What are the common tools that cover traditional and container development

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Wilhelm Mild
IBM Executive IT Architect
Integration Architectures & Digitalization
IBM LinuxONE & IBM Z
IBM R & D Lab Germany

IBM

Flexibility and options to decide for developing solutions

1. **Development language**

2. **Starting from self developed source Code or existing software**

3. **Starting from or with existing libraries**

4. **Where are the development tools available (open vs. proprietary)**

5. **Develop once and deploy anywhere requirements**

6. **What are the SLAs for the developed code**

   – update or replace code in place (continuous operation)

   – capacity / scalability / HA / availability, security,

IBM Developer for z/OS

- IBM® Developer for z/OS® (IDz) is a robust toolset for developing and maintaining IBM z/OS applications through the use of DevOps and agile practices.

- IBM Developer for z/OS, formerly Rational Developer for z Systems (RDz), offers COBOL, PL/I, High Level Assembler, REXX, C/C++, JCL, and JavaTM development tools on an Eclipse base.

- A fully integrated debugger provides developers the ability to test, examine, monitor, and control the execution of programs in context.

IBM Developer for z/OS

- Developer for z/OS is the base.
- With Enterprise Edition, developers have the option to choose for their daily z/OS development work
  - Microsoft VS Code and
  - OpenShift Dev Spaces as IDE options
  - IBM Dependency Based Build, and 3270 debugging capabilities.
- IBM Wazi for Dev Spaces - by using this in-browser IDE, z/OS developers can code, build, test, and run applications from any machine without any local environment configurations.
- IBM Wazi for VS Code - this desktop IDE is easy to get started for developers that are familiar with VS Code.

