Completing the picture Hybrid Cloud to CICS

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Cloud accelerates business transformation

- Innovate with the latest technology from any source
- Access more types of data, analytics & AI, anywhere
- Improve return on existing investments

Yet to date, less than 20% of enterprise workloads have moved. Why?

Source: McKinsey research

Today's Hybrid, Multicloud reality presents new opportunities, as well as new challenges...

94% Share of enterprise customers using multiple clouds

67% Share of enterprise customers using more than one public cloud provider

Priority Concerns

Connectivity between clouds 82%

Movement between clouds 73%

Consistency of management 67%

Source: IBM MD&I; :McKinsey research

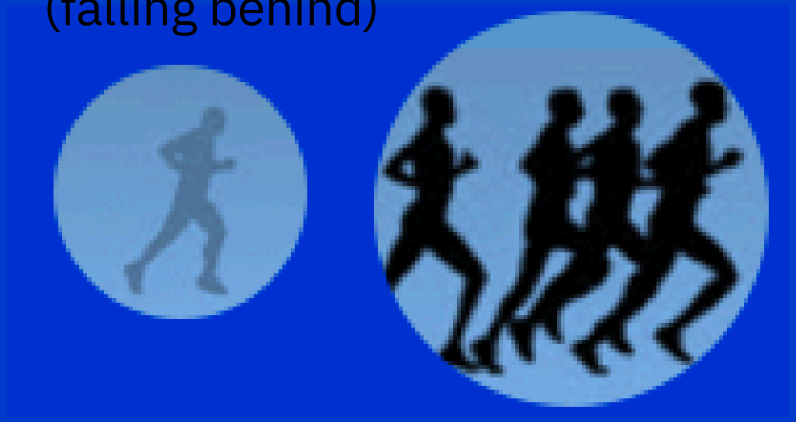
How can clients accelerate their

Digital Transformation

required to meet the opportunities and disruptions facing their market?

Option 1:

Keep the status quo
(falling behind)



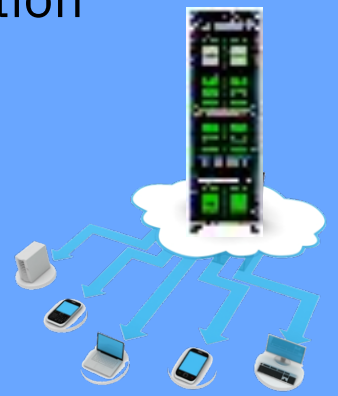
Option 2:

Rearchitect your
entire infrastructure

(high risk,
low reward,
opportunity costs)

Option 3:

Leverage your assets
on your existing platforms
to accelerate your
digital transformation



Acknowledge the Problems with IBM Z

Organizations are **moving to the cloud** because it provides **AGILITY**

- Is quickly understood & adopted
- Enhances speed to market
- Enables viral adoption of emerging technologies
- Provides solutions for new demands of digital business

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Currently, IBM Z is barely a footnote in this narrative

But the Mainframe …

Acknowledge the Problems with IBM Z

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But the Mainframe …

- Locks important assets in monolithic applications.
- Requires a lot of domain specific knowledge to use.
- Is strongly guarded against broad network access.
- Has a manual and labor intensive approach to resource management and maintenance.
- Has a separate and archaic approach to development and test processes.
- Carries a corporate IT culture which inhibits integration with the rest of the world.

Goal: Application Development Nirvana

Define a new idea in the morning
and have a solution
in production
by the end of the day

1. Liberate existing Intellectual Property assets currently locked in monolithic applications.
2. Provide access to on-premises infrastructure and resources for dev, test, prod.
3. Access and deploy resources via the cloud using modern DevOps methodologies and tools.
4. Recombine the assets based on dynamic business requirements and technology changes.
5. Rinse and Repeat

Future proof your existing IP
to easily align with the latest technologies.

What is the competition ?

