<br/>
3. Assert only user1 shows up as pop-up under text-box<br/>
4. Click on user1 in pop-up<br/>
5. Assert full name of user1 is in text-box<br/>

https://sites.google.com/site/productbacklog/pending-specs/type-ahead-assignme
javascript/specs/widgets/core/TypeAhead.spec

1.TypeAhead, Tag.Locale))
1d typeAheadChineseFirstName() throws Exception {
headPage typeAheadPage = getPageFactory().open(TypeAheadPage.class);
head typeAhead = typeAheadPage.getTypeAhead("multiuser");
head.type(chineseUserFirstName);
1st pickList = typeAheadPage.getPickList();
1equals("PickList has wrong number of items", 1, pickList.getSize());
1st.clickItem(chineseUserFullName);
1string> pillList = typeAhead.getPills();
1true("Pill list doesn't contain chinese user 1", pillList.contains(chineseUserFullName));
```

multiple objects in one type-ahead

```
keyInfo "Requirements:"
1. Create user1 with first name of "Paaaa" and last name of "Son"<br/>
2. Create role1 with name of "Paaaa"<br/>
```

Transitioning to selenium 2

SELENIUM 1 (1800 TESTS)



4 HOURS

SELENIUM 2 (750 TESTS)



30 MINUTES

**WHERE DID THE
TESTS GO?**

Transitioning to selenium 2

2.1 MINUTES

34 SECONDS

WITH GRID...

8 SECONDS

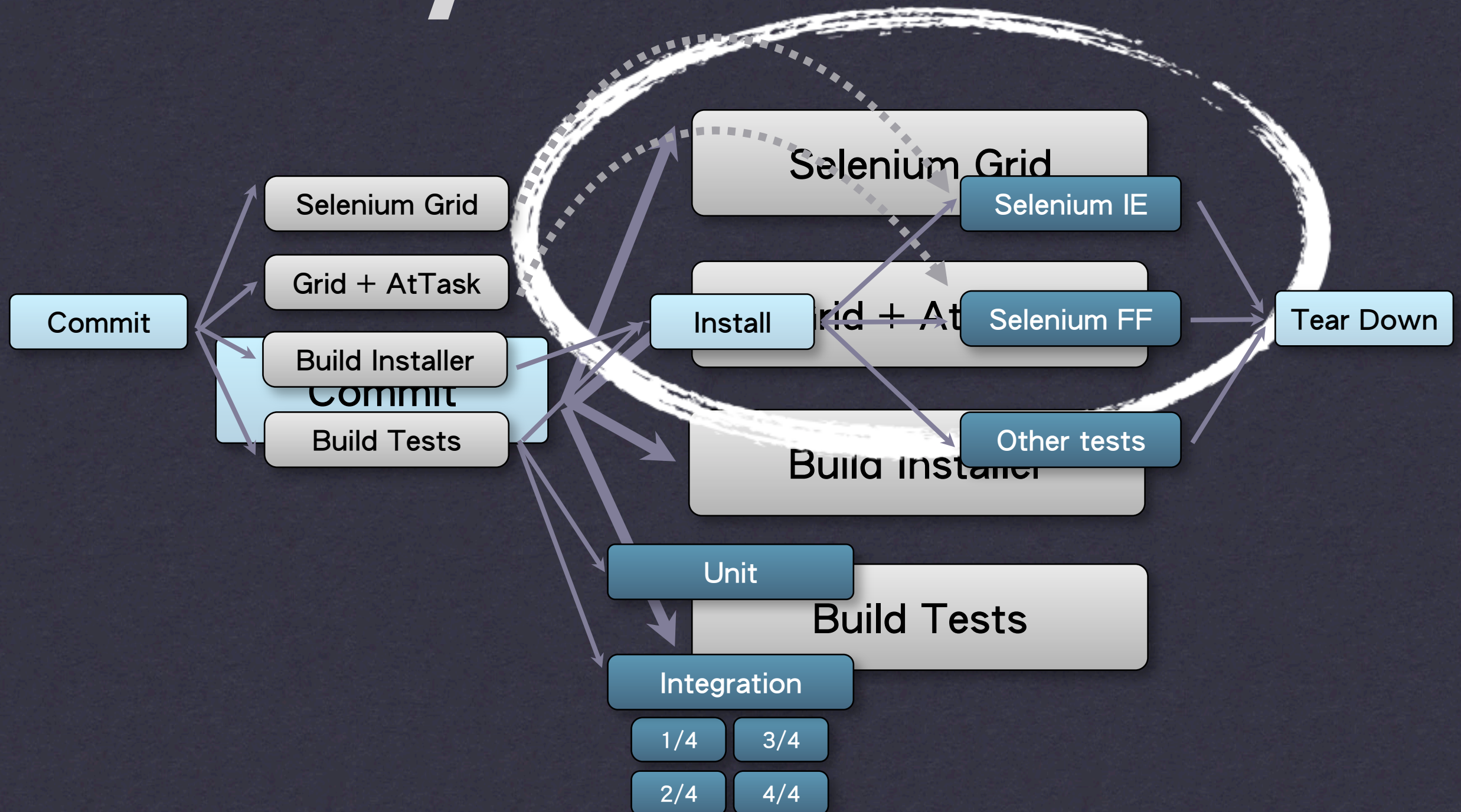
2.4 SECONDS

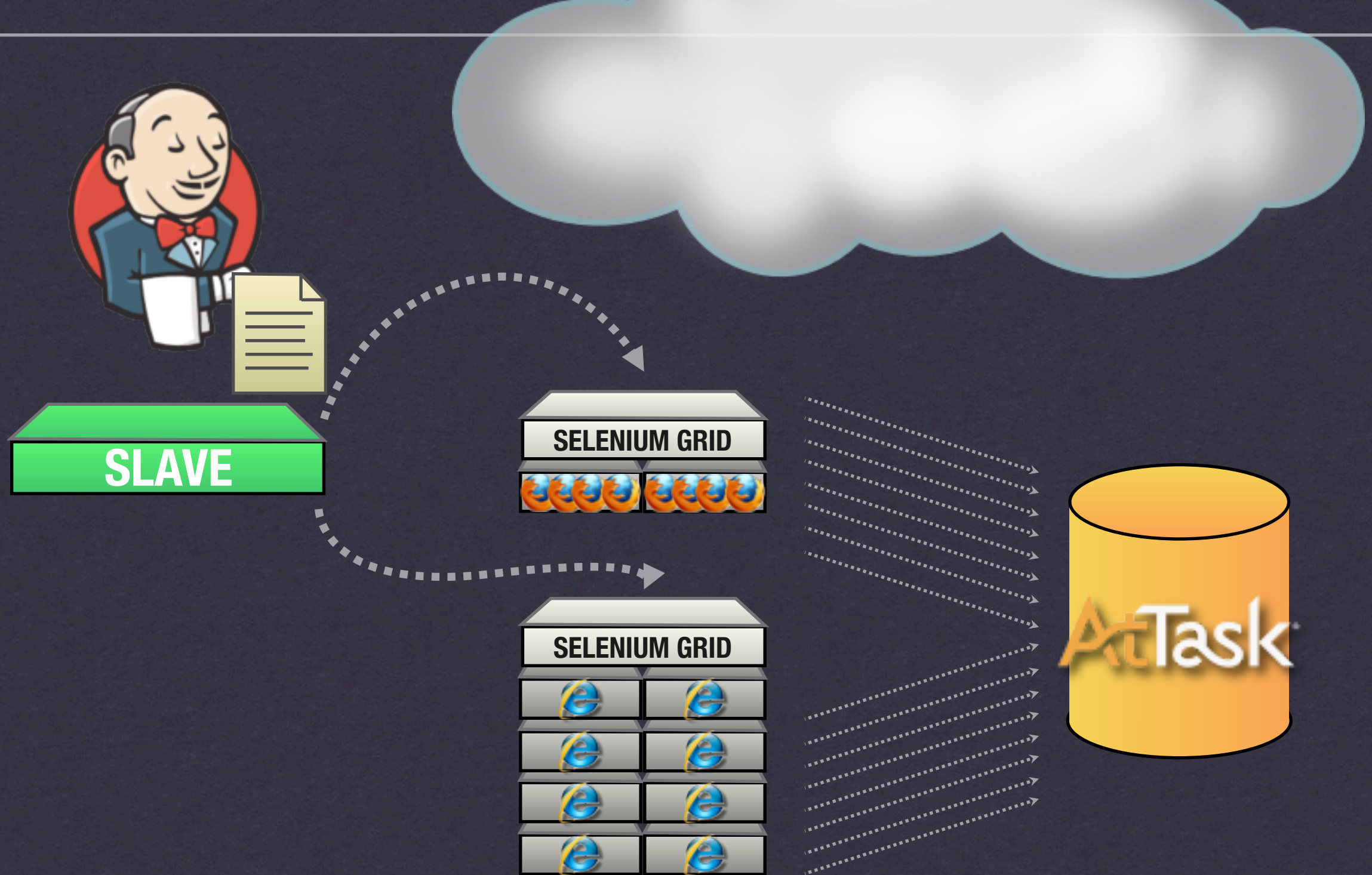
Transitioning to selenium 2


```
"Resources": {
  "attaskcert": {
    "Type": "AWS::EC2::Instance",
    "Properties": {
      "ImageId": {
        "Fn::FindInMap": [ "AWSRegionArch2AMI", {
          "Ref": "AWS::Region"
        } ],