https://www.ibm.com/products/developer-for-zos

IBM Developer for z/OS

"We estimate that IBM Developer for z/OS has increased our developers' efficiency by up to 25 percent. We've dramatically accelerated our development and testing phases and we encounter significantly fewer bugs, as we modernize our continuous integration practice."
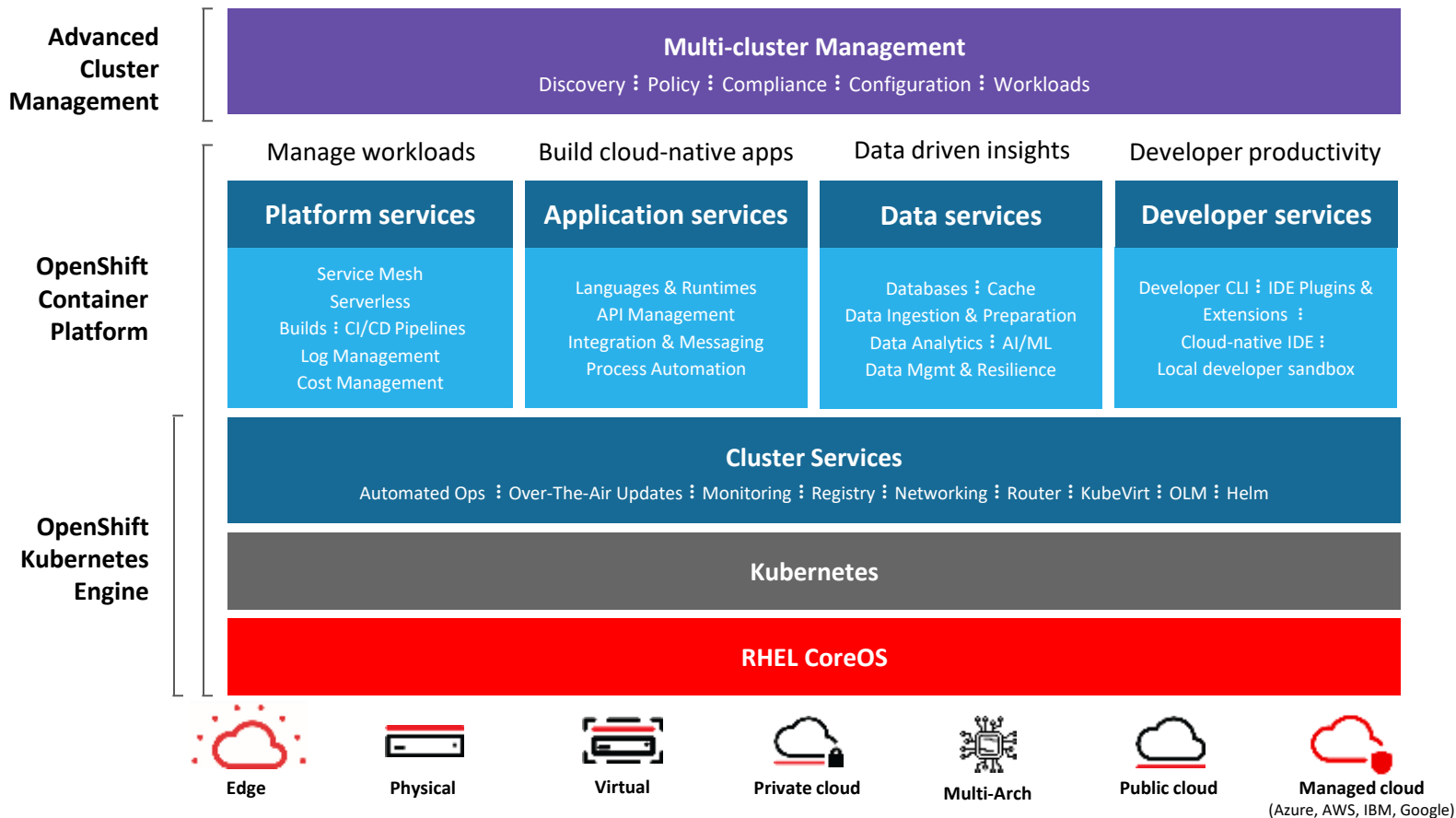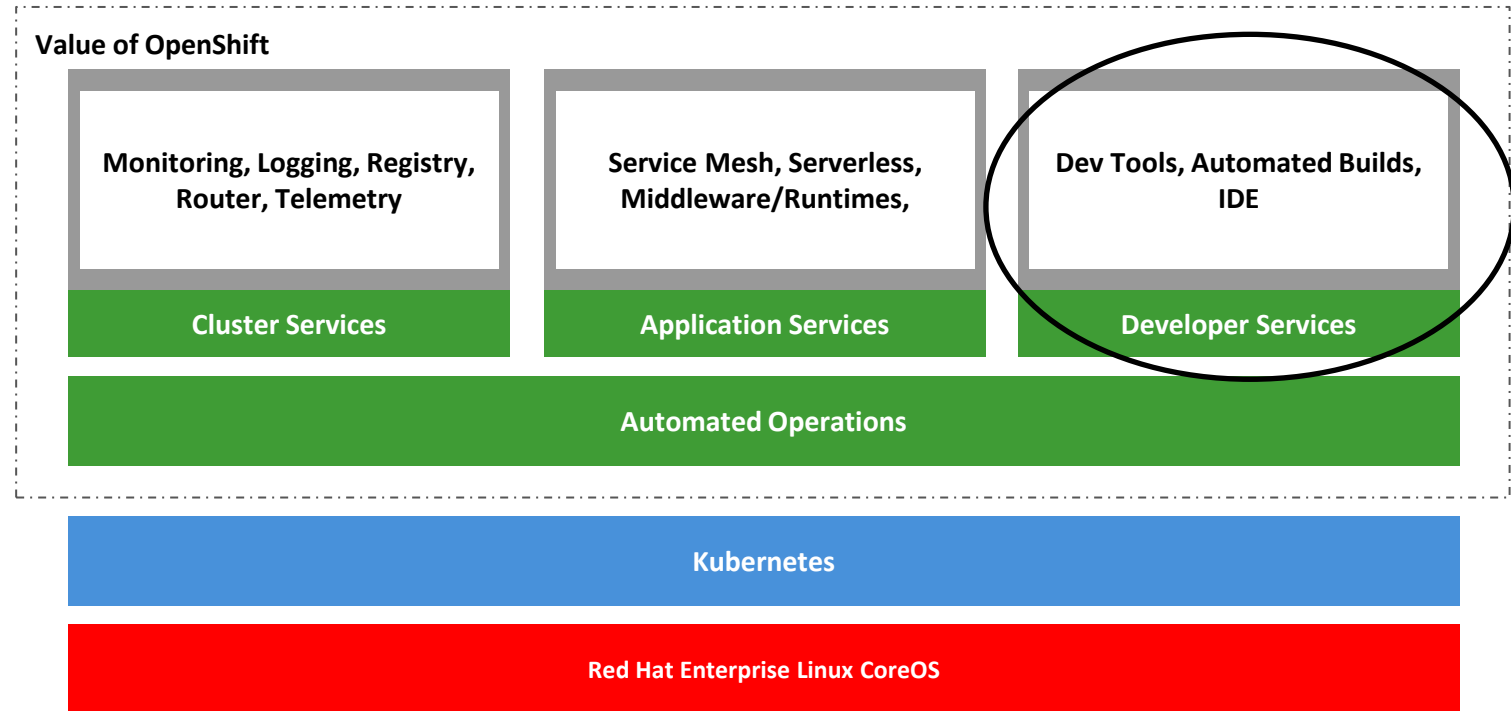
Umut Arslan

