

An aerial photograph of the Golden Gate Bridge in San Francisco, California, taken during the "blue hour" of twilight. The bridge's iconic orange-red towers and suspension cables are silhouetted against a pale, hazy sky. The bridge spans the dark, calm waters of the San Francisco Bay. In the foreground, a steep, rocky cliffside descends from the right towards the water's edge. A winding asphalt road with white lane markings and a guardrail curves along the top of the cliff. Several cars are visible on the road, their headlights and taillights glowing. The ocean below shows gentle waves lapping at a dark, pebbly beach. In the distance, rolling hills and other parts of the city are visible under the soft light of the setting or rising sun.

# Docker Beyond the Classroom

\$ whoami

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```
$ whois meltwater.com
```

Media monitoring company

Get data, enrich, analyze, search

~350 engineers

Using docker in production since 2014



# Agenda

Docker @ Class

Demos

Beyond the Classroom

How Can Docker Help

Kubernetes?

Discussion

# Docker @ Class

## What is Docker?

Docker is a tool to create container images and manage container instances

## What is a container?

A standard unit of software







A container is a standard unit of software that packages up code and all its dependencies so the application runs quickly and reliably from one computing environment to another.

A Docker container image is a lightweight, standalone, executable package of software that includes everything needed to run an application: code, runtime, system tools, system libraries and settings.



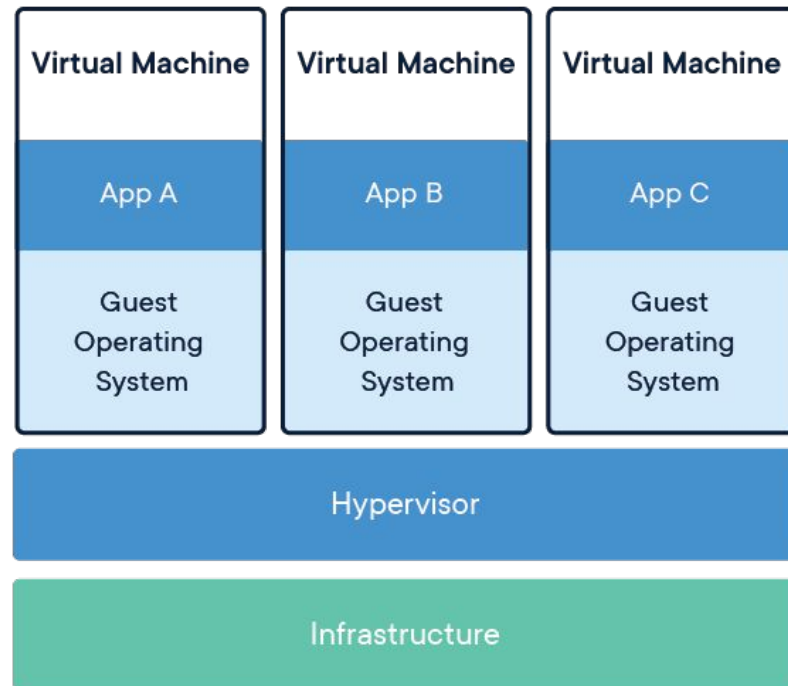
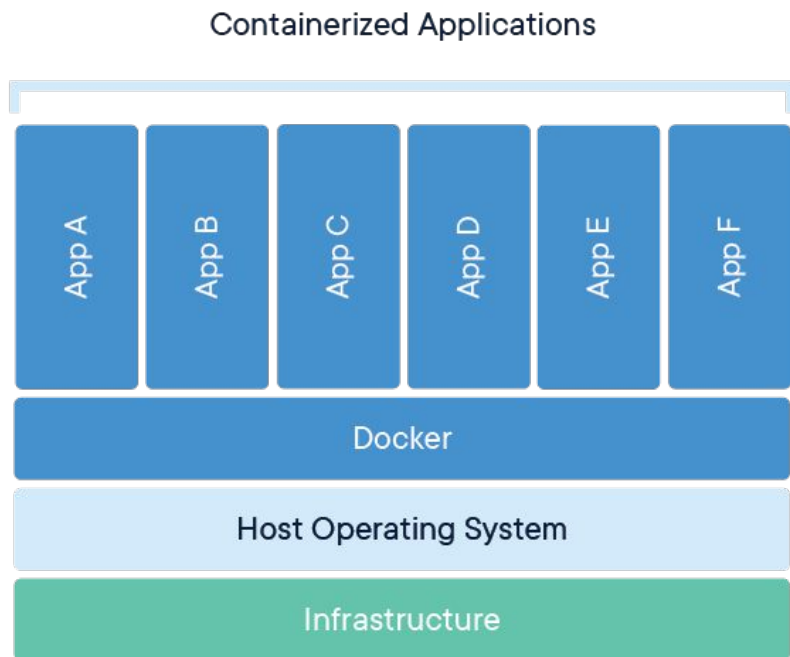
A bunch of code together = An application

An application = A container image

An application instance = A container instance



# Docker @ Class



## Containers are

- Standardized
- Isolated
- Lightweight
- Secure
- Reproducible
- Cheap



### Run a container (spawn a container instance from an image)

