



Open Liberty

# Liberty Quarterly Update

## 21.0.0.4-21.0.0.6

Alasdair Nottingham – Liberty Lead Architect

 @nottycode

# Agenda

Open Liberty



Part 1: 20 Minute Liberty overview

Part 2: Jakarta EE 9 Update

Part 3: What is new this quarter

Part 3: Q&A

# 20 minute overview

# 6 reasons why Liberty

Open Liberty



*Lightweight, highly-  
efficient runtime*

*CI/CD optimized  
operational experience*

*Simple true-to-production  
developer experience*

Just enough runtime



80% disk and 56% memory  
saving

Low operating cost



4x increased density over  
Tomcat & Spring Boot

Continuous delivery



Zero-effort security fixing & zero  
technical debt

Zero migration



100% v2v & fixpack migration  
saving

Kubernetes  
optimized



Self-tuned optimal perf,  
production-ready, kube-native

Developer experience



Container & kube-native  
experience, rapid inner loop

# Just Enough Application Server

Open Liberty



You control which features are loaded into each server instance

Java EE



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

jsp-2.3

jsf-2.3

servlet-4.0

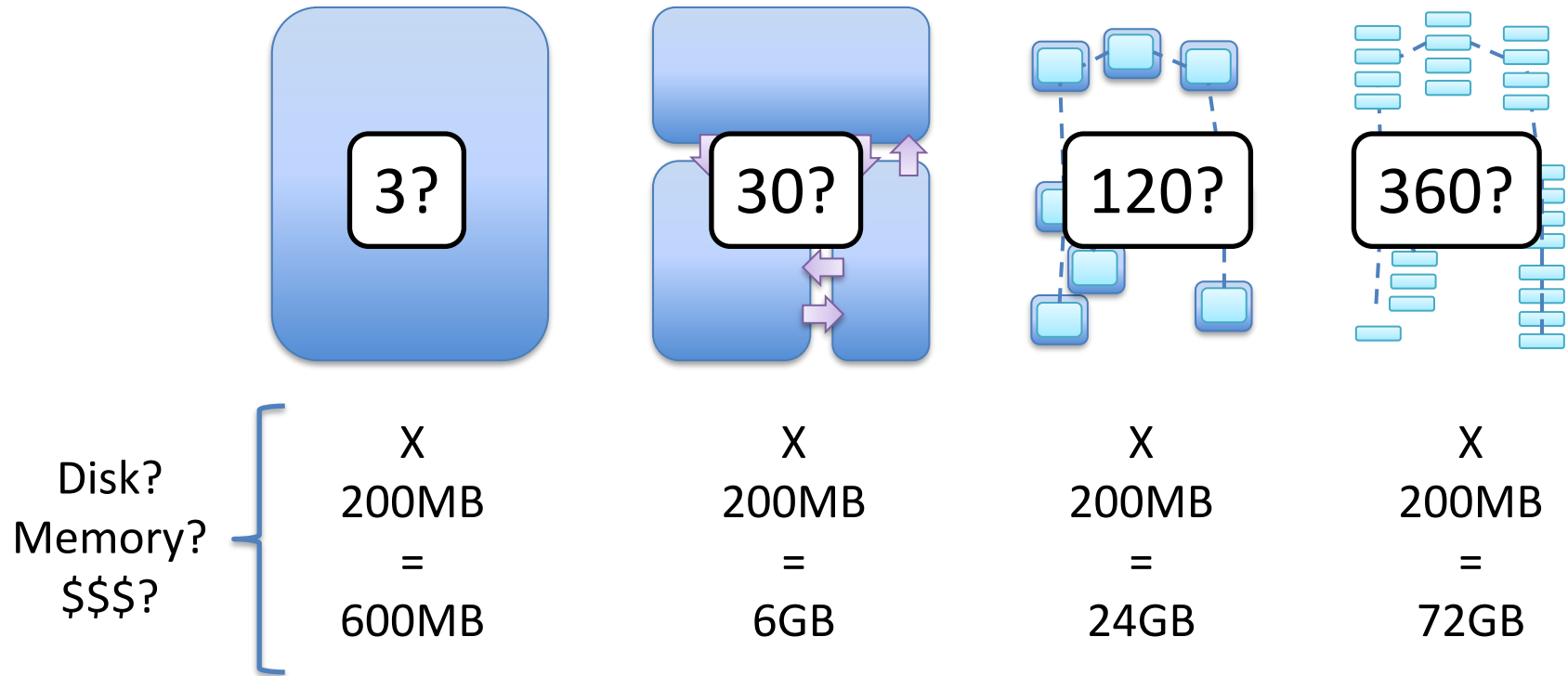
http-2.0

appmgr

Kernel



# Granularity cost implications



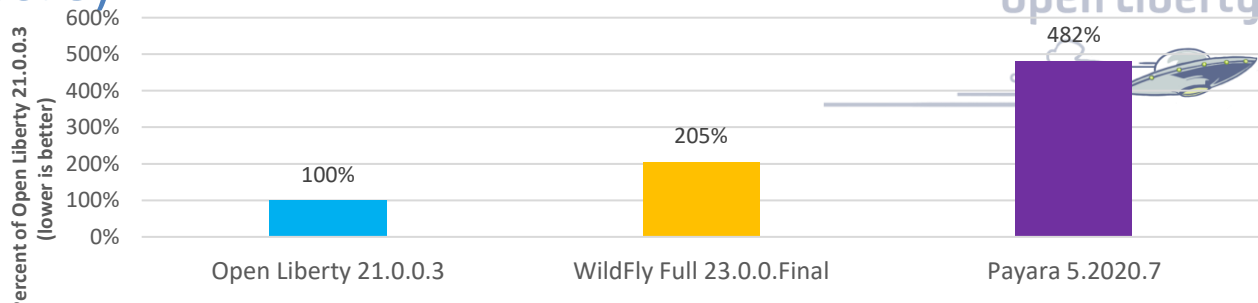
# Performance (Daytrader8)

- Comparisons used each application server's Docker image
- Liberty outperforms others on all metrics for EE8 performance (startup time about half, throughput and memory footprint over 50% better)

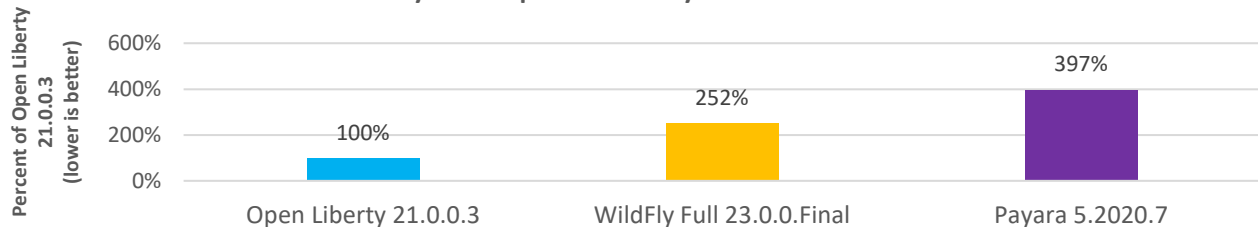
## System Configuration:

-----  
**SUT:** LinTel – Ubuntu 20.04.1 LTS, Intel(R) Xeon(R) Platinum 8180 CPU @ 2.50GHz, 4 cpus, 4GB RAM.  
JDK version distributed with the docker images used for each server instance.