Unit Manager

Garanti BBVA Technology

Red Hat OpenShift Container Platform – Architecture

OpenShift is the only solution running on multiple architectures including IBM Z and IBM Power

Advanced Cluster Management

Multi-cluster Management
Discovery ⋮ Policy ⋮ Compliance ⋮ Configuration ⋮ Workloads

OpenShift Container Platform

Manage workloads | Build cloud-native apps | Data driven insights | Developer productivity

Platform services

Service Mesh
Serverless
Builds ⋮ CI/CD Pipelines
Log Management
Cost Management

Application services

Languages & Runtimes
API Management
Integration & Messaging
Process Automation

Data services

Databases ⋮ Cache
Data Ingestion & Preparation
Data Analytics ⋮ AI/ML
Data Mgmt & Resilience

Developer services

Developer CLI ⋮ IDE Plugins &
Extensions
Cloud-native IDE ⋮
Local developer sandbox

OpenShift Kubernetes Engine

Cluster Services
Automated Ops ⋮ Over-The-Air Updates ⋮ Monitoring ⋮ Registry ⋮ Networking ⋮ Router ⋮ KubeVirt ⋮ OLM ⋮ Helm

Kubernetes

RHEL CoreOS

Edge **Physical** **Virtual** **Private cloud** **Multi-Arch** **Public cloud** **Managed cloud**
(Azure, AWS, IBM, Google)

OpenShift Container Platform add-on services

Value of OpenShift

Monitoring, Logging, Registry, Router, Telemetry	Service Mesh, Serverless, Middleware/Runtimes,	Dev Tools, Automated Builds, IDE
Cluster Services	**Application Services**	**Developer Services**

Automated Operations

Kubernetes

Red Hat Enterprise Linux CoreOS

Best IT Ops Experience   CaaS ⟷ PaaS ⟷ FaaS   **Best Developer Experience**

OpenShift enables developer productivity

BUILD → TEST → DEPLOY

Self-service provisioning

Consistent environments

Automated build & deploy

CI/CD pipelines

Configuration management

App logs & metrics

CODE ← REVIEW ← MONITOR

SPRING & JAVA™ EE	MICROSERVICES	FUNCTIONS
LANGUAGES	DATABASES	APPLICATION SERVICES
LINUX	RED HAT OPENSHIFT	WINDOWS*
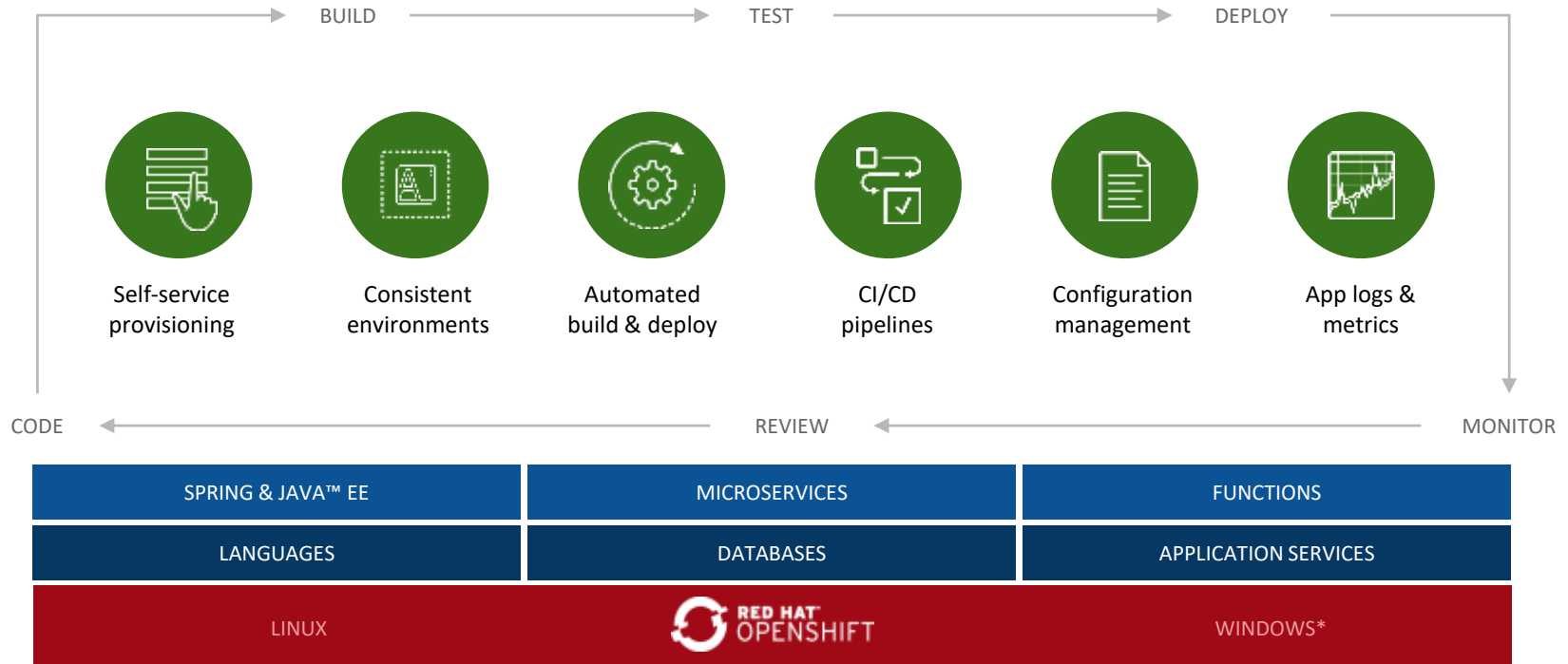
Red Hat Runtimes, ease your cloud-native development for RHOCP on Z & LinuxONE

