The Need For Speed: Building Pipelines To Be Faster

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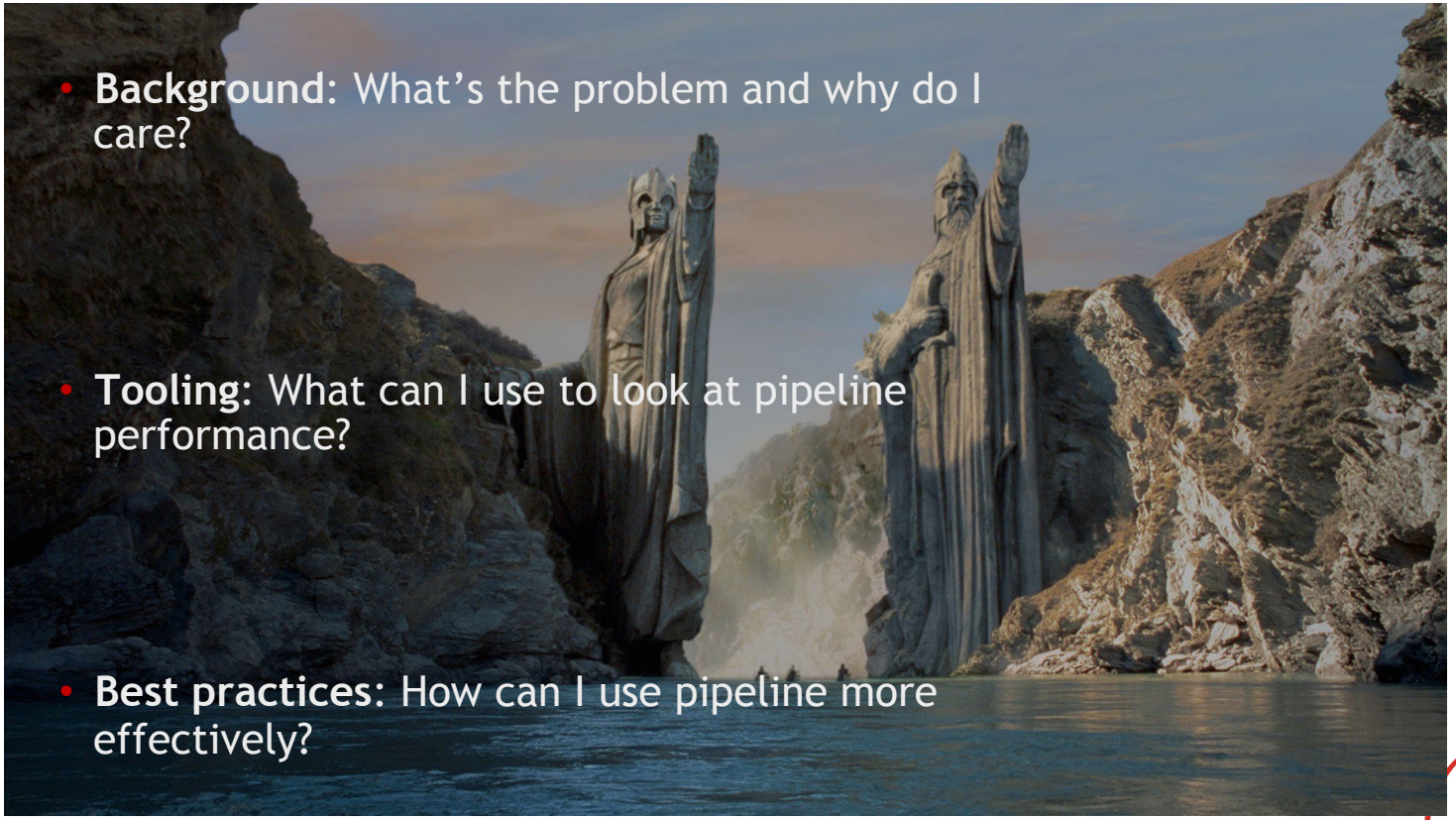
#JenkinsWorld

Where is our journey going?



- **Background**: What's the problem and why do I care?
- **Tooling**: What can I use to look at pipeline performance?
- **Best practices**: How can I use pipeline more effectively?