- Docker provides a way of containerizing applications
- Docker Swarm / Kubernetes / ICP / Open Shift proving management layers to running many docker containers
- SCM, CI/CD, test tooling is freely available (and available as docker images)
- Open Source tooling that is freely available that everyone can learn, grow skills (and adopt)

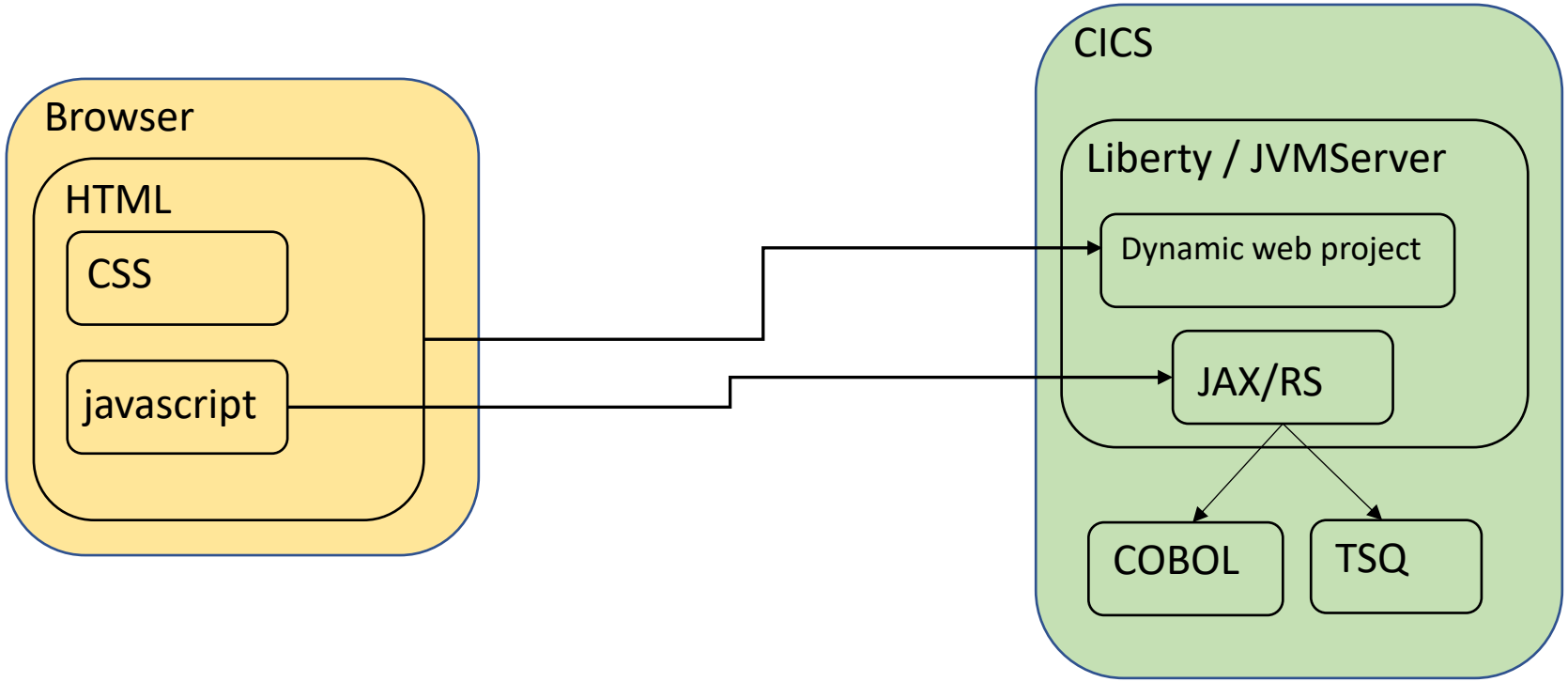
Demo

Lets play a little game of pong!