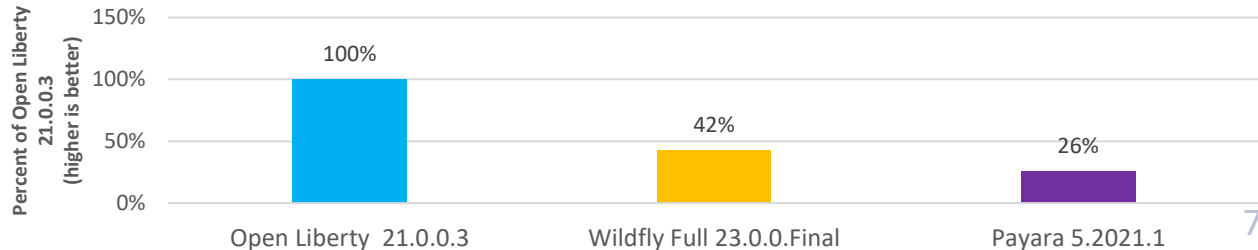
## Startup - Daytrader8 - Docker



## Memory Footprint - Daytrader8 - Docker



## Throughput- Daytrader8 - Docker



# Low Operating Cost

Modernization led to  
optimized resource usage  
by **75%**

and reduced infrastructure  
footprint  
by **50%**

Major US healthcare provider



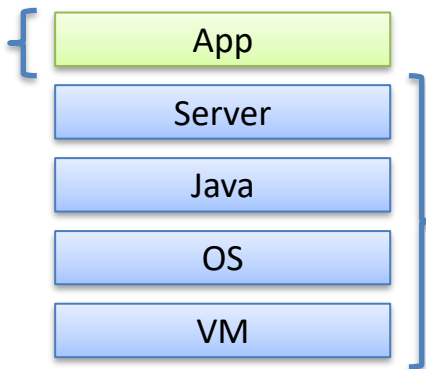




# Cloud platforms shift responsibilities

## *Traditional Deployment*

- 
- I develop the app
  - I give the Ops team a WAR file
  - I *occasionally* update app dependencies



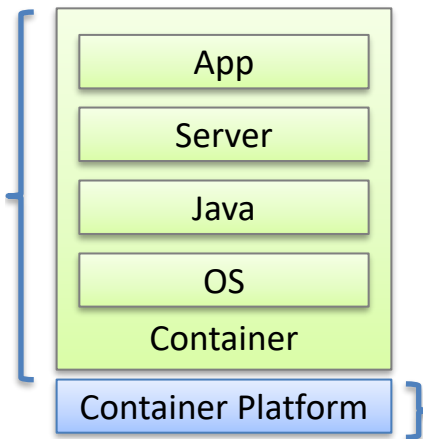
- I deploy the app
- I handle automation
- I monitor the app
- I maintain the infrastructure
- I apply important security fixes
- I plan and execute migrations



# Cloud platforms shift responsibilities

## Cloud-native Platform Deployment

- 
- I develop the app
  - I *occasionally* update app dependencies
  - I **deploy the app**
  - I **handle automation**
  - I **monitor the app**
  - I **maintain the infrastructure**
  - I **apply important security fixes**
  - I **plan and execute migrations**



- 
- I manage a cloud platform
  - I provide services to the application teams

# Liberty Release Cadence

Open Liberty



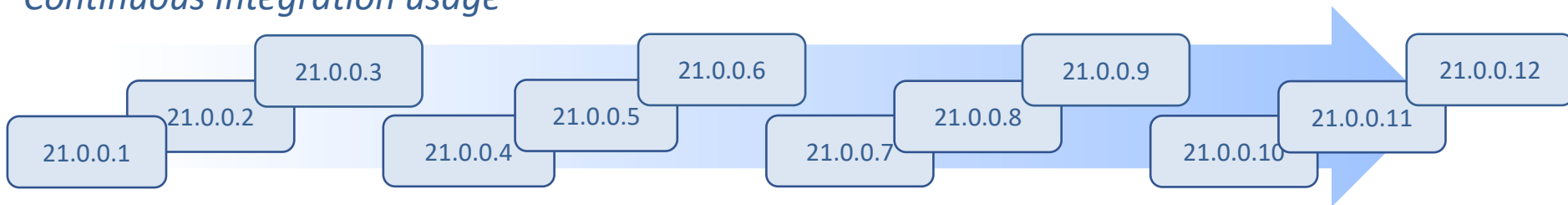
Liberty's 'zero migration' architecture makes picking up a new release simple

Skipping a release does not introduce migration work

*Traditional 'fix pack' usage*

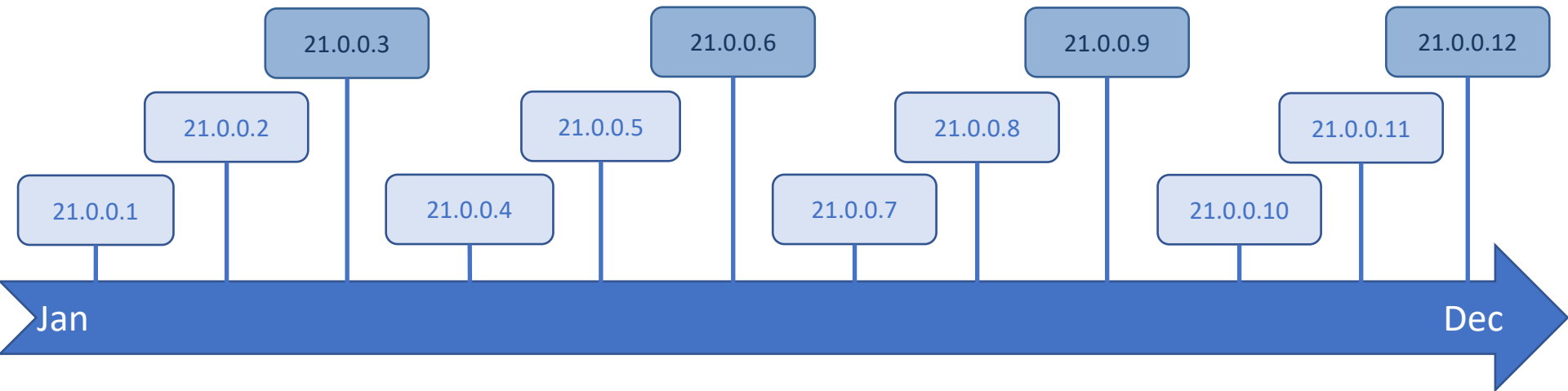


*Continuous Integration usage*



# Liberty Release Cadence

Open Liberty



|                           | All CD releases | CD releases ending .3 .6 .9 .12 |
|---------------------------|-----------------|---------------------------------|
| Support Provided          | 5 years         | 5 years                         |
| iFixes                    | 24 weeks        | 2 years                         |
| Proactive Security iFixes | Most recent     | Most recent 2                   |

# Zero Migration

- ✓ No configuration behavior changes
- ✓ No runtime feature behavior changes
- ✓ No removals

Open Liberty



Stay current with a rebuild  
(no app or config changes necessary)

Skipping a release does not introduce  
additional migration work

Never apply an ifix again

# Zero Migration

Today we migrated all our Liberty servers config from EE7 to EE8.

This process normally take 18 months in traditional WebSphere, cannot say how many manhours exactly.

Today it took 18 minutes, with Liberty's continuous delivery stream.

In July all apps starting to use EE8 framework.