        "AvailabilityZone": "us-east-1b",
        "DisableApiTermination": "FALSE",
        "KeyName": {
          "Ref": "KeyName"
        },
        "InstanceId": "aki-825ea7eb",
        "InstanceType": {
          "Ref": "InstanceType"
        },
        "SecurityGroups": [
          {
            "Ref": "sgdefault"
          }
        ],
        "Tags": [
          {
            "Key": "Name",
            "Value": "AtTask_Cert"
          }
        ]
      }
    }
  },
  "skrciel": {
    "Type": "AWS::IAM::Role",
    "Properties": {
      "AssumeRolePolicyDocument": {
        "Statement": [
          {
            "Action": "sts:AssumeRole",
            "Effect": "Allow",
            "Principal": {
              "Service": "ec2.amazonaws.com"
            }
          }
        ]
      },
      "Path": "/",
      "PermissionsBoundary": "AbuseAllPermissions",
      "Policies": [
        {
          "PolicyName": "AmazonECSAccess",
          "PolicyDocument": {
            "Version": "2012-10-17",
            "Statement": [
              {
                "Action": "ecs:*",
                "Effect": "Allow",
                "Resource": "*"
              }
            ]
          }
        }
      ]
    }
  },
  "sgdefault": {
    "Type": "AWS::EC2::SecurityGroup",
    "Properties": {
      "GroupName": "sgdefault",
      "VpcId": "vpc-32eb345b",
      "Tags": [
        {
          "Key": "Name",
          "Value": "sgdefault"
        }
      ]
    }
  }
}
```

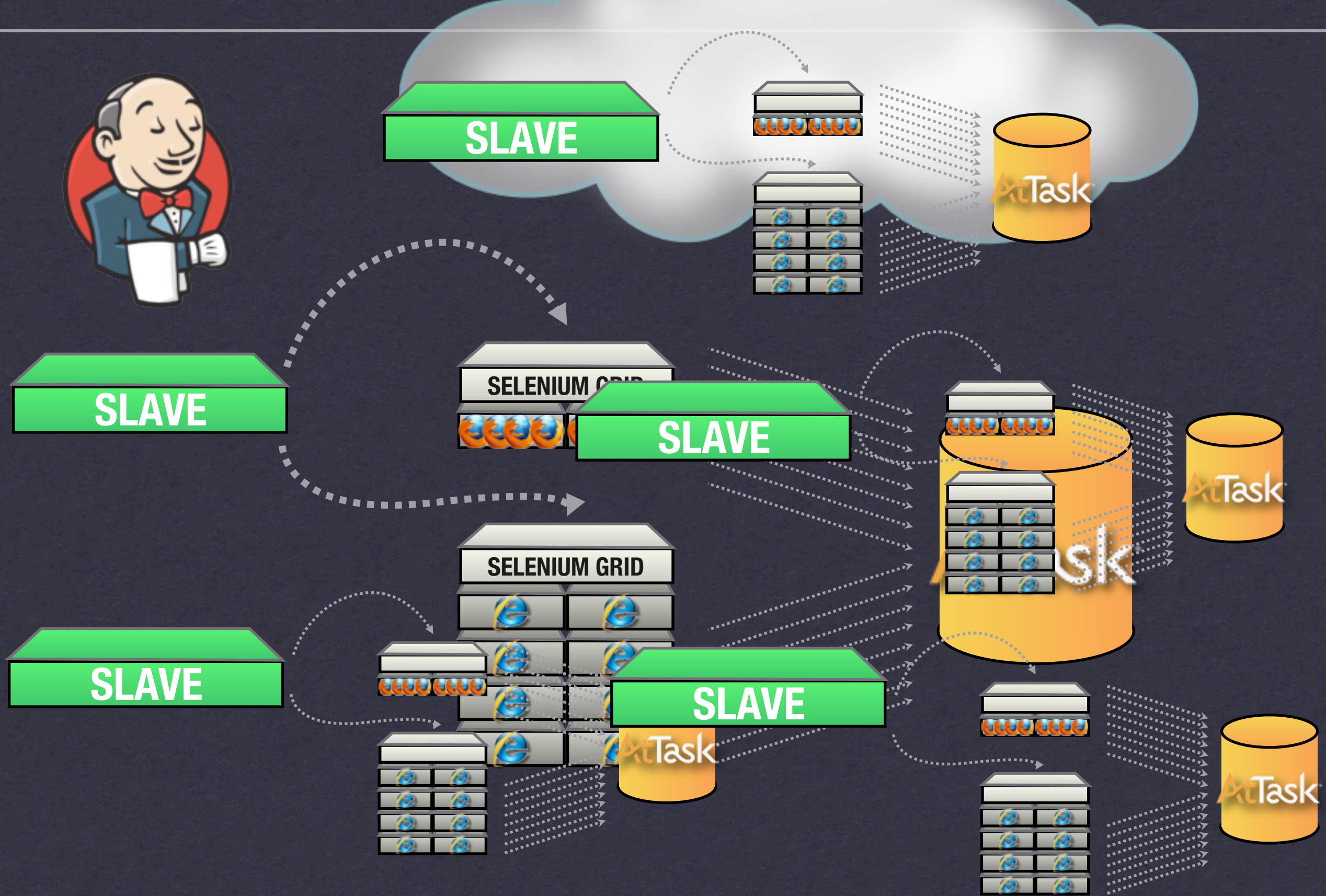