Red Hat Runtimes

Lightweight middleware developing cloud-native applications on RHOCP

➢ A collection of runtimes, frameworks, and languages for developers and architects, so they can choose the right tool for the right task.

➢ Support is included for:
Quarkus, Spring Boot, Vert.x, Node.js,

LAUNCH SERVICE

CLOUD-NATIVE RUNTIMES

Red Hat JBoss Enterprise Application Platform

Red Hat Data Grid

OpenJDK

Red Hat AMQ

RED HAT SSO

Red Hat Application Migration Toolkit
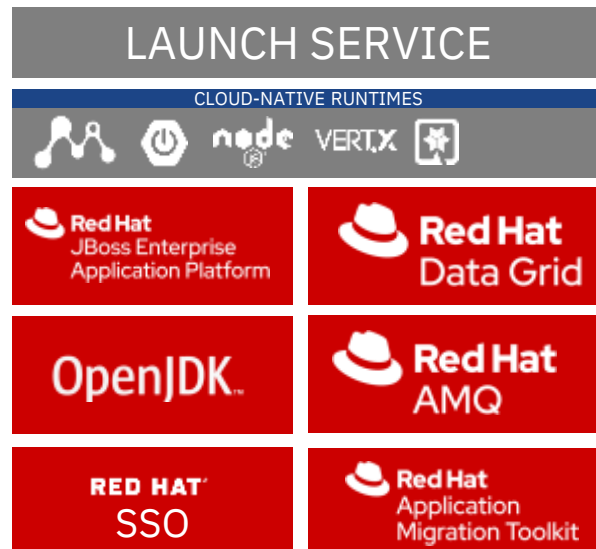
Cloud-native development tools in **Red Hat OpenShift** for IBM zSystems & LinuxONE
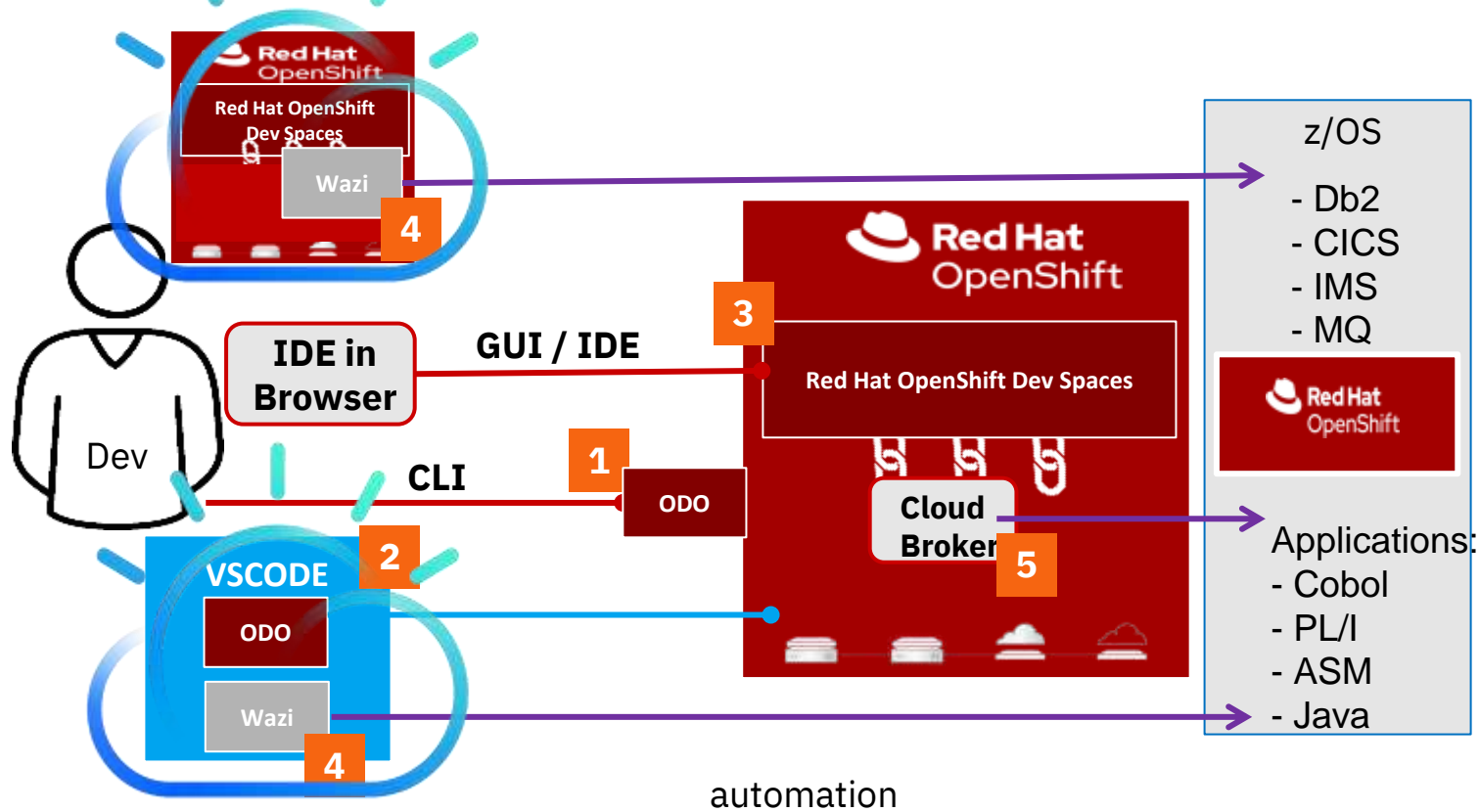
1 Openshift Do (odo) – the development CLI for apps in Red Hat OpenShift

odo is a CLI tool for creating applications on OpenShift Container Platform and Kubernetes. With odo, you can:
- develop / write,
- build,
- and debug

applications on an OpenShift cluster without the need to administer the cluster itself.

- **Creating deployment configurations, build configurations, service routes and other OpenShift Container Platform or Kubernetes elements are all *automated by .odo***

- For IBM Z & LinuxONE, OpenShift Do has been supported since release 1.2.5. You can download and check the latest release on OpenShift mirror site.

- **odo is the foundation for integration with other tools** for OpenShift container development

https://community.ibm.com/community/user/ibmz-and-linuxone/blogs/xiao-mei-zheng/2021/07/05/red-hat-openshift-do-on-ibm-system-zlinuxone

The OpenShift VS Code extension uses both odo and the oc binary to interact with your OpenShift Container Platform cluster on IBM system Z/LinuxONE.

- To work with these features, install the OpenShift VS Code extension OpenShift Connector on VS Code.

- Then VS Developers can easily create, deploy and live debug applications running on OpenShift.

- With Wazi for VS Code – you can have a complete tool set to develop Containers and z/OS applications

Once the extension installed, you can enter OpenShift Application Explorer View on left menu.

