

MONOLITHS TO MICROSERVICES: APP TRANSFORMATION

Hands-on Technical Workshop

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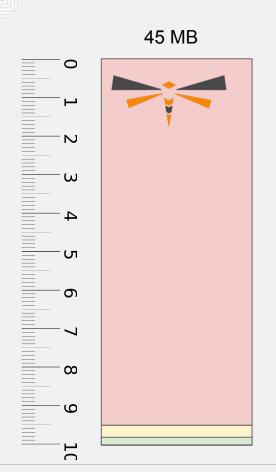
PACKAGING MICROSERVICES



Fat JARs

- Easily Portable, easily runnable (esp. in IDEs)
- Dependencies resolved at build time (not in production)
- Everyone supports it
 - Dropwizard was first (March 2011)
- Everything in one JAR
- Everything in one container layer
- Fat JAR is rebuilt for single line change (!)





Fat JAR Fight Club (Hello World + Joda Time lib)











Product

OPEN SOURCE



The Fault in Our JARs: Why We Stopped

Building Fat JARs

JUN 16, 2016 / BY JONATHAN HABER









HubSpot's backend services are almost all written

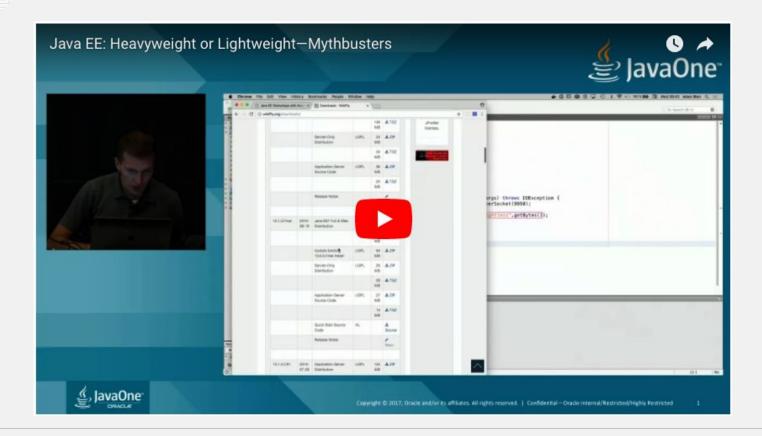
in Java. We have over 1,000 microservices

With over 100 engineers constantly committing, we usually do 1,000-2,000 builds per day. With each of these builds uploading a fat JAR, we were generating 50-100GB of build

artifacts per day. And the most painful part is how much duplication there is between each of these artifacts. Our applications have a lot of overlap in terms of 3rd party libraries, for example they all use Guice, Jackson, Guava, Logback, etc. Imagine how many copies of these libraries we have sitting in S3!