Background

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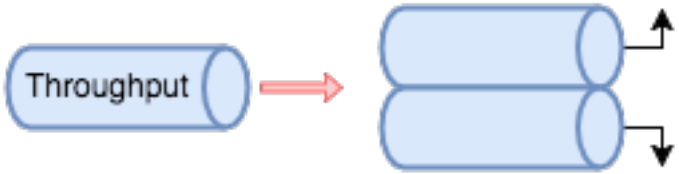
What Does “Fast” Really Mean: Throughput?

- **Throughput:** solved by scale-out or separation of concerns
  - Distributed builds: many build agents (slaves) per master
  - Multiple masters (one per team)



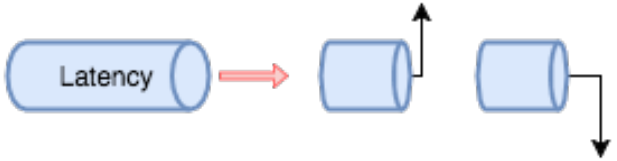
What Does “Fast” Really Mean: Resource Use?

- **Resource Use:**
  - AWS c4.xlarge: 4 vCPU, 7.5 GB RAM
    - **~$153/month** On-demand ($95 reserved)
    - Each **may support dozens of engineers**
  - Software Engineer: (Just salary + vacation)
    - ~**$3000-17000**/month* (plus benefits!)
  - Conclusion: Commodity Hardware is CHEAP!

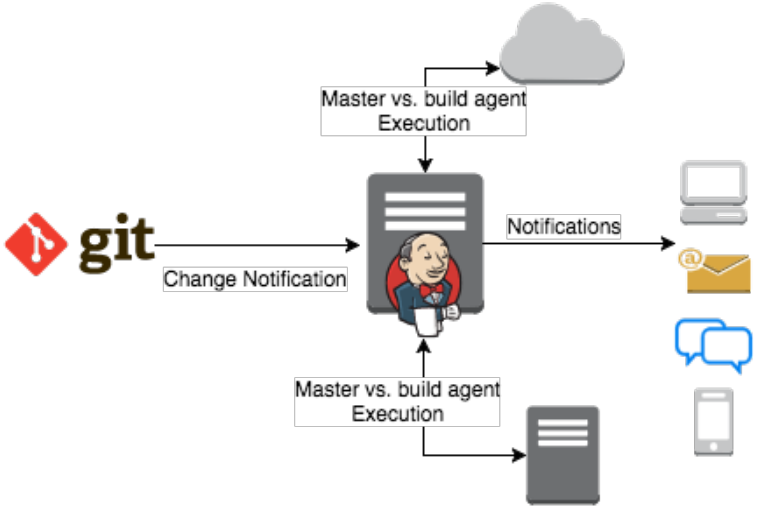
*Rough figures for US/EU engineers across geos, junior to principal level

What Does “Fast” Really Mean: LATENCY!

- **Latency:** the King!
  - Low turn around time = ship FASTER
  - Low turn around = less context switching for engineers
  - Context switching = lost time & mistakes
  - Staff time >> CPU time, so…
- **YES, we have the answer!**



What Are The Components Of Latency For Jenkins Pipelines?



1. **Triggering delay**: time from commit until a build is enqueued
2. **On-master overheads:** orchestration and tracking
3. **Queueing time**: waiting for an executor slot
4. **Executor time:** how long it takes to build, test, deploy
5. **Feedback delay:** time until someone that cares sees the key result (pass/fail)

Let's Get The Basics Out Of The Way: Triggering and Master

- **Triggering delay**:
  - Use web hooks or commit hooks: faster than polling, easier on Jenkins and the SCM
    - Everyone loves "GitHub API rate limit exceeded"
  - Short polling cycles can give a fast response time, but dramatically increase resource use (see also: CloudBees support ticket history)

- **On-master overhead**:
  - Delete old build records
  - Don't give masters any executors
  - Don't dump GBs of data to logs (should go without saying, but I've seen it)

Let's Get The Basics Out Of The Way: Executor Use

- **Queueing Time**
  - You must construct additional build agents (slaves)
  - Dynamic agents are an easy solution: cloud agents, Docker agents, etc
- **Feedback Delay**
  - Limit the spam! Only the culprits.
  - Make it meaningful, failure or prod
  - Use better systems: IM not email