15
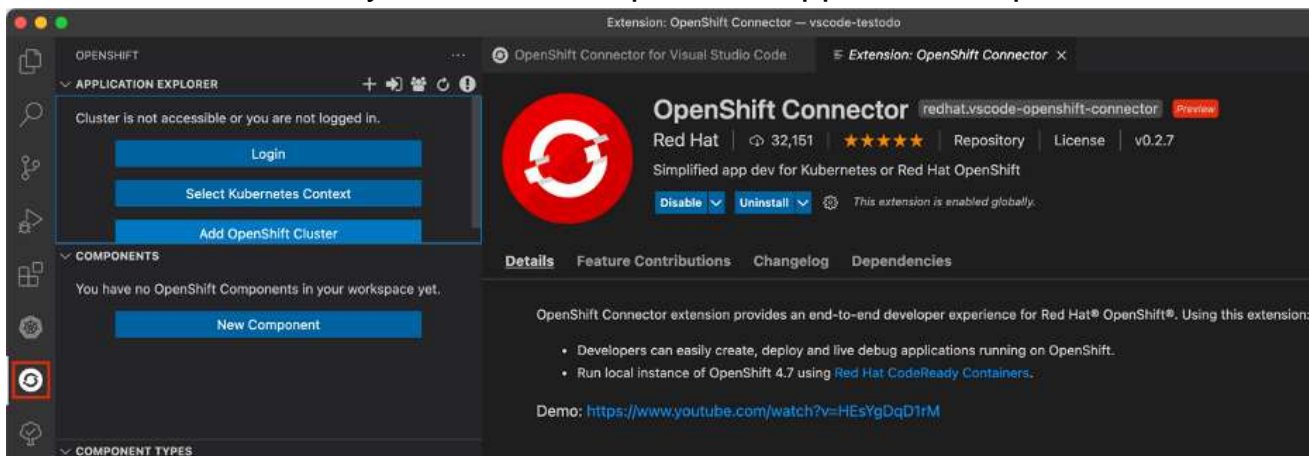
RH OpenShift Dev Spaces – the IDE in OpenShift for RHOCP Apps

Dev Spaces is a web IDE, based on a developer workspace server, based on Eclipse Che that includes a web IDE, project code and containerized runtime.
- If you are familiarized with Eclipse IDEs – it's the perfect match.
- With Wazi for Dev spaces – you have a complete tool set for Openshift and z/OS apps.

Using RH OpenShift Dev Spaces you can:
- edit the code
- test the code locally within the workspace
- push it to source control, which will trigger the application build and deployment to OpenShift on IBM Z and LinuxONE   https://www.redbooks.ibm.com/abstracts/tips1365.html?Open

- Dev Spaces contains an OpenShift DO (ODO) plugin via Eclipse Che
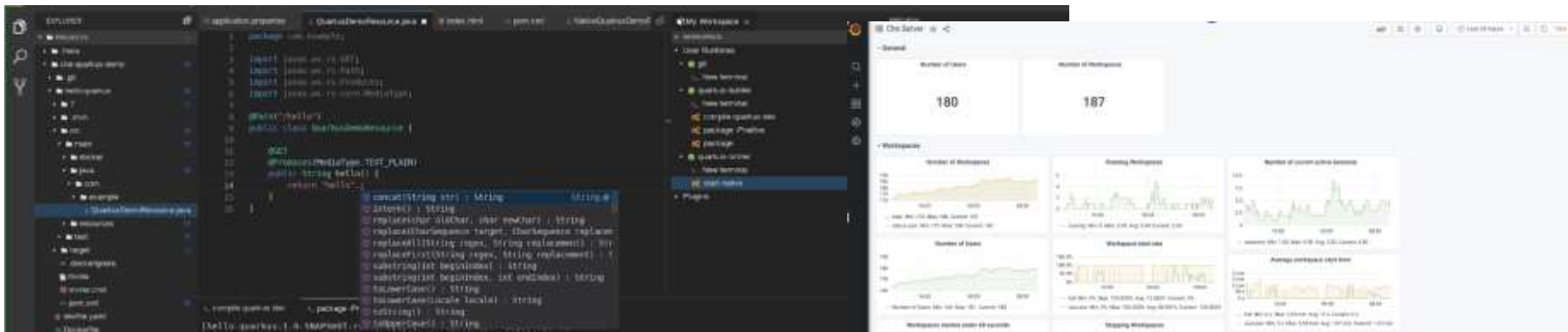
Devfile: Developer environment as code

The devfile provides easy-to-configure, highly reproducible definitions of portable developer environments.

It is a declarative abstraction of a replicable developer workspaces, which includes the runtime environments, the source code of the projects mapped to repositories and the tools, plugins and commands needed to code, build, test, run and debug a project.

Manage Consistency

First class support of K8S, manage the complexity of developer environments take out the pain.
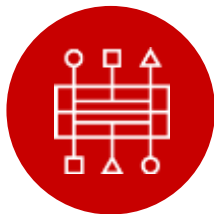
Easy to Integrate

Devfiles are easy to integrate with any tools. Developer environments can be created from anywhere at anytime.