https://youtu.be/LwimkQQDhio

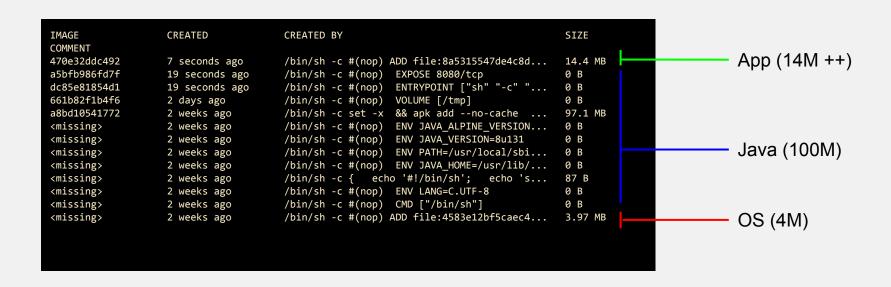




```
~ % docker history 7ac5d7400c9e
                                       CREATED BY
                                                                                      SIZE
IMAGE
                   CREATED
                                                                                                                  App Server + App (200M++)
                                                                                      209 MB
7ac5d7400c9e
                   6 weeks ago
                                       /bin/sh -c tar -C /tmp -xf - && /usr/local...
2d35763bda38
                   2 months ago
                                       /bin/sh -c #(nop) CMD ["/usr/local/s2i/run"]
                                                                                      0 B
<missing>
                   2 months ago
                                       /bin/sh -c mkdir -p /deployments/data
                                                                                      7 B
<missing>
                   2 months ago
                                       /bin/sh -c #(nop) COPY file:093cf59865b7eb...
                                                                                      421 B
<missing>
                                       /bin/sh -c mkdir -p /opt/jboss/.m2
                                                                                      7 B
                   2 months ago
<missing>
                   2 months ago
                                       /bin/sh -c #(nop) USER [1000]
                                                                                      0 B
<missing>
                   2 months ago
                                       /bin/sh -c mkdir -p /deployments/data && ...
                                                                                      7 B
                                                                                                                   Build scripts (negligible)
<missing>
                   2 months ago
                                       /bin/sh -c chmod 755 /opt/run-java/run-env.sh
                                                                                      96 B
<missing>
                                       /bin/sh -c #(nop) COPY file:41c68bae60a2fc...
                                                                                      89 B
                   2 months ago
<missing>
                   2 months ago
                                       /bin/sh -c chmod 755 /opt/run-java/run-jav...
                                                                                      11.2 kB
<missing>
                   2 months ago
                                       /bin/sh -c #(nop) COPY multi:f0215f3bf07a5...
                                                                                      11.2 kB
<missing>
                   2 months ago
                                       /bin/sh -c #(nop) ADD file:a997b3875f55a65...
                                                                                      7.78 kB
<missing>
                   2 months ago
                                       /bin/sh -c chmod 755 /usr/local/s2i/*
                                                                                      7.37 kB
<missing>
                   2 months ago
                                       /bin/sh -c #(nop) COPY dir:d2bc92464c815ef...
                                                                                      7.36 kB
                                                                                                                Trad. Java EE
<missing>
                                       /bin/sh -c #(nop) EXPOSE 8778/tcp
                   2 months ago
                                                                                      0 B
<missing>
                   2 months ago
                                       /bin/sh -c chmod 444 /opt/jolokia/jolokia....
                                                                                      448 kB
<missing>
                   2 months ago
                                       /bin/sh -c #(nop) ADD file:7428506ba578dc4...
                                                                                      2.78 kB
                                                                                                                Container Layers
<missing>
                   2 months ago
                                       /bin/sh -c mkdir -p /opt/jolokia/etc && c...
                                                                                      445 kB
<missing>
                   2 months ago
                                       /bin/sh -c curl https://archive.apache.org...
                                                                                      9.52 MB
<missing>
                   2 months ago
                                       /bin/sh -c usermod -g root -G jboss jboss
                                                                                      3.36 kB
<missing>
                   2 months ago
                                       /bin/sh -c echo securerandom.source=file:/...
                                                                                      32.8 kB
<missing>
                   2 months ago
                                       /bin/sh -c #(nop) USER [root]
                                                                                      0 B
                                                                                                                   Java (~200M)
<missing>
                   2 months ago
                                       /bin/sh -c #(nop) LABEL io.fabric8.s2i.ver...
                                                                                      0 B
<missing>
                   2 months ago
                                       /bin/sh -c #(nop) ENV JOLOKIA_VERSION=1.3....
                                                                                      0 B
<missing>
                   2 months ago
                                       /bin/sh -c #(nop) ENV JAVA HOME=/usr/lib/...
                                                                                      0 B
<missing>
                   2 months ago
                                       /bin/sh -c #(nop) USER [jboss]
                                                                                      0 B
<missing>
                   2 months ago
                                       /bin/sh -c yum -y install java-1.8.0-openj...
                                                                                      200 MB
<missing>
                   2 months ago
                                       /bin/sh -c #(nop) USER [root]
                                                                                      0 B
<missing>
                   2 months ago
                                       /bin/sh -c #(nop) MAINTAINER Marek Goldma...
                                                                                      0 B
<missing>
                   2 months ago
                                       /bin/sh -c #(nop)
                                                         USER [iboss]
                                                                                      0 B
<missing>
                   2 months ago
                                       /bin/sh -c #(nop) WORKDIR /opt/jboss
                                                                                      0 B
<missing>
                                       /bin/sh -c groupadd -r jboss -g 1000 && us...
                                                                                      296 kB
                   2 months ago
                                                                                                                   OS (~200M)
<missing>
                   2 months ago
                                       /bin/sh -c yum update -y && yum -y install...
                                                                                      27.6 MB
<missing>
                   2 months ago
                                       /bin/sh -c #(nop) MAINTAINER Marek Goldma...
                                                                                      0 B
<missing>
                   2 months ago
                                       /bin/sh -c #(nop)
                                                         CMD ["/bin/bash"]
                                                                                      0 B
                                       /bin/sh -c #(nop) LABEL name=CentOS Base ...
<missing>
                   2 months ago
                                                                                      0 B
<missing>
                   2 months ago
                                       /bin/sh -c #(nop) ADD file:d22a9c627d1d1f3...
                                                                                      193 MB
```

redhat.