Henrik Lundström, WAS Systems Administrator, Handelsbanken (Sweden)



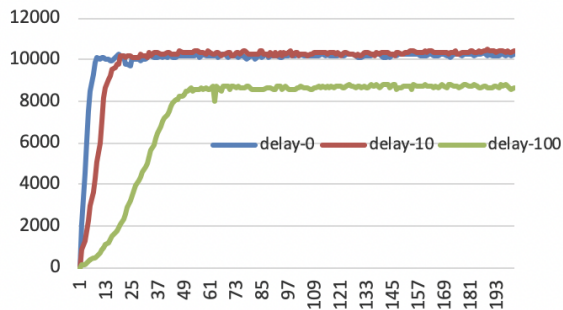
**43,800x**  
***improvement***

# Kubernetes optimized

Open Liberty



Liberty threadpool auto-tuning for various transaction delays



Open Liberty Operator  
provided by IBM

Deploy and manage  
applications running on Open  
Liberty



- **Deliver faster** without costly tuning exercises
- Get **optimal performance** even as the environment changes
- **Simple Operator-based deploy** and day-2 operations experience
- Supported **production-ready images**
- **APIs** for Kubernetes integration
- Container-based **usage tracking**

# Kubernetes Optimized

*“You don't have to tune thread pools. Liberty does an outstanding job”*

WebSphere Technology Owner  
Large health provider





# Developer experience

Open Liberty



## IDEs



## Repositories



## Build



## APIs



## Testing



Jesse Gallagher  
@Gidgerby

Have I mentioned lately how much of a delight [@OpenLibertyIO](#) is to work with? It's just thoroughly pleasant.



Tim Zöller  
@javahippie

The [@OpenLibertyIO](#) dev mode is one of the best hot-reload features I have ever worked with, I am seriously impressed!

# Dev mode in action

The screenshot displays a development environment with three main components:

- Code Editor (Top):** Shows the `server.xml` file in the `src > main > liberty > config` directory. The XML content is as follows:

```
1 <server description="Sample Liberty server">
2   <featureManager>
3     <feature>jaxrs-2.1</feature>
4     <feature>jsonp-1.1</feature>
5     <feature>cdi-2.0</feature>
6     <feature>mpMetrics-2.0</feature>
7     <feature>mpConfig-1.3</feature>
8   </featureManager>
9
10  <webApplication location="${artifactId}.
11
12  <mpMetrics authentication="false"/>
13
14  <!-- tag::logging[] -->
15  <logging traceSpecification="com.ibm.ws.
16  <!-- end::logging[] -->
17
18  <httpEndpoint host="*" httpPort="${defal
19    httpsPort="${default.https.port}" ic
```
- Terminal (Bottom):** Shows the output of the `devc` command, indicating that the Liberty container is running in dev mode. The output includes port mappings and network information.

```
[INFO] *****
[INFO] *    Liberty is running in dev mode.
[INFO] *    To run tests on demand, press Enter.
[INFO] *    To rebuild the Docker image and restart the container, type 'r' and press Enter.
[INFO] *    To stop the server and quit dev mode, press Ctrl-C or type 'q' and press Enter.
[INFO] *
[INFO] *    Liberty container port information:
[INFO] *    Internal container HTTP port [ 9080 ] is mapped to Docker host port [ 9080 ]
[INFO] *    Internal container HTTPS port [ 9443 ] is mapped to Docker host port [ 9443 ]
[INFO] *    Liberty debug port mapped to Docker host port: [ 7777 ]
[INFO] *
[INFO] *    Docker network information:
[INFO] *    Container name: [ liberty-dev ]
[INFO] *    IP address [ 172.17.0.2 ] on Docker network [ bridge ]
[INFO] *****
[INFO] Source compilation was successful.
[INFO] Tests compilation was successful.
[INFO] [AUDIT ] CwMKT0017I: Web application removed (default_host): http://c1bf2d4d704a:9080/
[INFO] [AUDIT ] CwMKT0009I: The application demo-devmode-maven has stopped successfully.
[INFO] [AUDIT ] CwMKT0016I: Web application available (default_host): http://c1bf2d4d704a:9080/
[INFO] [AUDIT ] CwMKT0003I: The application demo-devmode-maven updated in 1.157 seconds.
```
- Browser Window (Top Right):** Shows a 404 error message: `Error 404: java.io.FileNotFoundException: SRVE0190E: File not found: /health`.

# How to get Support

Open Liberty



## WebSphere



z/OS  
ND  
Base  
Core



## WebSphere Hybrid Edition

### IBM Integrated Application Runtimes

Java:

- WebSphere
- Liberty
- MicroProfile
- Jakarta EE
- OpenJ9



Cloud Foundry Migration Runtime

Transformation Advisor

Mono2micro



Red Hat OpenShift

# Liberty and Jakarta EE 9

Jared Anderson – Jakarta EE Dev Lead for Liberty

# Jakarta EE 9.0

Jakarta EE 9 – Nov 20, 2020

- Final Specifications for ALL Projects
  - <https://jakarta.ee/specifications/>
- Final APIs for ALL Projects
  - <https://mvnrepository.com/artifact/jakarta>
- Final TCKs for ALL Projects
  - <https://download.eclipse.org/jakartaee/>
- Final Compatible Implementation(s)
  - Glassfish 6.0.0 for Platform Specification Certification
  - <https://jakarta.ee/compatibility/>

JakartaOne LiveStream – Dec 08, 2020

- <https://jakartaone.org/2020/>
- Formal announcement of Jakarta EE 9



# Compatible Products



Jakarta EE Compatible Products   Jakarta EE 9   Jakarta EE 8

### Jakarta EE 9 Platform Compatible Products



**Eclipse GlassFish**  
Eclipse Foundation

6



**Open Liberty**  
IBM Corporation

21.0.0.3-beta

### Jakarta EE 9 Web Profile Compatible Products



**Eclipse GlassFish**  
Eclipse Foundation

6



**Open Liberty**  
IBM Corporation

21.0.0.2-beta

- <https://jakarta.ee/compatibility/#tab-9>
- First Vendor Compatible Implementation!
- <https://openliberty.io/blog/2021/03/05/jakarta-ee-9-compatibility.html>

# Jakarta EE 9.1

Jakarta EE 9.1 – May 25, 2021

- Main goal: Support Java SE 11
  - TCK hits due to supporting multiple Java SE versions
  - Lack of CORBA ORB in Java SE 11, for example
- Formal Announcement
  - <https://jakarta.ee/news/jakarta-ee-9-1-released/>
- Final Compatible Implementation(s)
  - IBM Open Liberty - <https://openliberty.io/blog/2021/05/26/jakarta-ee-9-1-compatibility.html>
  - Eclipse Glassfish
  - Apache TomEE
  - Red Hat Wildfly
  - ManageCat ManageFish
  - [https://jakarta.ee/compatibility/#tab-9\\_1](https://jakarta.ee/compatibility/#tab-9_1)



This Photo by Unknown Author is licensed under CC BY-NC

# General Strategy

- Two prong approach
  - Work with Open Source communities who have a Jakarta EE 9 version of a function
  - Transform existing Open Source and internal EE 8 implementation



# Eclipse Transformer

- IBM took the lead in creating a transformer project to be able to have code and test reuse and not require dual maintenance
- Using the transformer tool allows for rapid development and test of internal and open source implementations of Jakarta features
- IBM created a new Eclipse Open Source project to share this technology.
- Other companies are using this same technology to create their Jakarta EE 9 offerings
- Blog post outlining how to use the Eclipse Transformer:  
<https://openliberty.io/blog/2021/03/17/eclipse-transformer.html>

# New Feature Names

- With the package rename in Jakarta EE 9, the short names of Jakarta features also changed. Liberty feature short names for Jakarta EE 9 features are changed to match the new short names. Example, jpa is now persistence, jca is now connectors, etc
- There are a few exceptions.
  - concurrent was not changed to concurrency
  - Instead of authentication and authorization, we are using appAuthentication and appAuthorization to align with appSecurity Liberty feature (the Jakarta short name is just called security).
- If a user specifies the old name with the new version number, a helpful error message tells you what the new name is during server startup

# New JAX-RS Implementation

- JAX-RS 2.0 and 2.1 implementation in Liberty uses the Apache CXF open source implementation.
- With Restful Web Services 3.0, the implementation in Liberty has been changed to use RestEasy
- Main reason for this change is performance. While comparing different JAX-RS implementation, the performance team noted that RestEasy outperformed CXF. Jakarta EE 9 is the right time to make this transition to a new implementation
- Internal measurements of different applications that use Restful Web Services function show 7 to 20% throughput improvements.