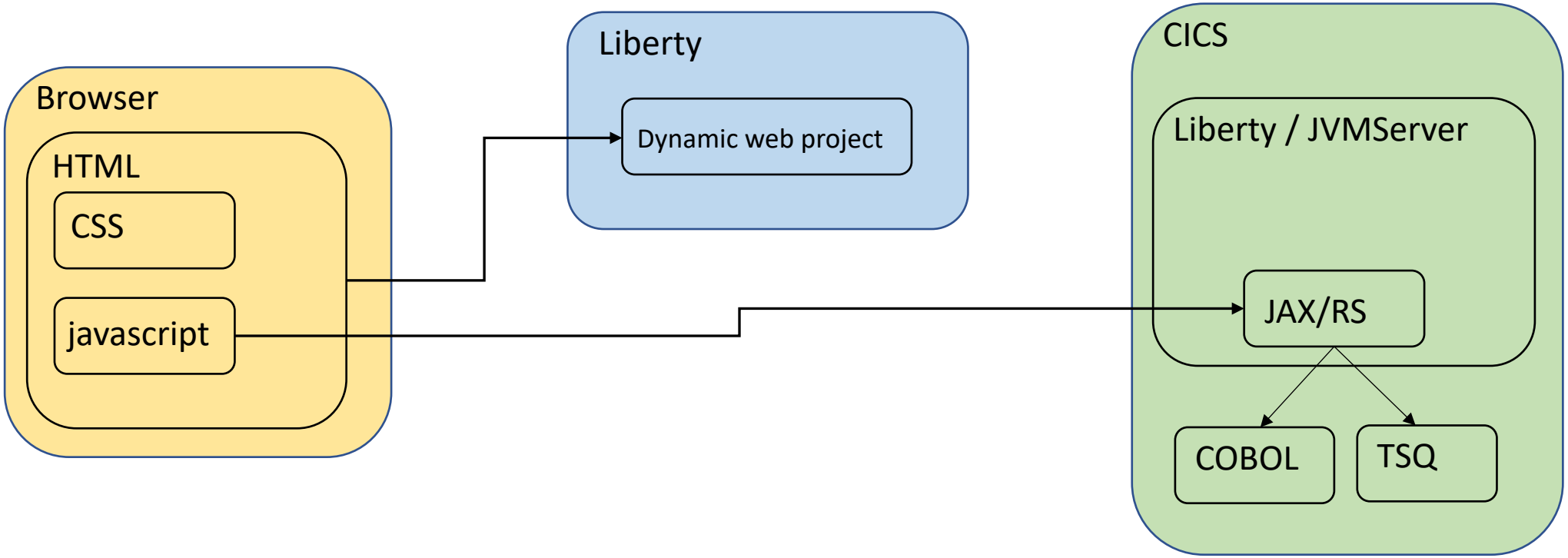
Not just a game of Pong!

- Front-End
  - HTML, CSS, Javascript
- Mid-Tier
  - JAX-RS APIs in Java
- Back-End
  - Java, COBOL, CICS