Let’s Get The Basics Out Of The Way

- **Triggering delay**:
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  - Short polling cycles can give a fast response time, but dramatically increase resource use (see also: CloudBees support ticket history)
- **On-master overhead**:
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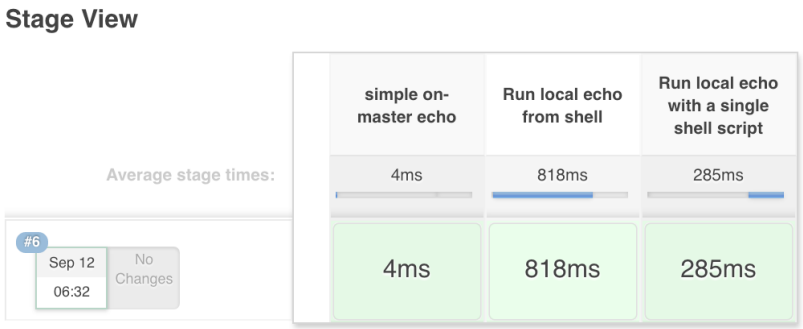
- **Queueing Time**:
  - You must construct additional build agents (slaves)
  - Dynamic slaves are an easy solution: cloud agents, Docker agents, etc
- **Notifications**
  - Limit the spam (people will ignore it), use IM not email

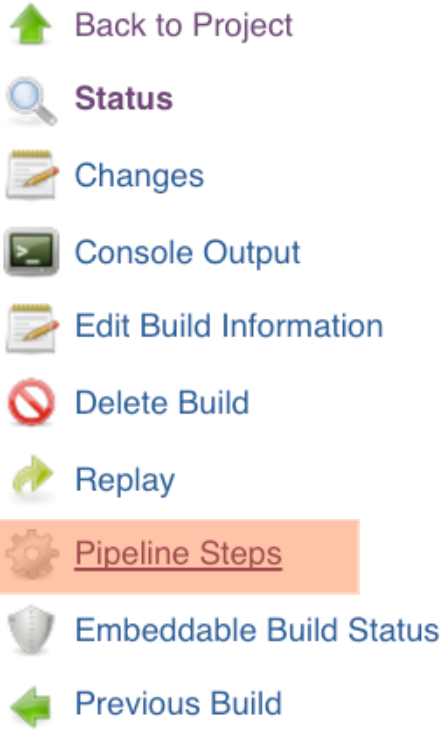

TOOLS!

Analysis, the Top Level: Pipeline Stage View



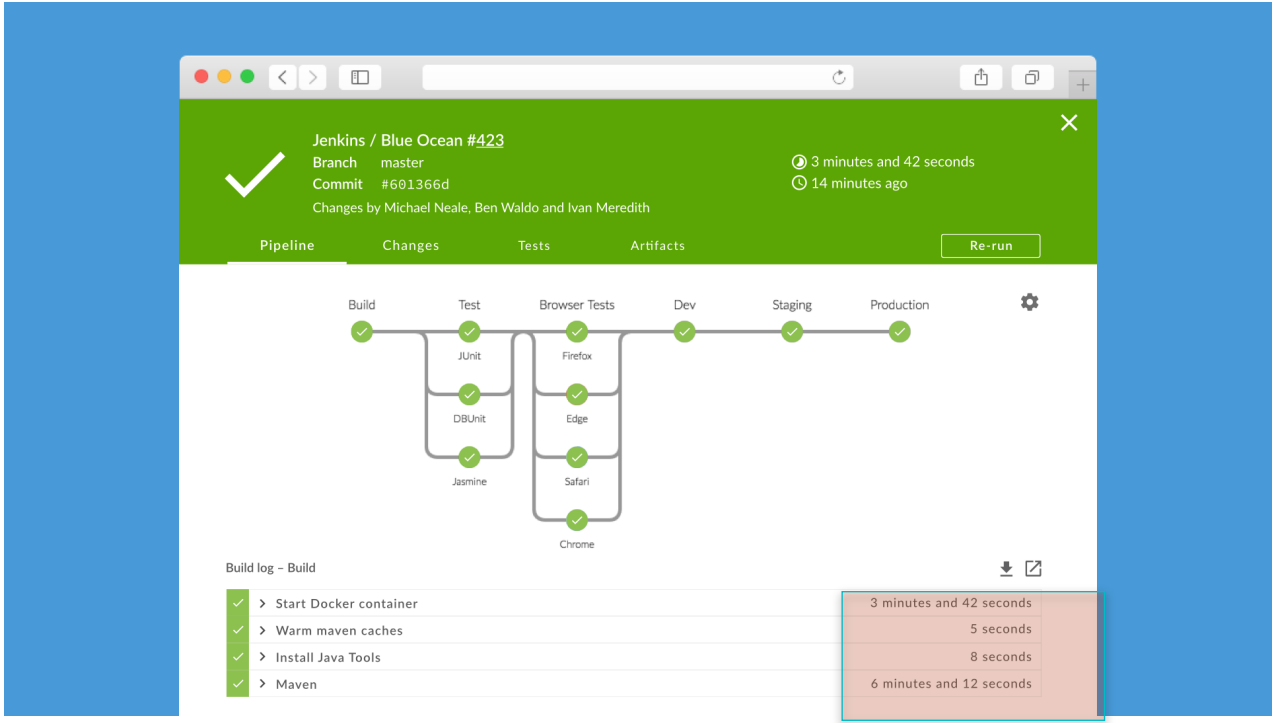

```groovy
stage('simple on-master echo') {
  for(int i=0; i<3; i++) {
    echo 'printing simple message'
  }
}
stage('Run local echo from shell') {
  node {
    for(int i=0; i<3; i++) {
      sh 'echo "running shell"'
    }
  }
}
stage('Run local echo with a single shell script') {
  node {
    sh 'for i in {1..3}; do echo "printing $i"; done'
  }
}
```