# What's next?

- Completing development and test of Open Liberty value-add features that depends on Java / Jakarta EE technologies to support Jakarta EE 9
- Updating WebSphere Liberty value-add features to support Jakarta 9
- Make this function available in a non-beta release. Rerun all TCKs against the non-beta release with Java 8 and 11
- Working with the community to support newer Java levels in the TCK. When the TCK and Liberty support Java 17, we will certify with Java 17 as well.
- MicroProfile 5.0 (which will work with Jakarta EE 9) support when it becomes available. MicroProfile 5.0 should finalize by end of this year.

# Open Liberty value-add features

- Open Liberty value-add features to be updated
  - acmeCA-2.0, adminCenter-1.0, audit-1.0, auditCollector-1.0, authFilter-1.0, batchManagement-1.0, constrainedDelegation-1.0, distributedMap-1.0, federatedRegistry-1.0, grpc-1.0, grpcClient-1.0, jwt-1.0, oauth-2.0, openidConnectClient-1.0, openidConnectServer-1.0, passwordUtilities-1.0, restConnector-2.0, restHandler-1.0, samlWeb-2.0, sessionCache-1.0, sessionDatabase-1.0, socialLogin-1.0, spnego-1.0, webBundle-1.0, webBundleSecurity-1.0, webCache-1.0, wsAtomicTransactions-1.2, wsSecurity-1.1, wsSecuritySaml-1.1

# WebSphere Liberty value-add features

- WebSphere Liberty value-add features to be updated
  - core - collectiveMember-1.0, openapi-3.0?
  - base - wmqJmsClient-2.0 (depends on MQ)
  - nd - clusterMember-1.0, collectiveController-1.0, dynamicRouting-1.0, healthAnalyzer-1.0, healthManager-1.0, scalingController-1.0, scalingMember-1.0
  - zos - batchSMFLogging-1.0, zosLocalAdapters-1.0, zosRequestLogging-1.0, zosSecurity-1.0, zosTransaction-1.0

# Recent Updates

# Periodic Table of Liberty (21.0.0.6)

Open Liberty



zOS

ND

Base

Core

Open  
Liberty

New in  
4Q20

New in  
3Q20

New in  
2Q21

New in  
1Q21

| batchSMFLogging-1.0      |  | zosLocalAdapters-1.0     |  | zosTransaction-1.0      |  |                           |  |
|--------------------------|--|--------------------------|--|-------------------------|--|---------------------------|--|
|                          |  | zosRequestLogging-1.0    |  | zosWlm-1.0              |  | zosSecurity-1.0           |  |
| collectiveController-1.0 |  | dynamicRouting-1.0       |  | healthManager-1.0       |  | scalingController-1.0     |  |
|                          |  | clusterMember-1.0        |  | healthAnalyzer-1.0      |  | scalingMember-1.0         |  |
| cloudant-1.0             |  | heritageAPIs-1.0         |  | batchManagement-1.0     |  | Operations                |  |
| javaee-7.0               |  | sipServlet-1.1           |  | wsAtomicTransaction-1.2 |  |                           |  |
| javaee-8.0               |  |                          |  |                         |  |                           |  |
| jakartaee-8.0            |  |                          |  |                         |  |                           |  |
| bells-1.0                |  | microProfile-4.0         |  | adminCenter-1.0         |  | acmeCA-1.0                |  |
| concurrent-1.0           |  | mpContextPropagation-1.2 |  | collectiveMember-1.0    |  | constrainedDelegation-1.0 |  |
| grpc-1.0                 |  | mpGraphQL-1.0            |  | distributedMap-1.0      |  | federatedRepository-1.0   |  |
| javaMail-1.6             |  | mpReactiveMessaging-1.0  |  | eventLogging-1.0        |  | jwt-1.0                   |  |
| jaxb-2.2                 |  | mpReactiveStreams-1.0    |  | logstashCollector-1.0   |  | jwtSso-1.0                |  |
| jdbc-4.3                 |  | opentracing-1.3          |  | monitor-1.0             |  | sessionDatabase-1.0       |  |
| jpaContainer-2.2         |  | osgiConsole-1.0          |  | openapi-3.1             |  | webCache-1.0              |  |
| jsfContainer-2.3         |  | springBoot-2.0           |  | requestTiming-1.0       |  |                           |  |
| json-1.0                 |  | webProfile-7.0           |  | usageMetering-1.0       |  |                           |  |
| jsonbContainer-1.0       |  | webProfile-8.0           |  | restConnector-2.0       |  |                           |  |
| jsonpContainer-1.1       |  | APIs                     |  | sessionCache-1.0        |  |                           |  |
|                          |  |                          |  |                         |  | passwordUtilities-1.0     |  |
|                          |  |                          |  |                         |  | wsSecurity-1.1            |  |
|                          |  |                          |  |                         |  | wsSecuritySaml-1.0        |  |
|                          |  |                          |  |                         |  | audit-1.0                 |  |
|                          |  |                          |  |                         |  | ldapRegistry-3.0          |  |
|                          |  |                          |  |                         |  | oauth-2.0                 |  |
|                          |  |                          |  |                         |  | openid-2.0                |  |
|                          |  |                          |  |                         |  | openidConnectClient-1.0   |  |
|                          |  |                          |  |                         |  | openidConnectServer-1.0   |  |
|                          |  |                          |  |                         |  | samlWeb-2.0               |  |
|                          |  |                          |  |                         |  | scim-1.0                  |  |
|                          |  |                          |  |                         |  | socialLogin-1.0           |  |
|                          |  |                          |  |                         |  | spnego-1.0                |  |
|                          |  |                          |  |                         |  | transportSecurity-1.0     |  |



# Focus areas



Developer Experience

APIs

Foundation

Orchestration

Security

# Liberty Last Quarter Review

Open Liberty



## Security

- Container Res-Auth for direct lookups
- LTPA/JWT authentication filter
- LDAP bind using Kerberos

## Dev Exp

- Gradle 7 support
- Multi-Module Maven Project support in dev mode
- Arquillian Plugin supports for Jakarta EE 9
- 10 Guides now support running in browser
- Guide for Code Ready Containers

## Foundation

- Request Timing config to not generate javacore
- Config app extension location
- Automatically cleanup JDBC connections

## API

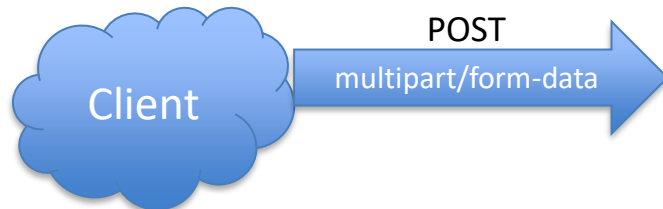
- MP Context Propagation 1.2
- JAX-RS Multipart payload

## Orchestration

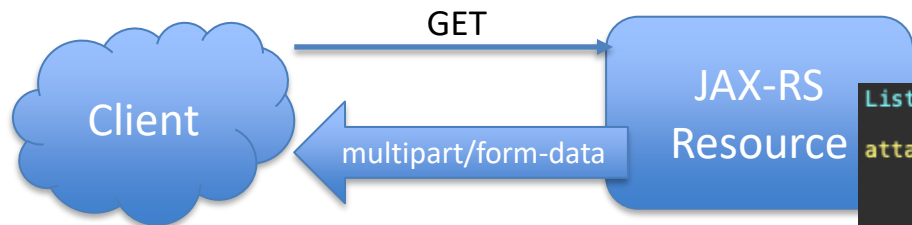
- Request Timing metrics available to Prometheus