Simple to Share

Devfile live with source code, are easy to modify, fork and share.
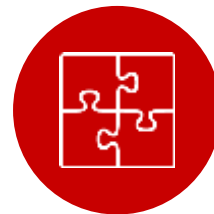
Extensible

Customize per task, with plug-in and developer preferences

4 **IBM** Wazi Developer for Red Hat OpenShift Dev Spaces

Develop hybrid applications spanning IBM Z and multi cloud platforms using a standard in-browser IDE and run applications from any machine

Wazi Code: Edit, build, and debug.
Reduce the need for specialized skills and improve productivity with cloud native tools

Wazi Analyze: Understand the impact of potential application changes.
Reduce costs with an enterprise wide standard toolchain.

Increase speed and agility with a containerized development & test environment using Wazi Sandbox

Flexibly rebalance entitlement over time: from what you need today, to what you need tomorrow

End to end cloud native developer experience

Code   Sandbox   Analyze   Test

Portable across any cloud or platform and Optimized to run on Red Hat® OpenShift®

Bring your own Integrated Development Environment (IDE)

Microsoft® Visual Studio Code™   Eclipse®

Red Hat® OpenShift Dev Spaces

DevOps for IBM Z can be seen as interrelated enterprise capabilities

"Culture" is in the center of DevOps

Transform and Innovate with Speed and Agility

- Couple business, technology, and process innovation
- Empower small, autonomous teams to make decisions
- Experiment in the market and fail fast
- Create a flexible team structure and minimize team distractions
- Build trust and alignment with better communication and transparency
- Take ideas to market with speed and deliver business outcomes fast

Portability of Container & Multi Architecture registry support

- **Container user experience (CLI, REST API) is identical across platforms**
- **Container images are not portable**, the source code or a s390x binary must be build and available
- Micro-service architectures often have clean structure and simple individual components
- Containers are often created with Dockerfiles (build descriptions) containing:
    - Specification of the base image
        - If the same distribution is available on s390x, usually simple
        - If the base image is not available, some creativity is required
    - Additional steps to modify the image are often platform independent
        - Add packages (needs to match the base image)
        - Download files, Perform build
- Same Dockerfile can be used for multi-platform builds
- Multi-arch Registry support available using external tools (i.e. manifest tool)
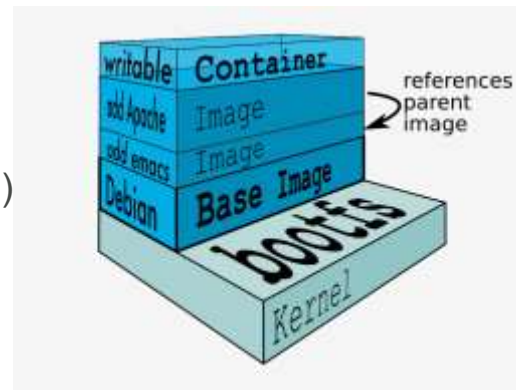
Create Multi – Architecture Images – use the 'manifest' tool