New: Pipeline Steps View As a Profiler



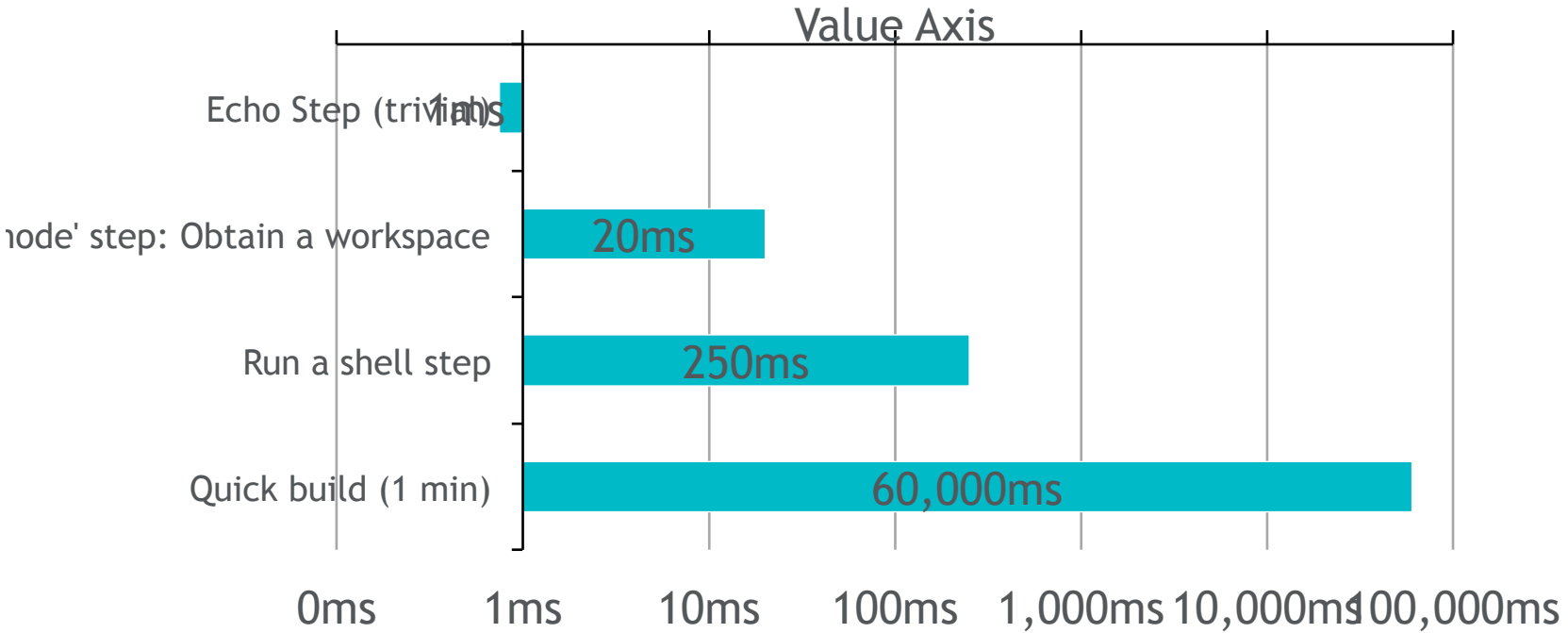
Step	Status
Start of Pipeline	
Stage : Start - (24 ms in block)	
simple on-master echo - (1 ms in block)	
Print Message	
Print Message - (1 ms in self)	
Print Message	
Stage : Start - (0.82 sec in block)	
Run local echo from shell - (0.81 sec in block)	
Allocate node : Start - (0.81 sec in block)	
Allocate node : Body : Start - (0.8 sec in block)	
Shell Script - (0.25 sec in self)	
Shell Script - (0.26 sec in self)	
Shell Script - (0.25 sec in self)	
Stage : Start - (0.28 sec in block)	
Run local echo with a single shell script - (0.28 sec in block)	
Allocate node : Start - (0.28 sec in block)	
Allocate node : Body : Start - (0.27 sec in block)	
Shell Script - (0.26 sec in self)	