# JAX-RS Multipart Form Payloads

Open Liberty



```
<form action="http://localhost:9080" method="POST" enctype="multipart/form-data">
  <div><input type="text" name="textField" value="DefaultValue"></div>
  <div><input type="file" name="file1"></div>
  <div><input type="file" name="file2"></div>
  <div><button type="submit">Submit</button></div>
</form>
```



```
List<IA Attachment> attachments = new ArrayList<>();
attachments.add(AttachmentBuilder.newBuilder("file1")
    .inputStream("some.xml", Util.xmlFile())
    .contentType(MediaType.APPLICATION_XML)
    .build());

attachments.add(AttachmentBuilder.newBuilder("file2")
    .inputStream(Util.asciidocFile())
    .fileName("mpRestClient2.0.asciidoc")
    .contentType("text/asciidoc")
    .contentId("myContentId")
    .header("MyCoolHeader", "SomeValue")
    .build());
```

# JAX-RS Multipart Form Payloads



```
List<IAttachment> attachments = new ArrayList<>();

attachments.add(AttachmentBuilder.newBuilder("blogPost")
    .inputStream(new FileInputStream("/path/to/yesterdaysBlogPost.xml"))
    .fileName("myRenamedBlogPost.asciidoc")
    .contentType("text/asciidoc")
    .contentId("myBlogPostID")
    .header("X-PriorityLevel", "Medium")
    .build());
attachments.add(AttachmentBuilder.newBuilder("file1")
    .inputStream("some.xml", new FileInputStream("/path/to/myPicture.png"))
    .contentType("image/png")
    .build());

Response response = client.target(BLOG_SITE_URI)
    .request()
    .post(Entity.entity(attachments, MediaType.MULTIPART_FORM_DATA));
```

