Open liberty

# How we use OSGi to build Open Liberty

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# Background

Open Liberty

# Project goals


- Implement Jakarta EE
- Small Footprint
- Start fast
- Composible
- Dynamic
- Easy to use

# Just Enough App Server

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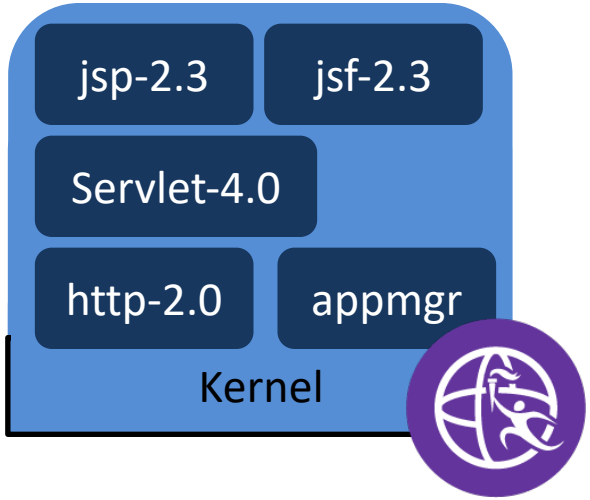
- You control which features are loaded into each server instance

```
<feature>jsf-2.3</feature>
```



# Server configuration

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```
<server>
    <featureManager>
        <feature>javaee-8.0</feature>
    </featureManager>