Microservice Architecture 2 tier



Microservice Architecture 3 tier



Jenkins feat. IBM Z Demo

DevOps on IBM Z

Step 1

Git Check out of new code

Pull all the code for the multi-language application

CODE

Step 2

Compile COBOL and Java code

Using DBB to compile the COBOL

CODE

Step 3

Carry out unit testing

Open Z unit test the COBOL code

TEST

Step 4

Create a CICS Bundle using CICS Build Toolkit

Assemble CICS resources in to a deployable bundle

BUILD

Step 5

Create an application container image

Build the z/OS container image of the microservice

BUILD

Step 6

Check for an existing container

Prepare for deprovision

DEPLOY

Step 7

Deploy new container

One command deploy of runtime and application

DEPLOY

Step 8

Run integration tests against new container

Check for any regressions and ensure the quality of the new version

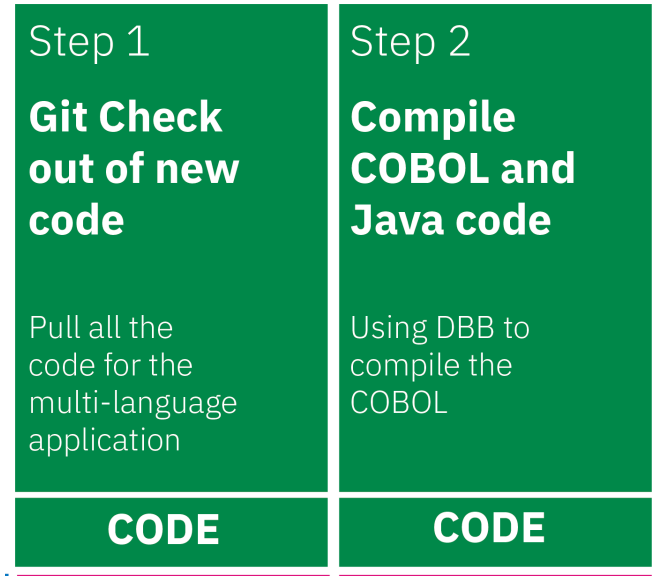
TEST

Step 9

If successful deprovision old container

Our new version of the application is ready, so let's clean up!

DEPLOY



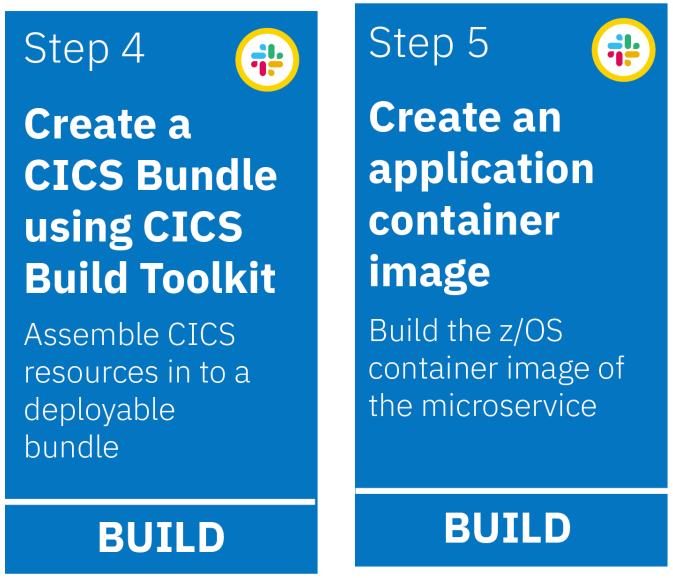
Git repository contains:

- Source code for:
  - COBOL
  - Java (a WAR project)
  - HTML, JavaScript, CSS
- CICS bundle project
- Source code for zosPT build

DBB:

- Allows us to either build the whole application OR
- Just the elements changed by a specific changeset

- Create builds under ANY hlq (for personal, test private builds)



CICS bundle in git is not a deployable asset but the project that a developer might have been using.

CICS Build toolkit can be used to turn this into a deployable asset.

Wrapping CICS build toolkit as a docker image allows this to be easily called from within jenkins

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Create an application container image

Build the z/OS container image of the microservice

BUILD

```
FROM openjdk:8
COPY cicsbt.zip /bin/
RUN unzip /bin/cicsbt.zip
ENV JAVA_HOME=/usr
ENV INPUT /default
ENV BUNDLE bundle
ENV TARGET com.ibm.cics.explorer.sdk.runtime55.target
ENV OUTPUT artifacts
CMD ["sh","-c","cicsbt/cicsbt -i ${INPUT} -b ${BUNDLE}
          -t ${TARGET} -o ${OUTPUT}"]
```

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Build the z/OS container image of the microservice

BUILD

```
docker run -v `pwd`/pong:/input/pong
           -v `pwd`/pongbundle:/input/pongbundle
           -v `pwd`/artifacts:/output
           -e OUTPUT="/output"
           -e INPUT="/input/pong /input/pongbundle"
           -e BUNDLE="pongbundle"
cicsts-docker-local.swg-devops.com/cicsbt:latest|
           exit 0
```