```
$ docker run [<FLAGS>] <IMAGE> [<COMMAND>]
```

example:

```
$ docker run -it -p 8080:80 nginx
```



## Manage a container

```
$ docker ps
```

```
$ docker [start|stop|pause|kill] <ID>
```



# DEMO





## Build a container

```
$ docker build [<FLAGS>] <PATH>
```

example

```
$ docker build -f path/to/Dockerfile .
```



## Anatomy of a Dockerfile

A Dockerfile is a simple text file containing instructions on how to assemble a Docker image

*# comment*

**INSTRUCTION** arguments



```
$ cat Dockerfile
```

```
FROM python:3.7-slim
```

```
LABEL maintainer="attila.nagy@meltwater.com"
```

```
COPY requirements.txt /tmp/requirements.txt
```

```
RUN pip install -r /tmp/requirements.txt
```

```
COPY my_source_code /my_app/my_source_code
```

```
ENTRYPOINT ["python3"]
```

```
CMD ["/my_app/my_source_code/main.py"]
```

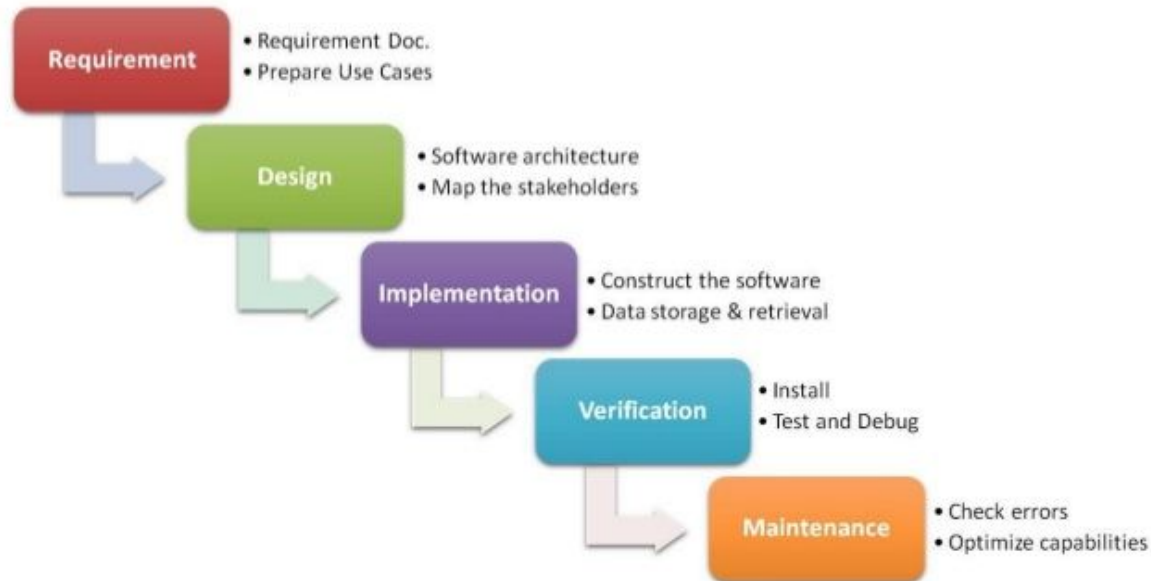


# DEMO

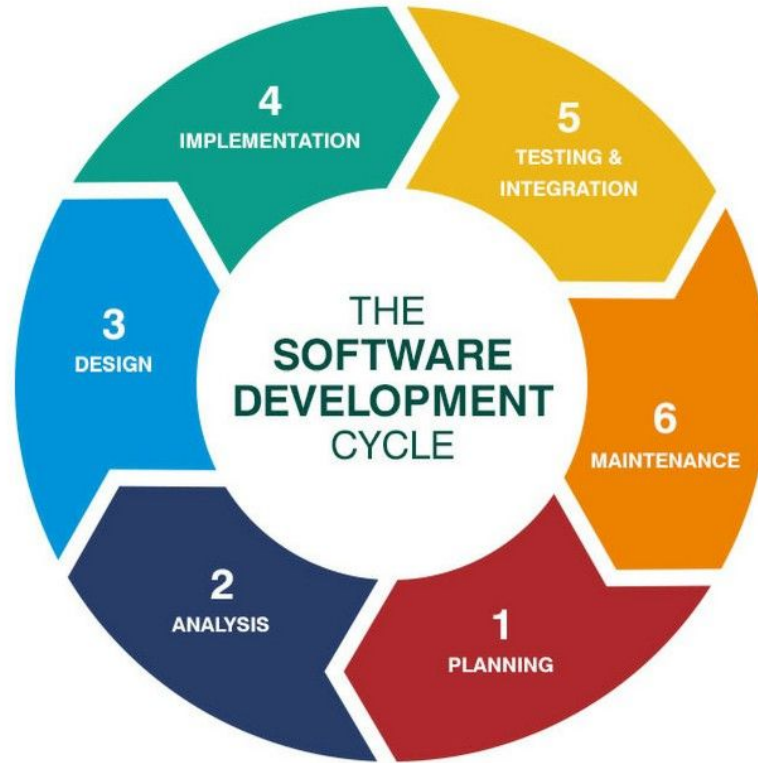


# Beyond the Classroom

## The Waterfall Model



# Docker Beyond the Classroom - Story

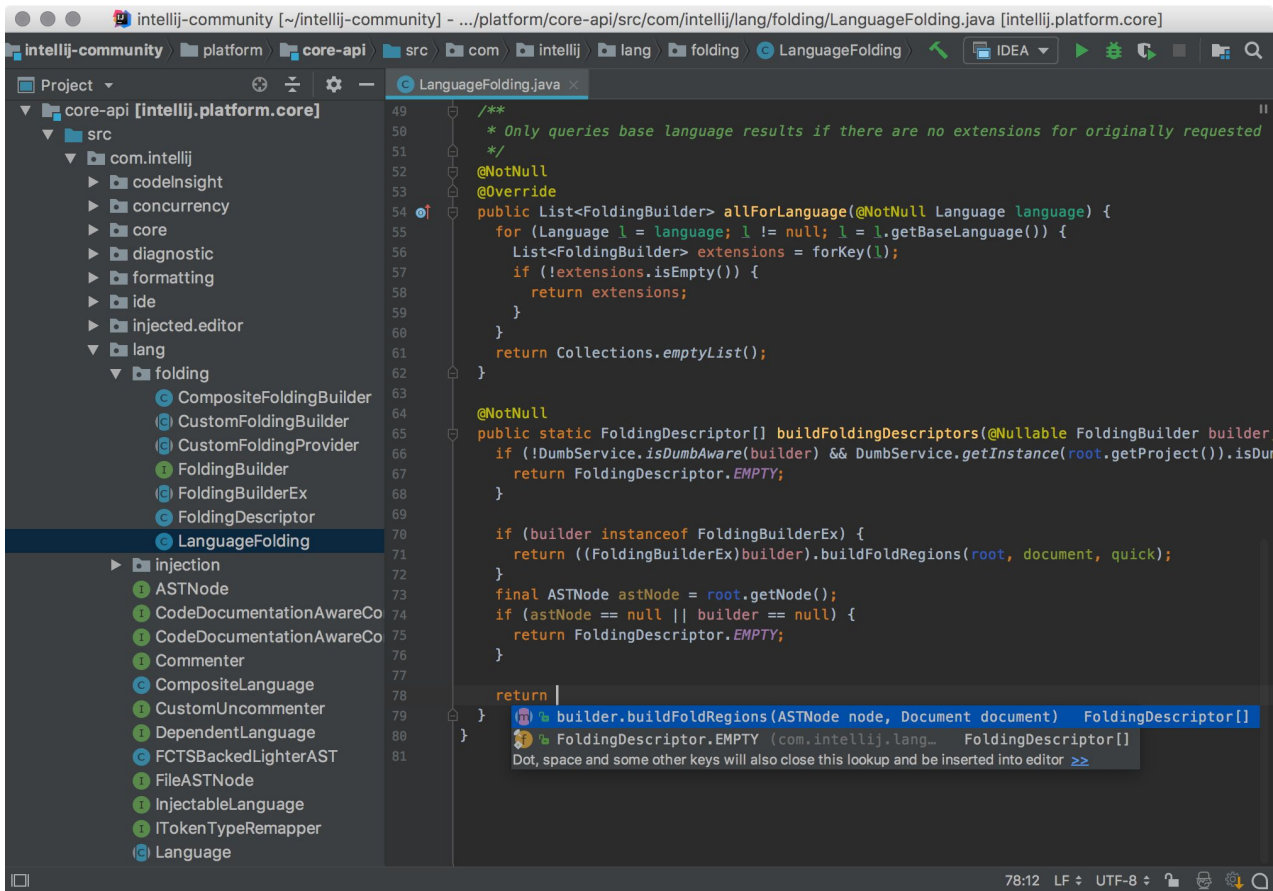


## Docker Beyond the Classroom - Story




















# Docker Beyond the Classroom - Story





# Docker Beyond the Classroom - Story

Run:  Unittests for model.AutoscalerTests 










▼  Test Results


19 s 994 ms




▼  model


19 s 994 ms




▼  AutoscalerTests


19 s 994 ms




 test\_autoscaling\_group


822 ms




 test\_autoscaling\_group\_adjust\_desired\_capacity


1 s 923 ms




 test\_cluster


783 ms




 test\_cluster\_health\_query


175 ms




 test\_node


417 ms




 test\_node\_eviction


5 s 368 ms




 test\_node\_eviction\_unable\_to\_evict


5 s 537 ms




 test\_node\_exclusion\_setting


317 ms




 test\_scale\_down


1 s 822 ms




 test\_scale\_down\_needed


121 ms




 test\_scale\_down\_not\_needed


195 ms




 test\_scale\_up


1 s 193 ms




 test\_scale\_up\_needed


123 ms



 test\_scale\_up\_not\_needed

121 ms



 test\_select\_nodes\_by\_least\_amount\_of\_disk\_used

1 s 77 ms



# Docker Beyond the Classroom - Story



## Docker Beyond the Classroom - Story



# Docker Beyond the Classroom - Story