# Auto Closing Connections



servlet

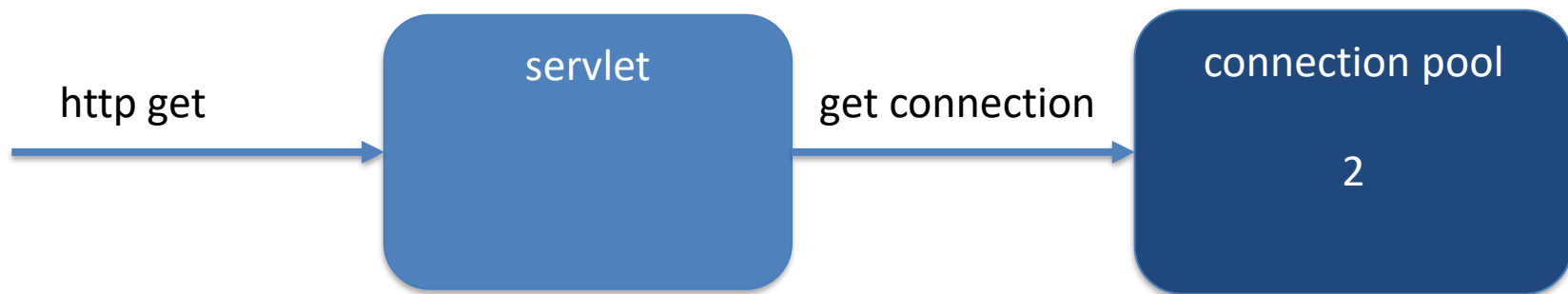
connection pool

3

# Auto Closing Connections



# Auto Closing Connections



# Auto Closing Connections



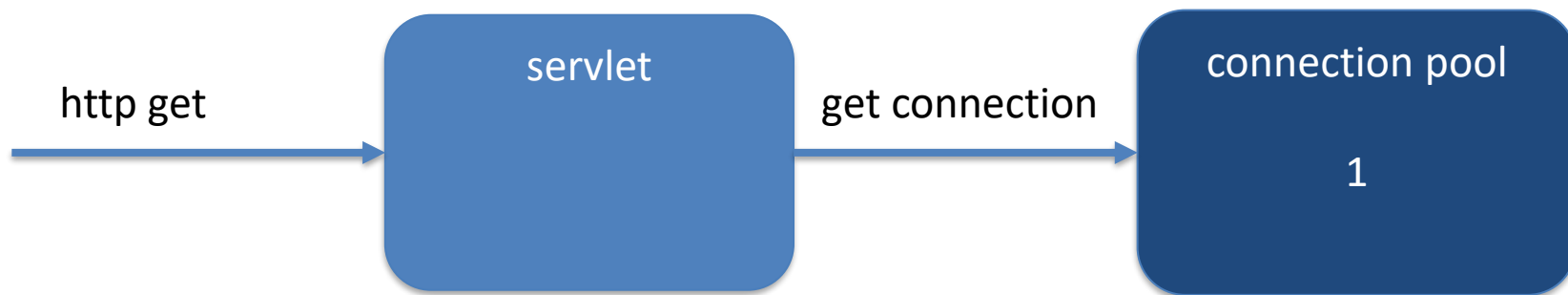
servlet

connection pool

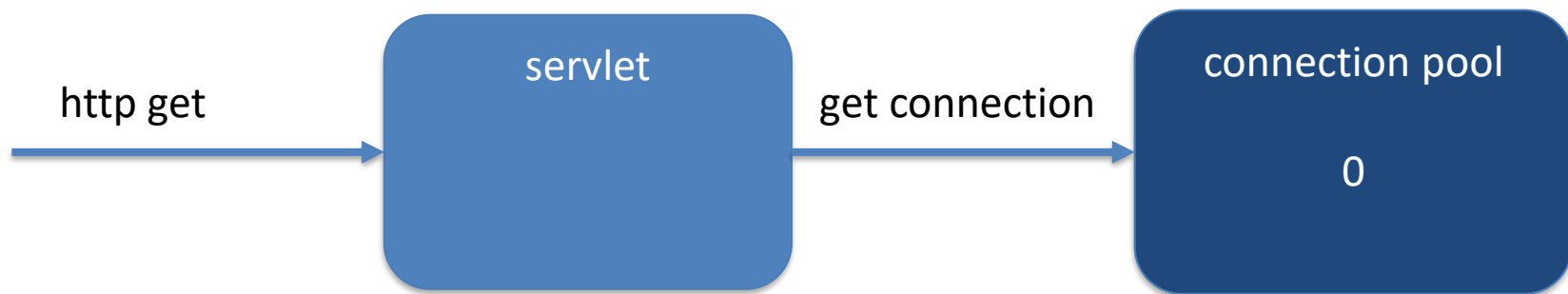
2



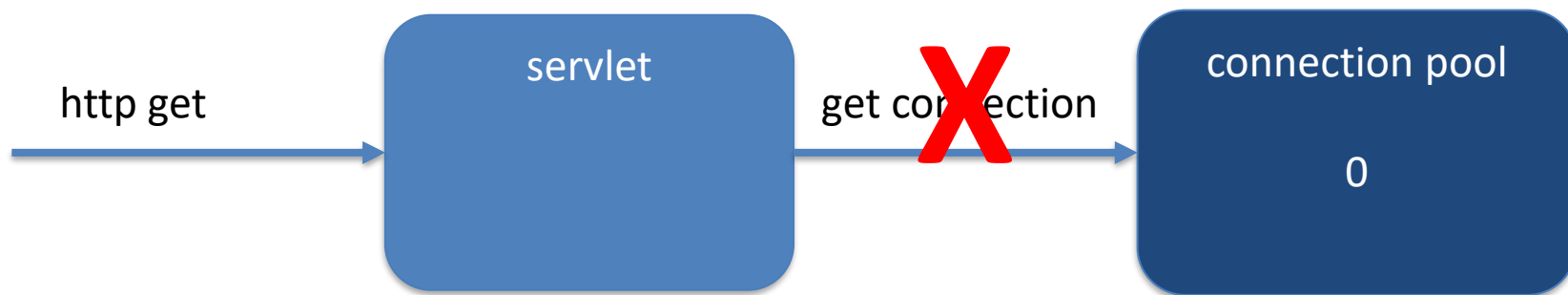
# Auto Closing Connections



# Auto Closing Connections



# Auto Closing Connections



# Auto Closing Connections



- Since 21.0.0.7

servlet

connection pool

3

# Auto Closing Connections



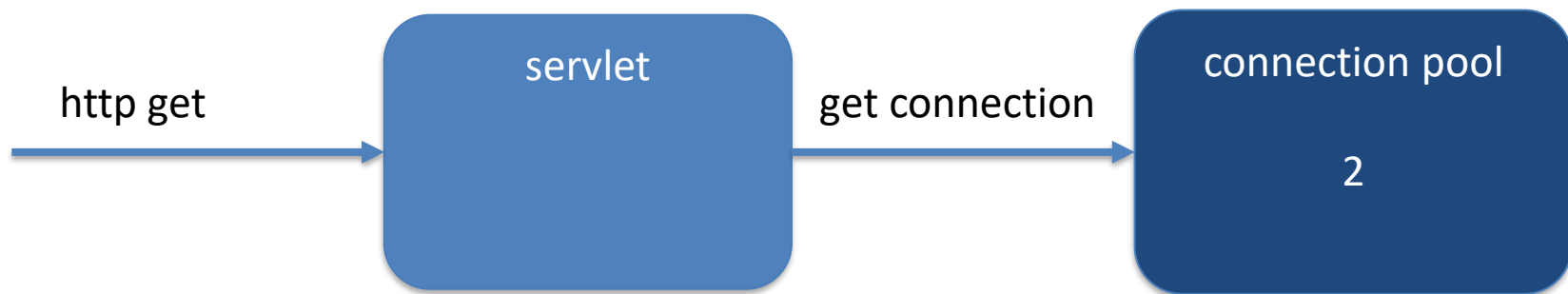
- Since 21.0.0.7



# Auto Closing Connections



- Since 21.0.0.7



# Auto Closing Connections



- Since 21.0.0.7

servlet

connection pool

3

# Auto Closing Connections



- Info message to help identify to close the connection

J2CA8070I: A connection that was obtained from jdbc/myDS was not closed. The following stack identifies the code that obtained the connection:

```
com.ibm.ejs.j2c.ConnectionManager.allocateConnection(Con
nectionManager.java:467)
com.ibm.ws.rsadapter.jdbc.WSJdbcDataSource.getConnection
(WSJdbcDataSource.java:140)
com.ibm.ws.rsadapter.jdbc.WSJdbcDataSource.getConnection
(WSJdbcDataSource.java:114)
test.MyServlet.doGet(MyServlet.java:251)
```



# Request Timing in MP Metrics



```
# TYPE vendor_requestTiming_activeRequests gauge
# HELP vendor_requestTiming_activeRequests requests currently running.
vendor_requestTiming_activeRequests 0
# TYPE vendor_requestTiming_requestCount gauge
# HELP vendor_requestTiming_requestCount requests since the server started
vendor_requestTiming_requestCount 0
# TYPE vendor_requestTiming_hungRequestCount gauge
# HELP vendor_requestTiming_hungRequestCount The number of servlet
requests that are currently running but are hung.
vendor_requestTiming_hungRequestCount 0
# TYPE vendor_requestTiming_slowRequestCount gauge
# HELP vendor_requestTiming_slowRequestCount The number of servlet
requests that are currently running but are slow.
vendor_requestTiming_slowRequestCount 0
```

```
<featureManager>
  <feature>mpMetrics-3.0</feature>
  <feature>requestTiming-1.0</feature>
</featureManager>

<requestTiming sampleRate="1"
                  slowRequestThreshold="10s">
  <servletTiming slowRequestThreshold="2s"
                 hungRequestThreshold="10s"/>
</requestTiming>
```

# Request Timing Grafana

Open Liberty



Servlet Request in the past [10m]



Active Hung Requests Count



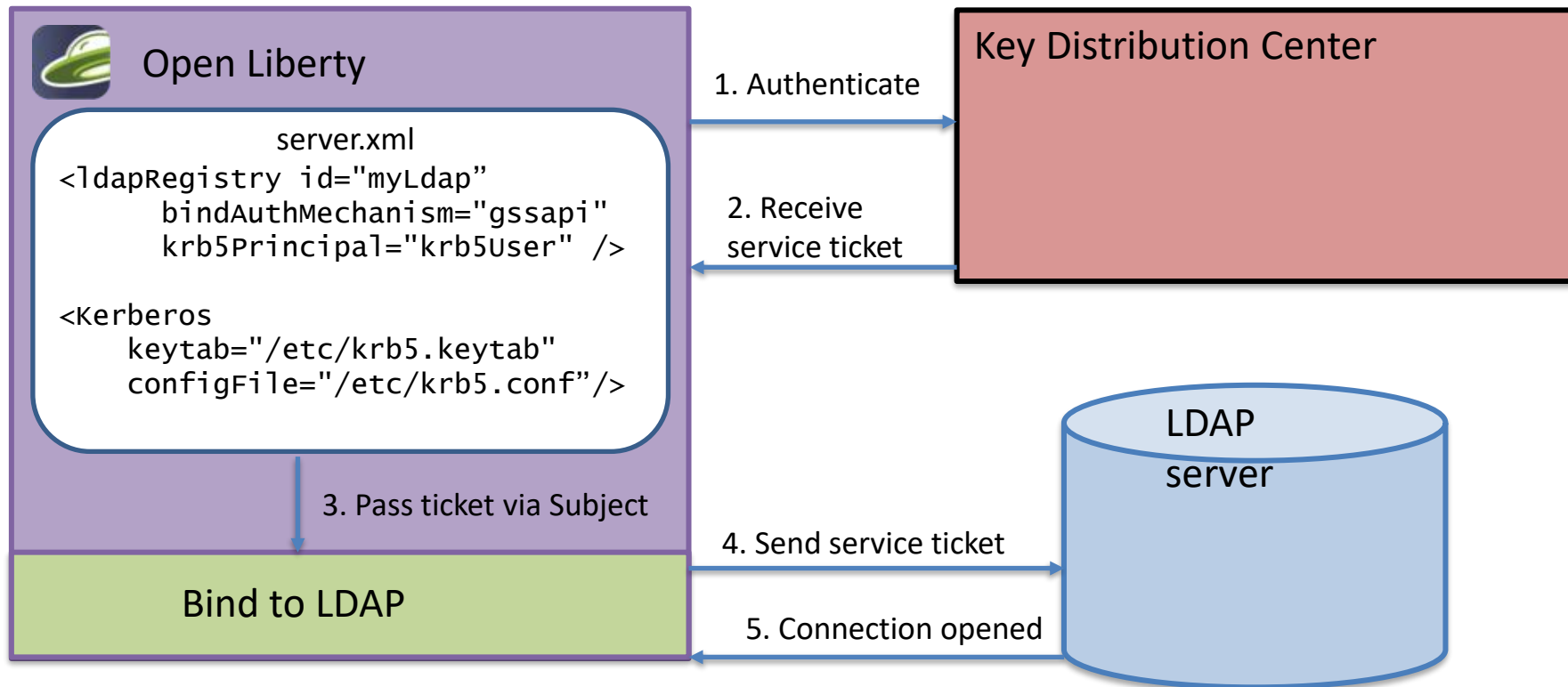
Active Request Count



Active Slow Request Count



# Kerberos bind to LDAP server



# Config for Kerberos Authentication



## Keytab Search order

1. server.xml
2. <user.home>/krb5.keytab

## Credential Cache Search order

1. server.xml
2. KRB5CCNAME environment variable
3. /tmp/krb5cc\_<uid>
4. <user.home>/krb5cc\_<user.name>