Step 4

Create a CICS Bundle using CICS Build Toolkit

Assemble CICS resources in to a deployable bundle

BUILD

Step 5

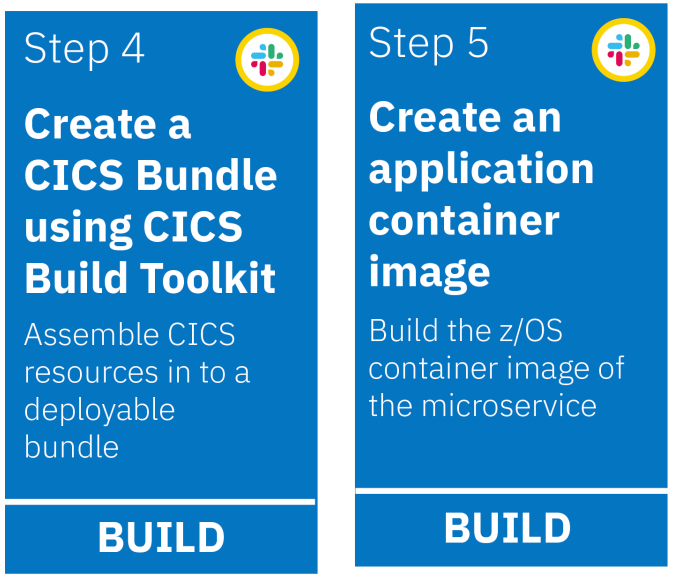
Create an application container image

Build the z/OS container image of the microservice

BUILD

```
FROM cics_55_liberty
COPY pongbundle bundles/pongbundle_1.0.0
COPY features/server.xml
workdir/DFHWLP/wlp/usr/servers/defaultServer/
        configDropins/overrides/server.xml
COPY application_binaries binaries
```

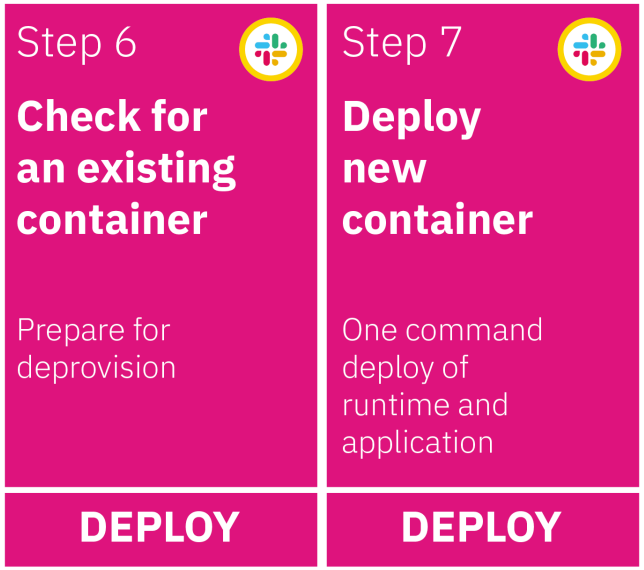
```
zospt build -t cics_ci_demo .
```



CICS-CI-DEMO is now a provision-able application container that will provision:

- My compiled COBOL load modules
- All the RDO definitions that are needed
- A WLP JVM Server that contains the deployed java application

Anyone can provision an instance of the application for testing.