Alternative Approach: Blue Ocean



How Long Does Pipeline Take? (Roughly)

- Hardware: modern AWS instance types with EBS storage (SSD)



- Standard modern AWS instances (with EBS SSD storage) - may improve over time!

Best Practices
What should I do?

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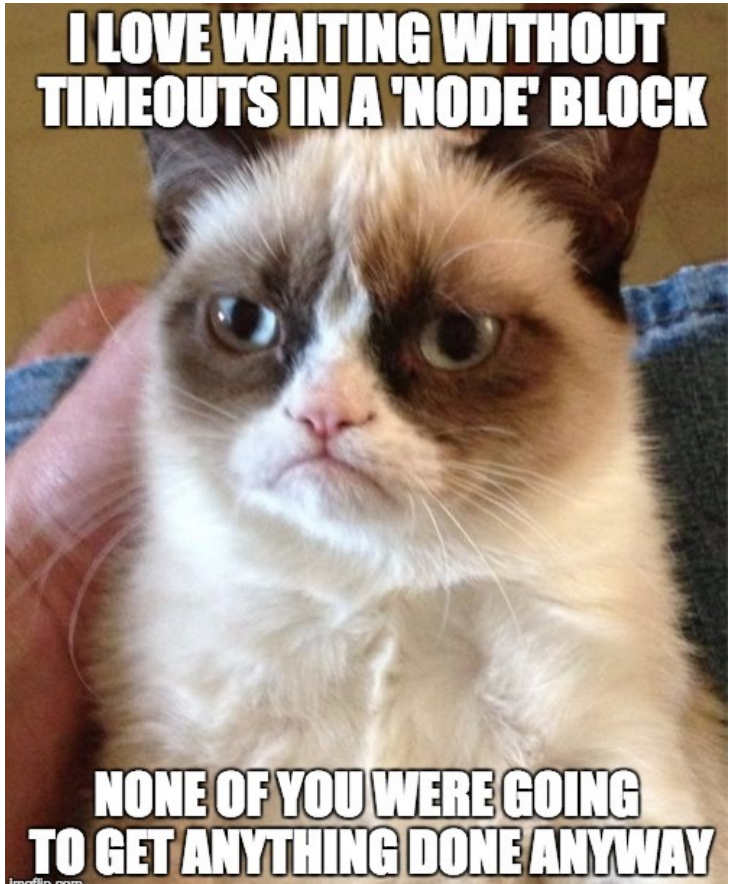
Hardcore Antipatterns That Can Breaking The World



- Input step that locks up an executor

```
stage ('make pipeline developers cry') {
    node {
        sh 'mvn clean install'
        input 'can we do something already?'
    }
}
```

- Godot wont't show up: but angry coworkers will

```
stage ('Why the pain?!?!') {
    waitUntil {
        node {
            try {
                sh './waitForGodot.sh'
            } catch (Exception fail) {
                return false;
            }
        }
    }
    // Deploy or publish
}
```

Better Practice: Bounded Loops


```
node('deployer') {
    try {
        retry (3) {
            deploy(serverName);
        }
    } catch (hudson.AbortException ex) {
        rollbackDeploy(serverName);
        throw new Exception("Deploy failed on $serverName", ex);
    }
}
```