```
java.lang.RuntimeException
    at sun.reflect.NativeConstructorAccessorImpl.newInstance0(Native Method)
    at sun.reflect.NativeConstructorAccessorImpl.newInstance(NativeConstructorAccessorImpl.java:39)
    at sun.reflect.DelegatingConstructorAccessorImpl.newInstance(DelegatingConstructorAccessorImpl.java:27)
    at java.lang.reflect.Constructor.newInstance(Constructor.java:513)
    at org.codehaus.groovy.reflection.CachedConstructor.invoke(CachedConstructor.java:77)
    at org.codehaus.groovy.runtime.callsite.ConstructorSite$ConstructorSiteNoUnwrapNoCoerce.callConstructor(ConstructorSite.java:52)
    at org.codehaus.groovy.runtime.callsite.CallSiteArray.defaultCallConstructor(CallSiteArray.java:52)
    at org.codehaus.groovy.runtime.callsite.AbstractCallSite.callConstructor(AbstractCallSite.java:192)
    at org.codehaus.groovy.runtime.callsite.AbstractCallSite.callConstructor(AbstractCallSite.java:196)
    at newifyTransform$_run_closure1.doCall(newifyTransform.gdsl:21)
    at sun.reflect.NativeMethodAccessorImpl.invoke0(Native Method)
    at sun.reflect.NativeMethodAccessorImpl.invoke(NativeMethodAccessorImpl.java:39)
    at sun.reflect.DelegatingMethodAccessorImpl.invoke(DelegatingMethodAccessorImpl.java:25)
    at java.lang.reflect.Method.invoke(Method.java:597)
    at org.codehaus.groovy.reflection.CachedMethod.invoke(CachedMethod.java:86)
    at groovy.lang.MetaMethod.doMethodInvoke(MetaMethod.java:234)
    at org.codehaus.groovy.runtime.metaclass.ClosureMetaClass.invokeMethod(ClosureMetaClass.java:272)
    at groovy.lang.MetaClassImpl.invokeMethod(MetaClassImpl.java:893)
    at org.codehaus.groovy.runtime.callsite.PogoMetaClassSite.callCurrent(PogoMetaClassSite.java:66)
    at org.codehaus.groovy.runtime.callsite.AbstractCallSite.callCurrent(AbstractCallSite.java:151)
    at newifyTransform$_run_closure1.doCall(newifyTransform.gdsl)
    at sun.reflect.NativeMethodAccessorImpl.invoke0(Native Method)
    at sun.reflect.NativeMethodAccessorImpl.invoke(NativeMethodAccessorImpl.java:39)
    at sun.reflect.DelegatingMethodAccessorImpl.invoke(DelegatingMethodAccessorImpl.java:25)
    at java.lang.reflect.Method.invoke(Method.java:597)
    at org.codehaus.groovy.reflection.CachedMethod.invoke(CachedMethod.java:86)
    at groovy.lang.MetaMethod.doMethodInvoke(MetaMethod.java:234)
    at org.codehaus.groovy.runtime.metaclass.ClosureMetaClass.invokeMethod(ClosureMetaClass.java:272)
    at groovy.lang.MetaClassImpl.invokeMethod(MetaClassImpl.java:893)
    at org.codehaus.groovy.runtime.callsite.PogoMetaClassSite.call(PogoMetaClassSite.java:39)
    at org.codehaus.groovy.runtime.callsite.AbstractCallSite.call(AbstractCallSite.java:121)
    at org.jetbrains.plugins.groovy.dsl.GroovyDslExecutor$_processVariants_closure1.doCall(GroovyDslExecutor.groovy:54)
    at sun.reflect.GeneratedMethodAccessor61.invoke(Unknown Source)
    at sun.reflect.DelegatingMethodAccessorImpl.invoke(DelegatingMethodAccessorImpl.java:25)
    at java.lang.reflect.Method.invoke(Method.java:597)
    at org.codehaus.groovy.reflection.CachedMethod.invoke(CachedMethod.java:86)
    at groovy.lang.MetaMethod.doMethodInvoke(MetaMethod.java:234)
    at org.codehaus.groovy.runtime.metaclass.ClosureMetaClass.invokeMethod(ClosureMetaClass.java:272)
```



「\(\ツ\)」

**IT WORKS**  
*on my machine*

## Docker Beyond the Classroom - Story





## Why?

- The environment is too different
  - Hardware
  - OS
  - Network
  - Libs
  - Runtime (JVM)
  - Filesystem
  - Configuration
  - Service dependencies





# Docker Beyond the Classroom - Story

intellij-community [~/intellij-community] - .../platform/core-api/src/com/intellij/lang/folding/LanguageFolding.java [intellij.platform.core]

intellij-community platform core-api src com intellij lang folding LanguageFolding IDEA

Project LanguageFolding.java