Step 6
Check for an existing container
Prepare for deprovision
DEPLOY
Step 7
Deploy new container
One command deploy of runtime and application
DEPLOY

```
/u/yatesw:>zospt ps
2019-08-07 03:58:36  IBM z/OS Provisioning Toolkit V1.1.6
2019-08-07 03:58:37  Connecting to z/OSMF on host winmvs27.hursley.ibm.com port 32070.
NAME                    IMAGE          OWNER   CREATED              STATE          TEMPLATE                SYSTEM  CONTAINER TYPE
REG-DB2_DB2REG00        N/A            wharmby 2019-07-16T09:53:33  provisioned    DB2RegistrationTemplate MV27    Standard
CICS_CICPY00F           cics_ci_demo   yatesw  2019-08-06T15:26:58  provisioned    cics_55                 MV2C    Standard
```

This running container

Running our image

Using groovy to parse the output from z/OS PT to Extract the names of running containers in case we need to deprovision them later

```
/u/yatesw:>zospt run cics_ci_demo
2019-08-07 03:58:50  IBM z/OS Provisioning Toolkit V1.1.6
2019-08-07 03:58:50  Running image cics_ci_demo.
2019-08-07 03:58:50  The z/OSMF template used is cics_55.
2019-08-07 03:58:50  The z/OSMF domain is default.
2019-08-07 03:58:50  The z/OSMF tenant is dev_on_mv2c.
2019-08-07 03:58:50  Connecting to z/OSMF on host winmvs27.hursley.ibm.com port 32070.
2019-08-07 03:58:52  The z/OSMF template cics_55 was created by COMERM at 2019-05-16T13:40:43.5
22Z. The template type is standard. It was last modified by COMERM at 2019-05-16T13:41:10.517Z.
2019-08-07 03:58:57  Creating container CICS_CICPY00C with id 924ce00d-7e30-45f3-8feb-368410dfe
1b3 on system MV2C.
2019-08-07 03:58:57  This workflow contains parallel steps.
2019-08-07 03:59:04  Getting dynamic APPLID - Complete.
2019-08-07 03:59:04  Calculating CICS SYSID - Complete.
2019-08-07 03:59:17  Obtaining CICS version and hostname for the LPAR - Complete.
2019-08-07 03:59:17  Allocating CMCI port - Complete.
2019-08-07 03:59:17  Allocating HTTP port - Complete.
2019-08-07 03:59:17  Allocating HTTPS port - Complete.
2019-08-07 03:59:27  Creating CICS region data sets - Complete.
2019-08-07 04:00:21  Creating the zFS directory for the CICS region - Complete.
2019-08-07 04:00:21  Formatting CICS region data sets - Complete.
2019-08-07 04:00:21  Creating CICS log stream model - Complete.
2019-08-07 04:00:21  Creating CICS security configuration - Complete.
2019-08-07 04:00:49  Setting directory permissions - Complete.
2019-08-07 04:00:49  Creating CICS CSD definitions - Complete.
2019-08-07 04:00:49  Creating the CICS region JCL - Complete.
2019-08-07 04:00:50  DFH_REGION_CMCIPORT : 26002
2019-08-07 04:00:50  DFH_REGION_HTTP : 26006
2019-08-07 04:00:50  DFH_REGION_APPLID : CICPY00C
2019-08-07 04:00:50  DFH_CICS_TYPE : SMSS
2019-08-07 04:00:50  DFH_REGION_ZFS_DIRECTORY : /u/cicprov/mnt/CICPY00C
2019-08-07 04:00:50  DFH_REGION_HOSTNAME : WINMVS2C.HURSLEY.IBM.COM
2019-08-07 04:00:50  DFH_REGION_HTTPS : 26007
2019-08-07 04:00:51  Created container CICS_CICPY00C with id 924ce00d-7e30-45f3-8feb-368410dfe1
b3 on system MV2C.
2019-08-07 04:00:51  Connecting to z/OSMF on host winmvs27.hursley.ibm.com port 32070.
2019-08-07 04:00:52  Performing start on container CICS_CICPY00C.
2019-08-07 04:01:06  Checking zFS is mounted - Complete.
2019-08-07 04:01:17  Starting the CICS region - Complete.
2019-08-07 04:01:19  Container CICS_CICPY00C has been started.
```