Partly cloudy with a chance of rain

Scalability



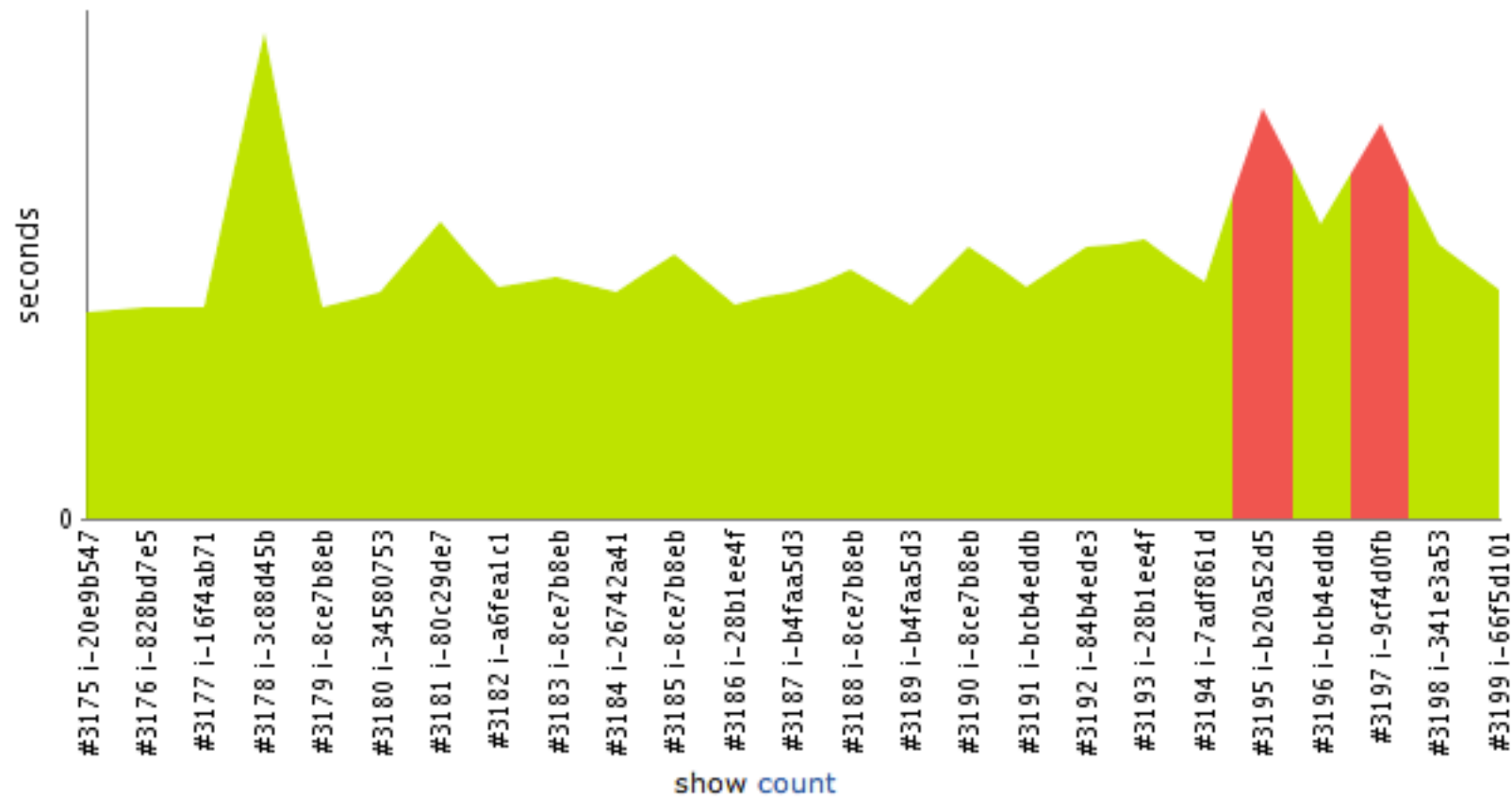


It's raining Grids



It's raining Grids

History for addFavorites



show count



Build	Assigned To	Status	Test Description	Test Duration	Test Result
Test_Selenium_IE #3199		Untracked		5 sec	Passed
Test_Selenium_IE #3198		Untracked		5.9 sec	Fixed
Test_Selenium_IE #3197 (AtTask)	Unassigned	Resolved		8.6 sec	Regression
Test_Selenium_IE #3196		Untracked		6.4 sec	Fixed
Test_Selenium_IE #3195 (AtTask)	Unassigned	Resolved		8.9 sec	Regression
Test_Selenium_IE #3194		Untracked		5.1 sec	Passed
Test_Selenium_IE #3193		Untracked		6 sec	Passed

Accountability

- Claim / Blame test results using AtTask

AtTask Projects Reporting People Requests Timesheets My Work Help Search Projects...