Spring Boot "Hello World" Fat JAR in a Container





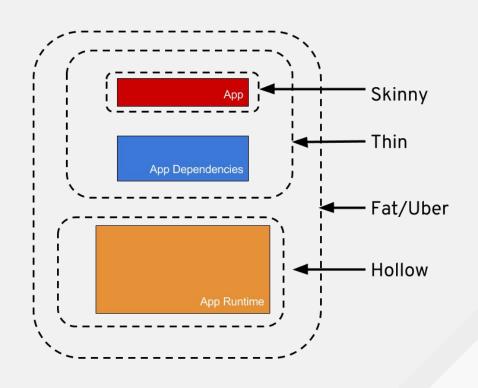
Wildfly Swarm "Hello World" Skinny JAR/WAR in a Container

```
App (Skinny WAR)
IMAGE
                   CREATED
                                      CREATED BY
                                                                                    SIZE
2c2a26c16ba3
                   9 seconds ago
                                      /bin/sh -c #(nop) ADD file:267565476904261...
                                                                                    2.27 kB
                                                                                                                 WF Swarm
37cdd8f0be3e
                   10 seconds ago
                                      /bin/sh -c #(nop) ADD file:3696ab070f867a9...
                                                                                    46.3 MB
da2c317b1fad
                   35 hours ago
                                      /bin/sh -c #(nop) EXPOSE 8080/tcp
                                                                                    0 B
                                                                                                                 (Hollow JAR)
5827f39ca476
                                      /bin/sh -c #(nop) ENTRYPOINT ["sh" "-c" "...
                                                                                    0 B
                   35 hours ago
661b82f1b4f6
                   3 days ago
                                      /bin/sh -c #(nop) VOLUME [/tmp]
                                                                                    0 B
                                                                                                                 (46M)
a8bd10541772
                   2 weeks ago
                                      /bin/sh -c set -x && apk add --no-cache ...
                                                                                    97.1 MB
<missing>
                   2 weeks ago
                                      /bin/sh -c #(nop) ENV JAVA ALPINE VERSION...
                                                                                    0 B
<missing>
                   2 weeks ago
                                      /bin/sh -c #(nop) ENV JAVA VERSION=8u131
                                                                                    0 B
                                                                                                                Java (100M)
<missing>
                   2 weeks ago
                                      /bin/sh -c #(nop) ENV PATH=/usr/local/sbi...
                                                                                    0 B
<missing>
                   2 weeks ago
                                      /bin/sh -c #(nop) ENV JAVA_HOME=/usr/lib/...
                                                                                    0 B
<missing>
                   2 weeks ago
                                      /bin/sh -c { echo '#!/bin/sh'; echo 's...
                                                                                    87 B
<missing>
                   2 weeks ago
                                      /bin/sh -c #(nop) ENV LANG=C.UTF-8
                                                                                    0 B
<missing>
                  3 weeks ago
                                      /bin/sh -c #(nop) CMD ["/bin/sh"]
                                                                                    0 B
<missing>
                                      /bin/sh -c #(nop) ADD file:4583e12bf5caec4...
                                                                                    3.97 MB
                   3 weeks ago
                                                                                                                 OS (4M)
```



Fat, Thin, Skinny, Hollow

- Thin
 - App + Direct Dependencies (ex: traditional Java EE .WAR files)
- Skinny
 - App only, dependencies satisfied externally
 - Must be "deployed" to hollow app
- Hollow
 - App runtime only, contains app dependencies





FAT JAR COMPARISON

github.com/jamesfalkner/wfswarm-packaging-demo

Demo



Fat, Thin, Skinny, Hollow support

	Fat	Thin	Skinny/Hollow
Spring Boot	•		
WildFly Swarm	•	✓	
Eclipse Vert.x	•	✓ (via maven)	✓ (via <u>Capsule</u> ?)
Dropwizard	•	✓ (via maven)?	✓ (via <u>Capsule</u> ?)



Microservices Packaging Recommendations

- Fat JAR
 - Works well in many cases, dev-friendly
 - Consider size of resulting app & (re-)deployment speed esp. w/containers
- Thin
 - Useful for large dependency sets at scale
- Skinny/Hollow
 - Highly efficient packaging
 - Additional initial complexity





THANK YOU

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