Step 9

If successful deprovision old container

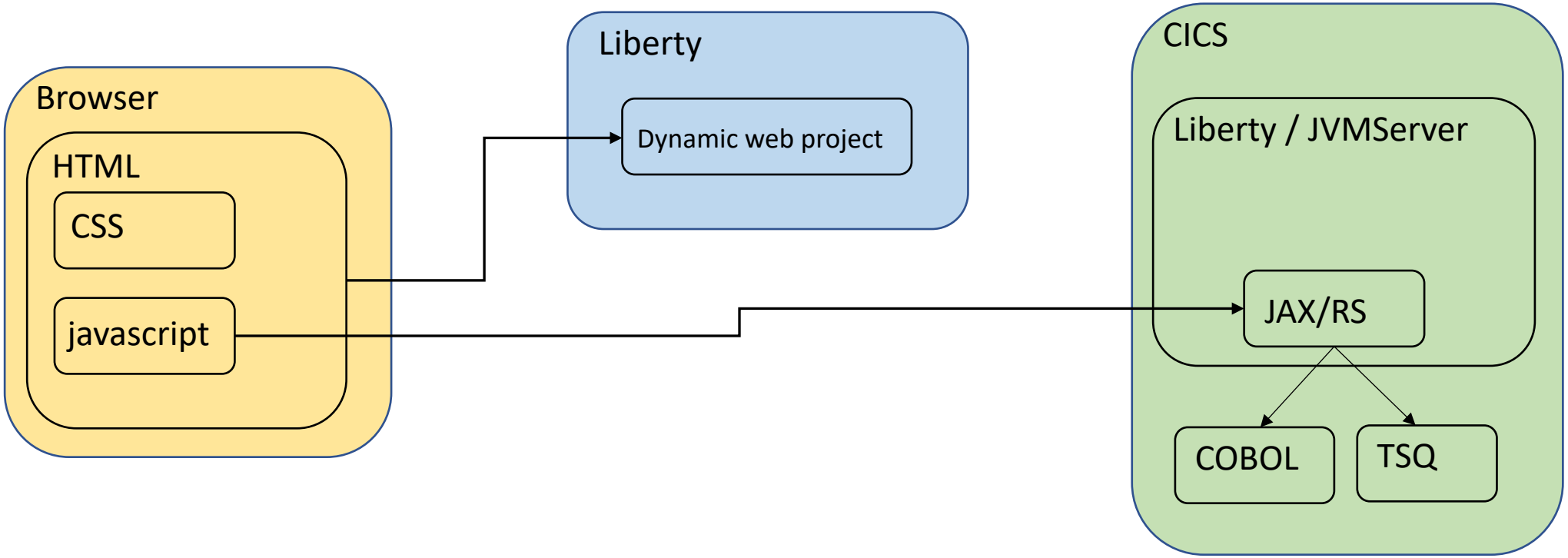
Our new version of the application is ready, so let's clean up!

DEPLOY

You appear to have solved it all – can we leave now?

- Building the zOS PT image makes the solution immediately live!
- The Jenkins job is responsible for searching for existing containers and cleaning up
- The port number of the provisioned endpoint changes each time
- Rolling updates to instances of applications are not possible
- Application access is not self serve, there’s now online catalog of services a developer can simply pick from