## Server.xml

```
<ldapRegistry id="myLdap"
  bindAuthMechanism="gssapi"
  krb5Principal="krb5User" />

<kerberos
  keytab="/etc/krb5.keytab"
  configFile="/etc/krb5.conf"/>
```

# Multi-Module Support in dev mode

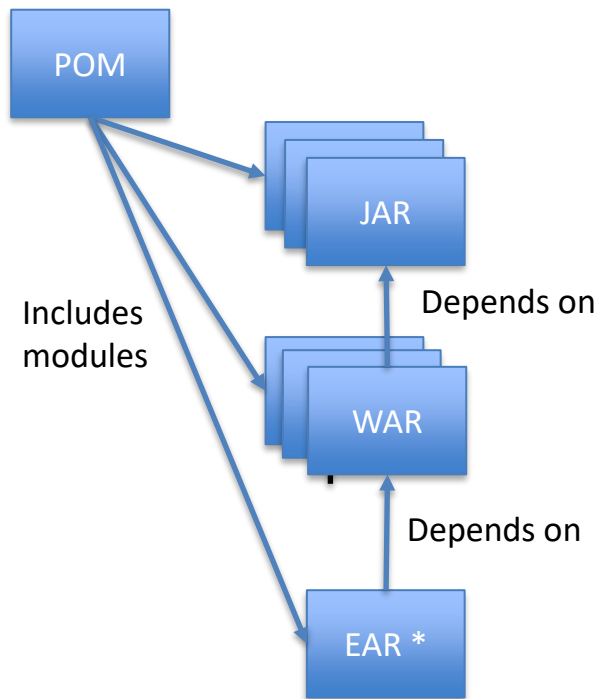


Fast iterative development for  
projects with multiple modules

Hot deploy, test and debug changes

Available in milestone releases for  
Liberty Maven Plugin

*mvn liberty:devc*



# Labs, Questions

# WebSphere Liberty Virtual POT

Open Liberty



Download the operating system specific content zip file from either

<https://ibm.box.com/WASLibertyVPoT> (fast - about 10 minute download)

<https://public.dhe.ibm.com/ibmdl/export/pub/software/websphere/wasdev/pot/> (slower but firewall friendly – about 1 hour download)



Liberty Quarterly Update\_20.0.0.4-6.final.pdf



LibertyPoT\_20.0.0.6\_WIN.zip V2



LibertyPoT\_20.0.0.6\_MAC.zip V2



LibertyPoT\_20.0.0.6\_LINUX.zip V2



labs\_n\_presentations\_only.zip V2



LibertyResourceList.pdf V2

charts only

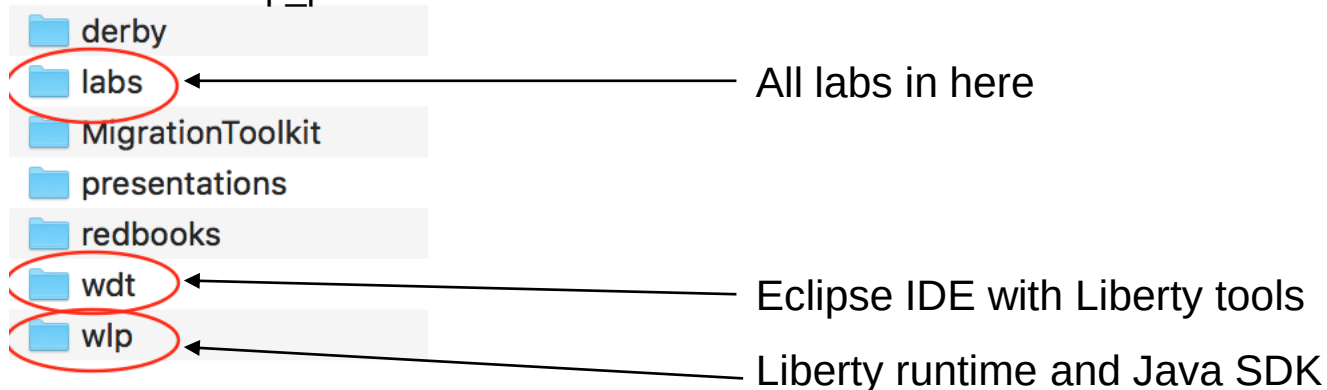
charts & lab instructions  
only

# WebSphere Liberty Virtual POT



Unzip to C:\wlp\_pot

- Note: You can unzip to anywhere you wish but the lab instructions assume the unzip location is C:\wlp\_pot



Follow [labs\gettingStarted\0\\_setup\\_20180105\setup.pdf](#)

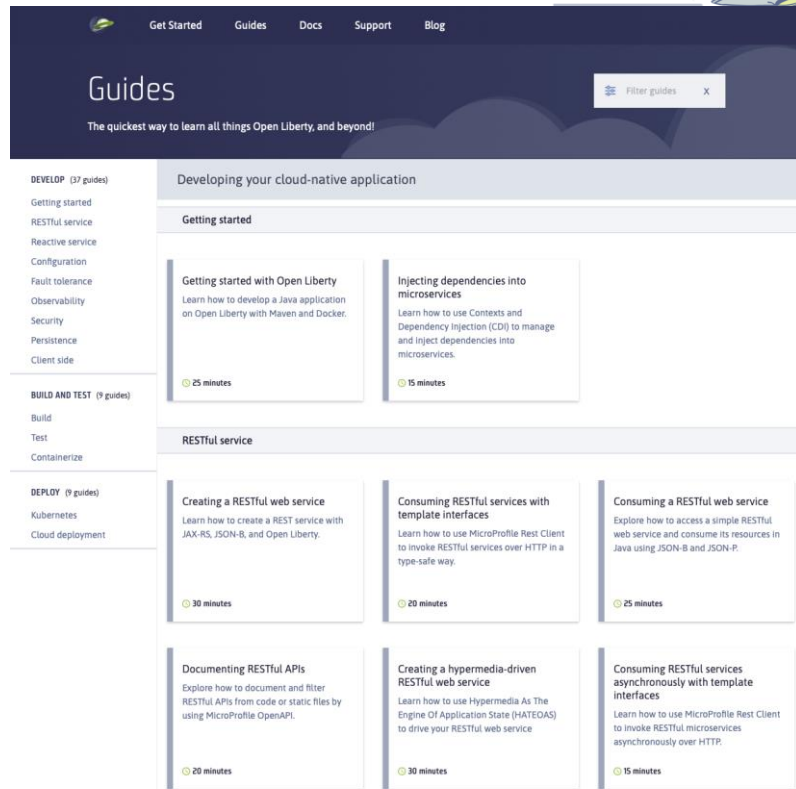
Then choose any labs you want to do



# Open Liberty Guides



- Hands-on learning in ~20 minutes
- 52 guides
  - MicroProfile & Jakarta EE
  - Open Shift, Docker, Kubernetes Istio
- Latest Guides
  - *Authenticating users through social media providers*
  - *Deploying microservices to OpenShift by using Kubernetes Operators*