    <httpEndpoint id="defaultHttpEndpoint"
                  httpPort="8080"/>

    <webApplication location="myWeb.war"
                    contextRoot="/"/>
</server>
```

- Metatype describes config
- DS describes config
- CA parses XML

- Subsystem Feature describes bundles for feature

- DS component activated to start http transport

- DS component activated to start application

# Jakarta EE on OSGi

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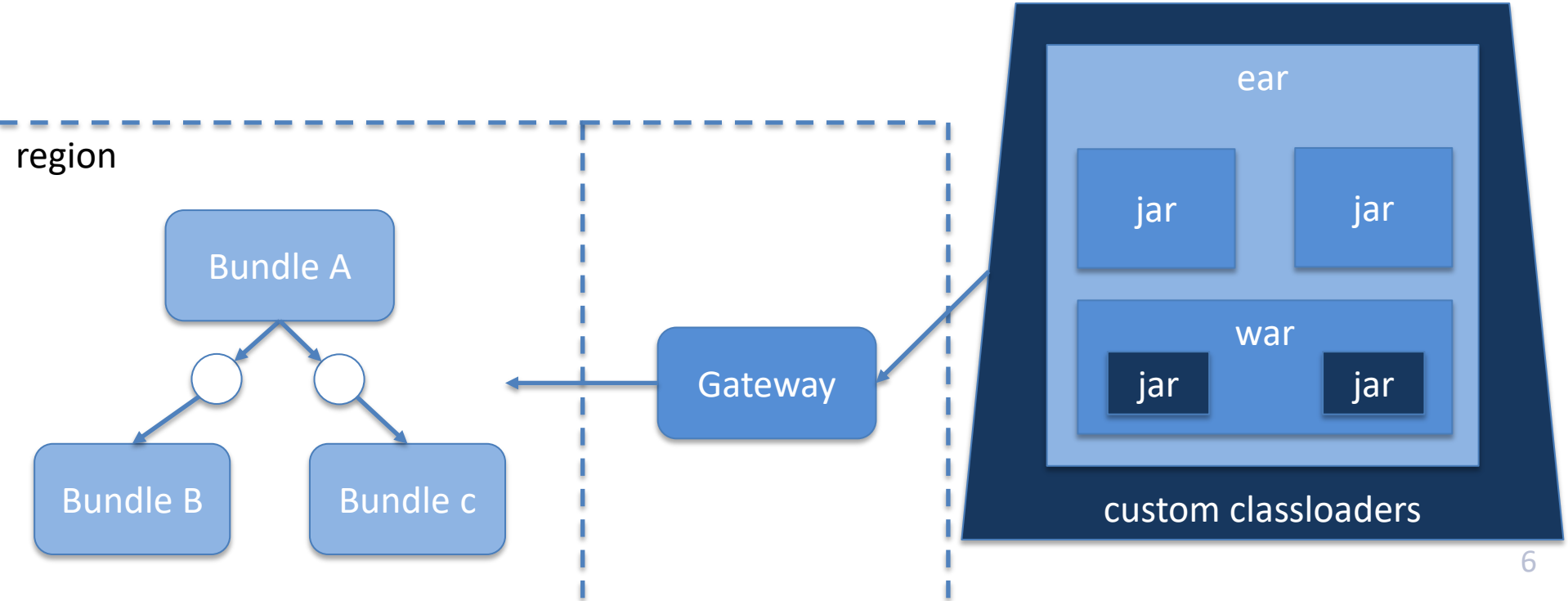

# Last 12 months

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# Towards one second start-up

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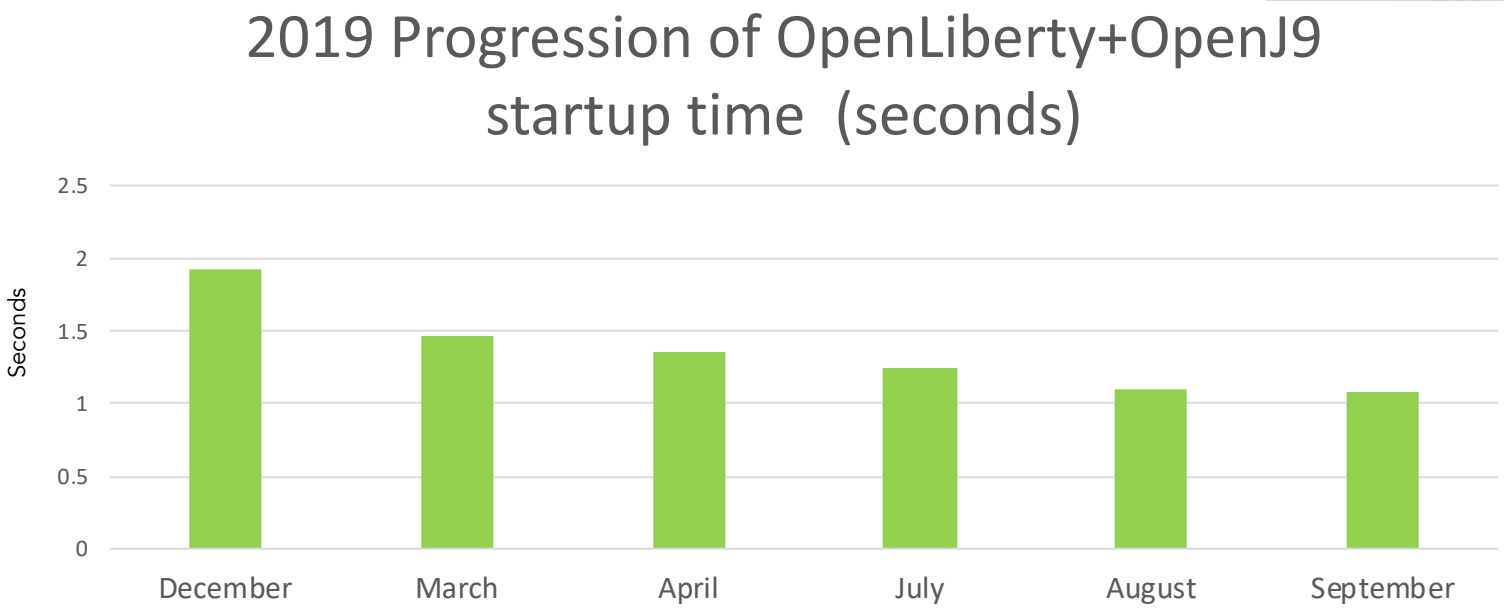


**Amost halved startup time** due to app server and JVM improvements through 2019

2 hyperthreaded cpus on 2 socket system, each socket containing 24 cores. cpu model: Intel Xeon Platinum 8168 CPU @ 2.70 GHz

Application PingPerf - https://github.com/HotswapProjects/pingperf

# Performance Improvements


- Equinox
- Regions (Equinox)
- Metatype (Equinox)
- Declarative Services (Felix SCR)
- Config Admin (Liberty)
- Subsystem Features (Liberty)

# Things that are expensive


- findEntries

```
Enumeration e = b.findEntries("OSGI-INF", "*.xml", true);
```

  - Searching jar files for sub-paths is expensive
- XML Parsing
- Text file parsing
- Opening and reading many files vs one
- Case insensitive matching in filters
- Reflection to find methods on DS components

# Parallel Bundle start


- Equinox activates bundle one by one
- Updated to support starting bundles within start level in parallel
- Turns out a lot of code actually depends on bundle start order when you have a predictable install order

# Things we learned


- Shutdown is not as simple as stopping the framework
- Statics and service do not mix & match
- Use the build tools
- Very powerful for large complex software
- DS and ConfigAdmin together are brilliant
- High learning curve
- Java SE classloading assumptions don’t mix well in OSGi
- Shuffle bundle install order to avoid start time dependencies

# Thoughts on future

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- Can Liberty function without the OSGi Modularity layer?
- Can we choose the modularity layer and swap between OSGi, JPMS and none?
- Stick with DS, CA, services, but not OSGi bundles