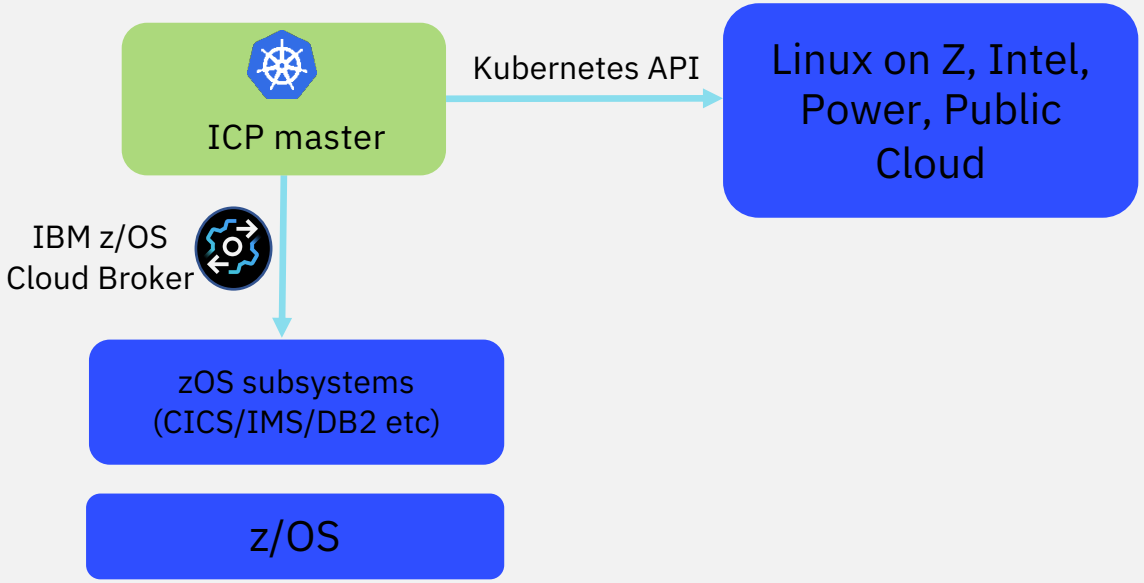
Microservice Architecture 3 tier



z/OS in your private cloud

z/OS Cloud Broker is technology that **gives users the ability to access and deploy z/OS resources and services** on Kubernetes based cloud platforms for a seamless and universal cloud development experience

z/OS Cloud Broker
Integrate z/OS Environment to Central Enterprise Control Plane



Challenge

Business critical applications running on z/OS are isolated, and installation of any Cloud platform will not integrate my z/OS subsystem within same control planes. Will require multiple control planes and integration tools.

Client Value

- z/OS subsystem can be deployed leveraging z/OSMF and standardized Service Broker implementation and Open Service Broker APIs
- Single control plane across z/OS, Linux on Z, x86, Power, and public cloud
- Protect existing investment, optimize management efficiencies, and achieve speed for innovation

Primary z/OS Cloud Broker Use Cases

DevOps – Attract and exploit new talent and improve time to market
Providing all types of application developers access to IBM Z environments and resources, leveraging common cloud marketplace open standards and tooling.

Service Provider – Less burden on Ops in a secure environment
Centralization and automation of operations to provide z/OS services to agencies or clients in a self-service model.

Multi-Cloud Service Integration – Streamline IT investments
Providing a unified experience for IBM Z cloud services across private cloud and public cloud.

Roadmap - vision and where we're starting

Phase 1: Containers for z/OS applications

- **Zach can add z/OS nodes for development, test, and production**
- **Stan can configure templates for z/OS containers**
- **Bobbi can configure pipeline to build z/OS image**
- **Alan can deploy and test a CICS COBOL application using a Helm chart**
- **Richard can use orchestration to move images through to production**

Phase 2: Heterogeneous Cluster

- **Zach can configure network proxy to publish z/OS-based services to the cluster**
- **Freya can deploy a Node.js application that uses services deployed by Alan on a z/OS node**
- **Sagar can architect a solution across Linux on Z and z/OS**
- **Operations has a single view of the hybrid cluster**

Phase 3: Redeployment

- **Sagar** can choose to move a high volume Node.js application from x86 to z/OS
- **Build engineer** can configure pipeline to rebuild z/OS image for a Node.js application
- **Freya** can deploy and test a Node.js application on z/OS using a modified Helm chart

Summary

With available, open technologies you can deploy applications in a modern devops style

Kubernetes, has won this iteration of the deployment battle, to stay relevant we have to play our part in heterogenous network deployments

As a platform we are integrating z/OS runtimes into the cloud deployment landscape making it an attractive proposal