<https://openliberty.io/guides>

# Resources

Open Liberty



## Useful Liberty Links

- Why choose Liberty for Microservices: <https://ibm.biz/6ReasonsWhyLiberty>
- Choosing the right Java runtime: <https://ibm.biz/ChooseJavaRuntime>
- How to approach application modernization: <https://ibm.biz/ModernizeJavaApps>
- Open Liberty: <https://www.openliberty.io>
- Open Liberty Guides: <https://www.openliberty.io/guides>

## Programming API Links

- Eclipse MicroProfile: <https://microprofile.io>
- Jakarta EE: <https://jakarta.ee>

## Support Links

- Java support dates: <http://www.ibm.com/developerworks/java/jdk/lifecycle>
- Single Stream Continuous Delivery: <https://www-01.ibm.com/support/docview.wss?uid=ibm10869798>
- Container Support Policy: <https://www.ibm.com/support/pages/container-deployment-support-policy-websphere-liberty>

## Migration Tools

- IBM Transformation Advisor <http://ibm.biz/cloudta>
- WebSphere Binary Migration Toolkit: <http://ibm.biz/WAMT4AppBinaries>

# Resources



## Red Hat UBI images

- <https://hub.docker.com/r/ibmcom/websphere-liberty>
- <https://hub.docker.com/r/openliberty/open-liberty>

## Ubuntu images

- [https://hub.docker.com/\\_/websphere-liberty](https://hub.docker.com/_/websphere-liberty)
- [https://hub.docker.com/\\_/open-liberty](https://hub.docker.com/_/open-liberty)

## IBM Container Registry images

- <https://cloud.ibm.com/docs/Registry?topic=RegistryImages-ibmliberty>

## Configuration/build files in github

- <https://github.com/WASdev/ci.docker>
- <https://github.com/OpenLiberty/ci.docker>

# Next Quarterly Update

Open Liberty



## **Liberty 21.0.0.4-6 Update**

——~~Session#1: July 21, 2021 from 1-3pm ET - <http://ibm.biz/Liberty-Jul21>~~

Session#2: Aug 4, 2021 from 9-11am ET - <http://ibm.biz/Liberty-Aug04>

## **Liberty 21.0.0.7-9 Update**

Session#1: Sep 22, 2021 from 1-3pm ET - <http://ibm.biz/Liberty-Sep22>

Session#2: Sep 29, 2021 from 9-11am ET - <http://ibm.biz/Liberty-Sep29>

# WebSphere Customer Advisory Board

All Customers and Business Partners  
welcome

<http://ibm.biz/WebSphereAdvisoryBoard>

email: [claudiab@us.ibm.com](mailto:claudiab@us.ibm.com)

## OPEN invitation

Join 230+ other members

Recordings/charts:

[ibm.biz/WASCABCommunityResources](http://ibm.biz/WASCABCommunityResources)

**NEW**

Monthly sessions  
for Business  
Partners and in  
the IST timezone

### Possible engagement levels – no commitment needed:

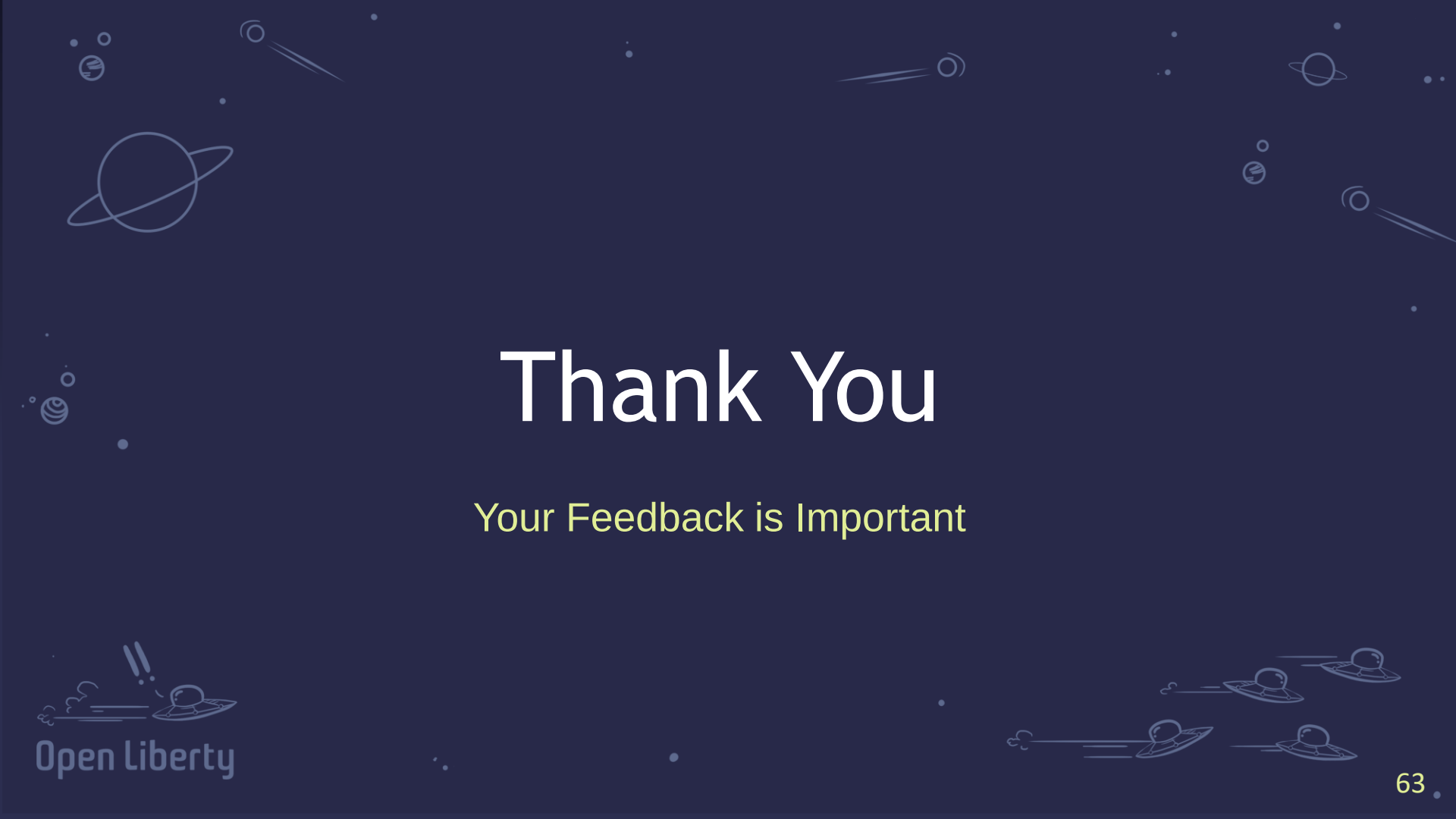
1. Fly on the wall – NEW\*\*
2. Stay ahead of the curve: more time commitment
3. Close the gap: quarterly involvement
4. At your own pace: impact longer term goals

### What you get out of it:

- ✓ **Direct access** to architects, developers, team leads during sessions
- ✓ **Insight** into roadmaps, pre-announce insider tips (under Feedback agreement)
- ✓ Directly **influence** deliverables
- ✓ **Gain** insights from other customers
- ✓ **Bonus:** special sessions at conferences
- ✓ **Bonus:** Free Cloud assessment

# Questions?

<http://stackoverflow.com/questions/tagged/websphere-liberty>  
[alasdair@ibm.com](mailto:alasdair@ibm.com)



# Thank You

Your Feedback is Important