```
1  [|||||]
2  [|||]
3  [|||||]
4  [|||||]
5  [|||||]
6  [|||]
Mem[
Swp[

] 7 [|||||]
] 8 [|||]
] 9 [|||||]
] 10 [|||||]
] 11 [|||||]
] 12 [|||]
] 13 [|||]
] 14 [|||]
] 15 [|||]
] 16 [|||]
] 17 [|||]
] 18 [|||]
] 19 [|||||]
] 20 [|||]
] 21 [|||]
] 22 [|||]
] 23 [|||]
] 24 [|||||]

Tasks: 124, 3914 thr; 1 running
Load average: 1.82 1.03 1.00
Uptime: 358 days(1), 23:12:43
```

PID	USER	PRI	NI	VIRT	RES	SHR	S	CPU%	MEM%	TIME+	Command
37463	root	20	0	18.80	3335M	19580	S	0.0	2.6	0:06.10	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37465		20	0	18.80	3335M	19580	S	0.0	2.6	4:42.96	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37468		20	0	18.80	3335M	19580	S	0.0	2.6	0:58.78	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37469		20	0	18.80	3335M	19580	S	0.0	2.6	0:01.92	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37470		20	0	18.80	3335M	19580	S	0.0	2.6	0:02.26	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37471		20	0	18.80	3335M	19580	S	0.0	2.6	0:00.00	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37472		20	0	18.80	3335M	19580	S	0.0	2.6	2:17.90	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37473		20	0	18.80	3335M	19580	S	0.0	2.6	0:21.85	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37474		20	0	18.80	3335M	19580	S	0.0	2.6	0:00.00	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37476		20	0	18.80	3335M	19580	S	0.0	2.6	0:00.00	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37484		20	0	18.80	3335M	19580	S	0.0	2.6	0:00.00	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37485		20	0	18.80	3335M	19580	S	0.0	2.6	0:33.52	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37497		20	0	18.80	3335M	19580	S	0.0	2.6	0:00.00	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37498		20	0	18.80	3335M	19580	S	0.0	2.6	1:41.05	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37499		20	0	18.80	3335M	19580	S	0.0	2.6	0:01.89	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37561		20	0	18.80	3335M	19580	S	0.0	2.6	0:06.95	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37562		20	0	18.80	3335M	19580	S	0.0	2.6	0:06.21	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37566		20	0	18.80	3335M	19580	S	0.0	2.6	3:26.55	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37573		20	0	18.80	3335M	19580	S	0.0	2.6	2:46.53	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37574		20	0	18.80	3335M	19580	S	0.0	2.6	1:59.65	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37575		20	0	18.80	3335M	19580	S	0.0	2.6	0:06.07	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37576		20	0	18.80	3335M	19580	S	0.0	2.6	1:06.34	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37577		20	0	18.80	3335M	19580	S	0.0	2.6	0:52.52	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37578		20	0	18.80	3335M	19580	S	0.0	2.6	0:31.51	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37579		20	0	18.80	3335M	19580	S	0.0	2.6	0:03.76	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37580		20	0	18.80	3335M	19580	S	0.0	2.6	0:03.44	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37589		20	0	18.80	3335M	19580	S	0.0	2.6	0:06.95	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37612		20	0	18.80	3335M	19580	S	0.0	2.6	0:01.37	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37616		20	0	18.80	3335M	19580	S	0.0	2.6	0:58.38	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37617		20	0	18.80	3335M	19580	S	0.0	2.6	6:18.72	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote
37618		20	0	18.80	3335M	19580	S	0.0	2.6	5:54.42	java -Xmx5000m -Dfile.encoding=UTF-8 -Dlogback.configurationFile=/service/etc/logback-json.xml -Dlogging.config=file:/service/etc/logback-json.xml -Djava.rmi.server.hostname=localhost -Dcom.sun.management.jmxremote.port=1088 -Dcom.sun.management.jmxremote

CompositeLanguage 77  
CustomUncommenter 78  
DependentLanguage 79  
FCTSBackedLighterAST 80  
FileASTNode 81  
InjectableLanguage 82  
ITokenTypeRemapper 83  
Language 84