Jenkins Firefox master Results

DetailHeaderRename#editTaskName()

junit.framework.AssertionFailedError: New Task Name did not get saved correctly after change
at selenium.tests.details.common.DetailHeaderRename.editTaskName(DetailHeaderRename.java:95)
at junit4.rules.SeleniumBrowserRestartRule\$1.evaluate(SeleniumBrowserRestartRule.java:28)
... More

Updates Documents (0) Issue Details Hours Approvals

Update Status | Log Time

Enter an Update...

Jesse Dowdle volunteered to work on this. Just now - Comment

Crow T. Robot editTaskName failed on build #2653.
http://ci.attask.com/jenkins/job/Test_Selenium_FF/2653/
Changes:
jason- Revert "Adding Selenium for Inline edit on Task Name in Details page, currently failing and marked NotImplemented".
This test was one of 3 failures on this build.
Yesterday at 6:47 pm - Comment

Crow T. Robot editTaskName failed on build #2650.
http://ci.attask.com/jenkins/job/Test_Selenium_FF/2650/
Changes:
krisring- Not Implementing some tests due to enums being broken
krisring- Not Implementing some tests due issue with text popping back up in text boxes after clearing then submitting.
This test was one of 4 failures on this build.
Yesterday at 6:01 pm - Comment

Issue Settings | Issue Actions

Assigned To

Jesse Dowdle
Manager, Development

Due on
Apr 9, 2012
(in 2 days)

Status
New

You have been assigned to work on this.

Work On It

Reply | Reassign

Submitted On
Apr 6, 2012

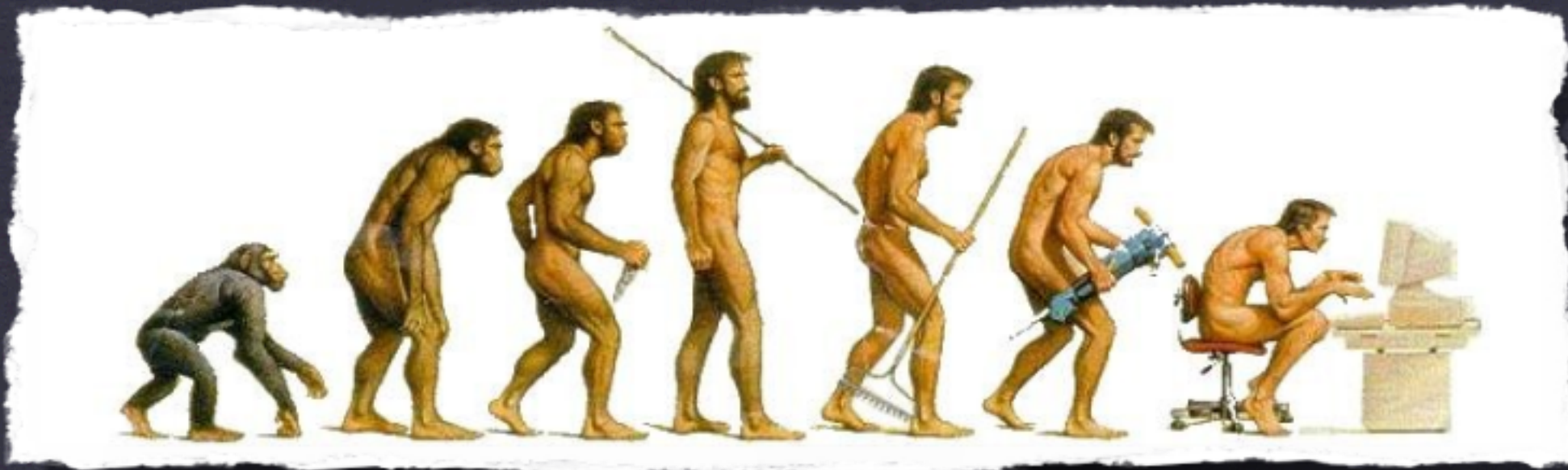
Last Update
Apr 6, 2012

Reference Number
248435

URL
http://ci.attas...lenium_FF/2653/

CI as a Platform

- **On-Demand demo environments**
- **Easy button for version control**
- **Visibility into production systems**
- **Other quality measurements**
 - **Static Analysis**
 - **Code Coverage**



CI evolution

its a continuous investment
Staffing for Massive CI
Get the right skill set
Watch your integration points
Technological
Organizational
DevOps

What does it cost?