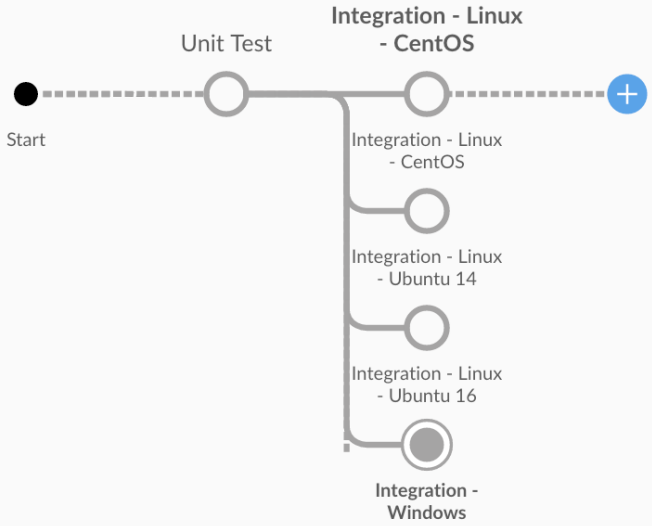
- We get it, things fail - network requests, downtime, slow processes
- Computers are dumb: they don't know when to stop
- Pipelines persist state: unbounded loops are like leaving your garden hose on
- Best practice within a node{ } block

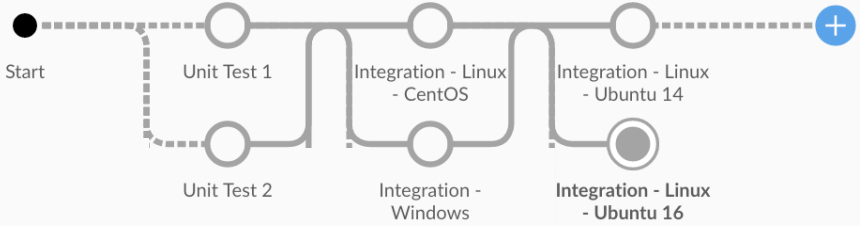
Better Practice: Timeouts


```
try {
    timeout(time: 30, unit: 'SECONDS') {
        issueApiCall(params);
    }
} catch (FlowInterruptedException ex) {
    echo 'API call timed out!'
    cleanup();
    throw new Exception("API call timed out!")
}
```

- Subtler version of retry case
- Are you deploying? Are you doing network calls?
  - You need a timeout somewhere.
  - Yes, really.
- Lets you safely recover from hangups
- Yes, you can AND SHOULD mix with retries for critical bits

#1 Biggest Time Saver: Effective Use Of Parallel





#2 Biggest Time Saver: Effective Notifications


```groovy
// Notify with each failure in the parallel branches, but still get the full test results
Closure wrapTest(String testName, Closure test) {
    try {
        test.call()
    } catch (Exception ex) {
        // Basic example, you might include a link, or first line of stack trace, send email, etc
        String failure = "Build FAILED in test $testName - ${env.JOB_NAME} ${env.BUILD_NUMBER}"
        hipchatSend notify:true, message: failure
        throw ex;
    }
}

def testBranches = ['failFast':false]
testBranches['linux'] = wrapTest('linux', {
    node('linux') {
        git repoName
        sh 'make build test'
    }
})
testBranches['windows'] = wrapTest('windows') {
    node('windows') {
        git repoName
        bat 'build.bat test'
    }
}

parallel testBranches
```

Optimization: Consolidate, Consolidate, Consolidate!

- Node blocks:
  - Giving up a workspace lease means someone else might snatch it!
- Shell/batch steps
  - Remember that ~0.25s overhead for each shell step? Consolidate!
- Complex processing logic (XML parsing etc):
  - CPS has some significant overheads for tracking all the things
  - Use @NonCPS functions for more complex processing w/ no steps
  - Next step: use a helper script for processing

Conclusions

- Focus on **latency** (turn around time)
  - Prioritizes what matters (results and technical labor) over what doesn't (CPU time)
  - Easier to measure, easier to use
- **Tools**:
  - Stage View —> Blue Ocean for top level
  - Pipeline steps for specifics
    - Pipeline step view: step and block level
    - Blue Ocean and Stage View* for per-step stats
- **Best Practices**:
  - Use parallel right, use notifications early and often
  - Don't block things: input outside of workspace, retry, timeout

Thank you, and I hope everyone enjoyed their time at Jenkins World!

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