```
return  
}  
}  
Dot, space and some other keys will also close this lookup and be inserted into editor >>
```

builder.buildFoldRegions(ASTNode node, Document document) FoldingDescriptor[]  
FoldingDescriptor.EMPTY (com.intellij.lang... FoldingDescriptor[]

78:12 LF UTF-8

# How Can Docker Help

## How could've Docker helped in the story?

- A container runs the same on the Dev's laptop and a server in prod
- Everything encapsulated in a package
- Standard way to run
- Standard way to configure
- Always start from scratch



## Packaging

- A container encapsulates everything the app needs
  - With a few exceptions...



## Isolation

- Libraries
  - No conflicts with other versions of the same lib needed by another app
- Filesystem
  - Files are not shared (by default) between containers
- From other processes



## Reproducible environments

- Easy to do full system integration tests locally
  - Dependencies
  - Dependent systems
  - Databases



# Docker Beyond the Classroom - How Can Docker Help

```
$ cat docker-compose.yaml
```

```
services:
```

```
  elasticsearch:
```

```
    image: elasticsearch:5.2.1
```

```
    ports:
```

```
      - "9200:9200"
```

```
    environment:
```

```
      - cluster.name=dummy-cluster
```

```
      - "ES_JAVA_OPTS=-Xms512m -Xmx512m"
```

```
    mem_limit: 1g
```

```
  redis:
```

```
    image: redis:3.2.4
```

```
    ports:
```

```
      - "6379:6379"
```



## Multi-tenancy

- Machine dedicated to an app...
- Multiple instances of the same app on the same machine
- Different apps on the same machine
- Just a bunch of machines
  - Pets vs. Cattle

## Container Orchestration

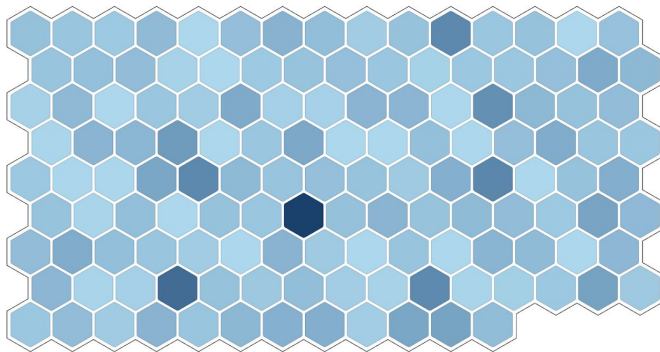
- “Make this happen, I don’t care how and where”



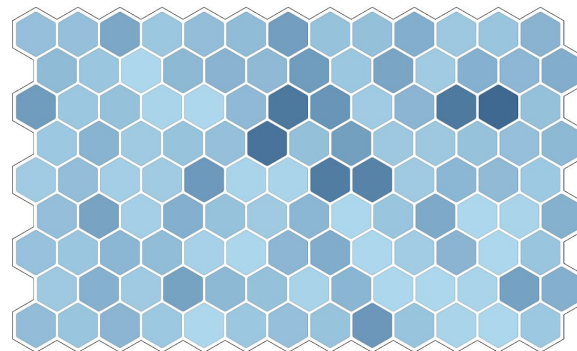


# Docker Beyond the Classroom - How Can Docker Help

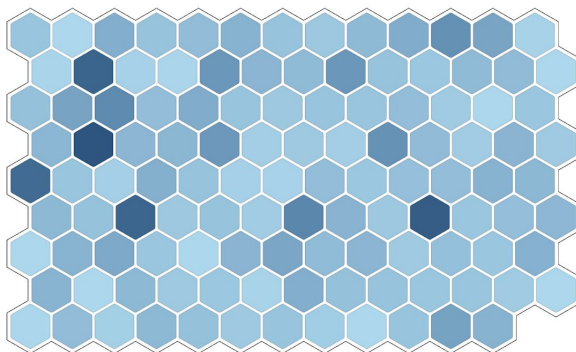
eu-west-1a



eu-west-1b



eu-west-1c



# Docker Beyond the Classroom - How Can Docker Help