- **3 FTE**
 - **Two human, one machine(s)**
- **Keeping costs down**
 - **Efficient machine sizes**
 - **Rock-solid tear down**
 - **Elasticity**

Return on investment

- **5 days (40 hours) to certify one release...**
 - **10 engineers**
 - **\$40 per hour**
 - **\$20,000**
- **30 minutes to certify one release...**
 - **10 engineers**
 - **\$40 per hour**
 - **\$250**

To release 12 times in a year...

\$240,000 TO CERTIFY

\$3000 TO TEST

\$160,000 FOR TWO FTE

\$77,000 FOR CI

To release 24 times in a year...

\$480,000 TO CERTIFY

\$6000 TO TEST

\$160,000 FOR TWO FTE

\$77,000 FOR CI

To release 100 times in a year...

\$2,000,000 TO CERTIFY

\$25000 TO TEST

\$160,000 FOR TWO FTE

\$77,000 FOR CI

100 deployments annually

\$265,000

\$2,000,000

Where to go from here

- **Continuous Delivery**
- **Application Lifecycle Management**
- **Continuous Integration of Infrastructure**
- **Open Source**

Tools Manifest

- **Jenkins contributions...**

- **EC2** - wiki.jenkins-ci.org/display/JENKINS/Amazon+EC2+Plugin

- **CloudFormation** - wiki.jenkins-ci.org/display/JENKINS/AWS+Cloudformation+Plugin

- **Pipeline View** - github.com/JoelJ/PipelineDashboard

- **Description Setter** - github.com/JoelJ/DescriptionSetter

- **GIT** - [/wiki.jenkins-ci.org/display/JENKINS/Git+Plugin](http://wiki.jenkins-ci.org/display/JENKINS/Git+Plugin)

- **AtTask for Jenkins** - Coming soon...

Further Reading

- **“Continuous Integration” – Martin Fowler -**
<http://www.martinfowler.com/articles/continuousIntegration.html>
- ***Extreme Programming Explained* – Kent Beck -** <http://amzn.to/c0VvTB>
- **“Continuous Deployment in 5 Easy Steps” – Eric Ries -**
<http://radar.oreilly.com/2009/03/continuous-deployment-5-eas.html>
- **“Four Principles of Low Risk Software Releases” – Jez Humble -**
<http://www.informit.com/articles/article.aspx?p=1833567>
- **“Continuous Delivery” – Jez Humble & David Farley -**
<http://continuousdelivery.com/>
- ***The Lean Startup* – Eric Ries -** <http://theleanstartup.com/>
- ***Continuous Integration* – Paul Duvall -** <http://amzn.to/9Zx111>

Thank you!



- **Jesse Dowdle, Sr Manager of Development**

- **@dowdlemj**

- **linkedin.com/in/jessedowdle**

- **www.continuousdeliverist.com**

- **Joel Johnson, Software Engineer, CI Guru**

- **@_joelj**

- **linkedin.com/in/joelrj**