common
Dockerfile

podman build
podman push

Z

docker build
docker push

x86

Z+x86
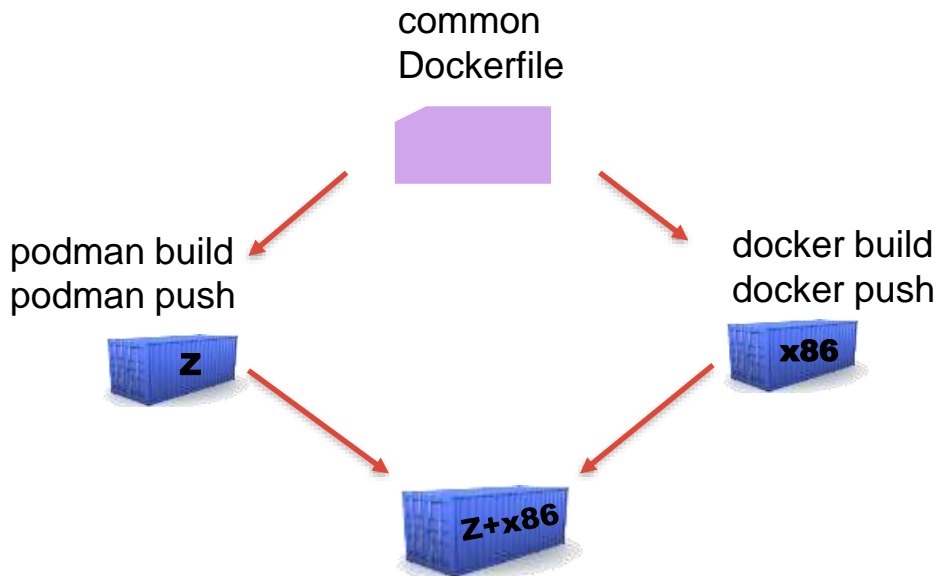
```
image: webapp:latest
manifests:
-
image: webapp-s390x
platform:
architecture: s390x
os: linux
-
image: webapp-amd64
platform:
architecture: amd64
```
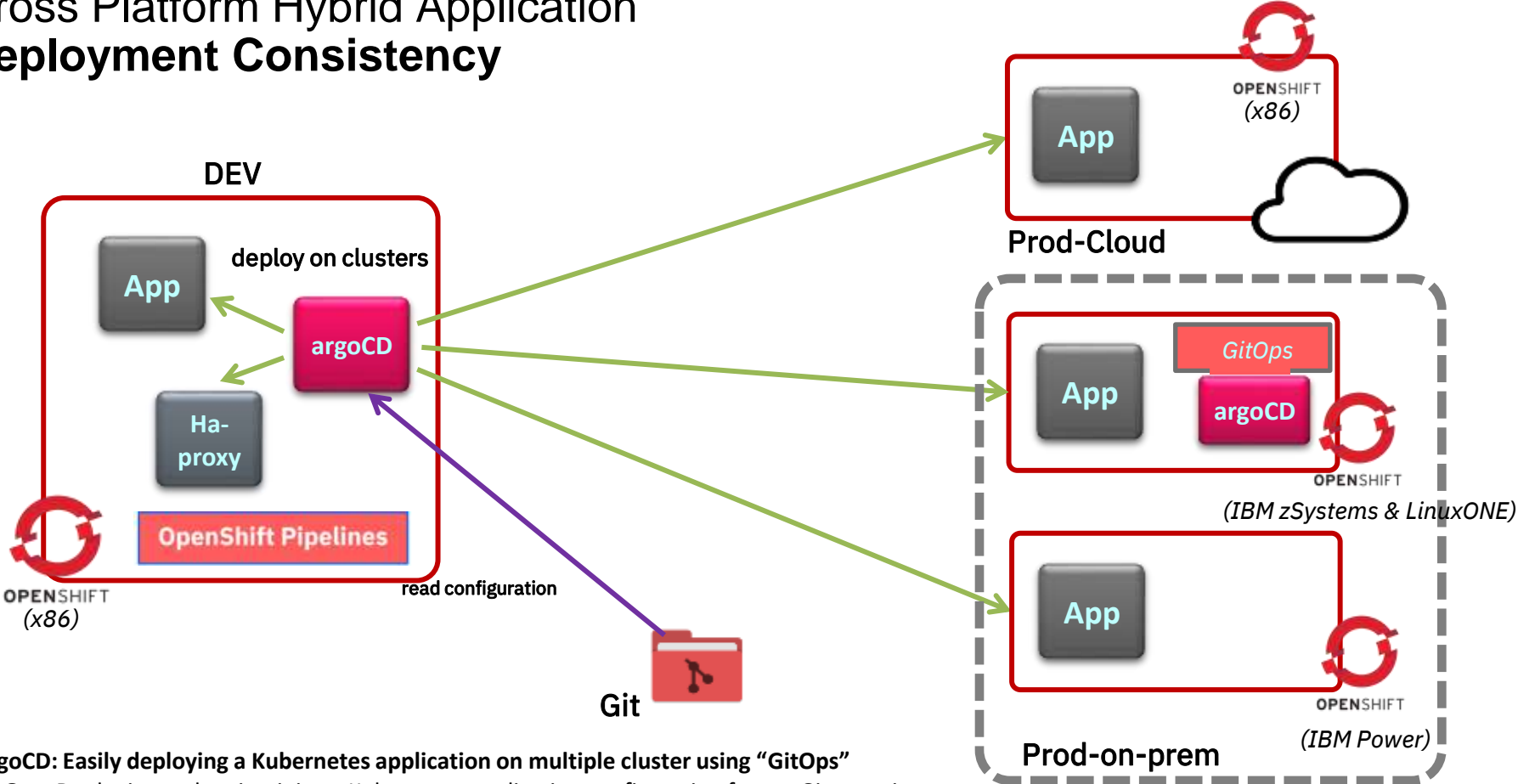
- Many container images on external registries are multi-arch
- lots of images as s390x versions available
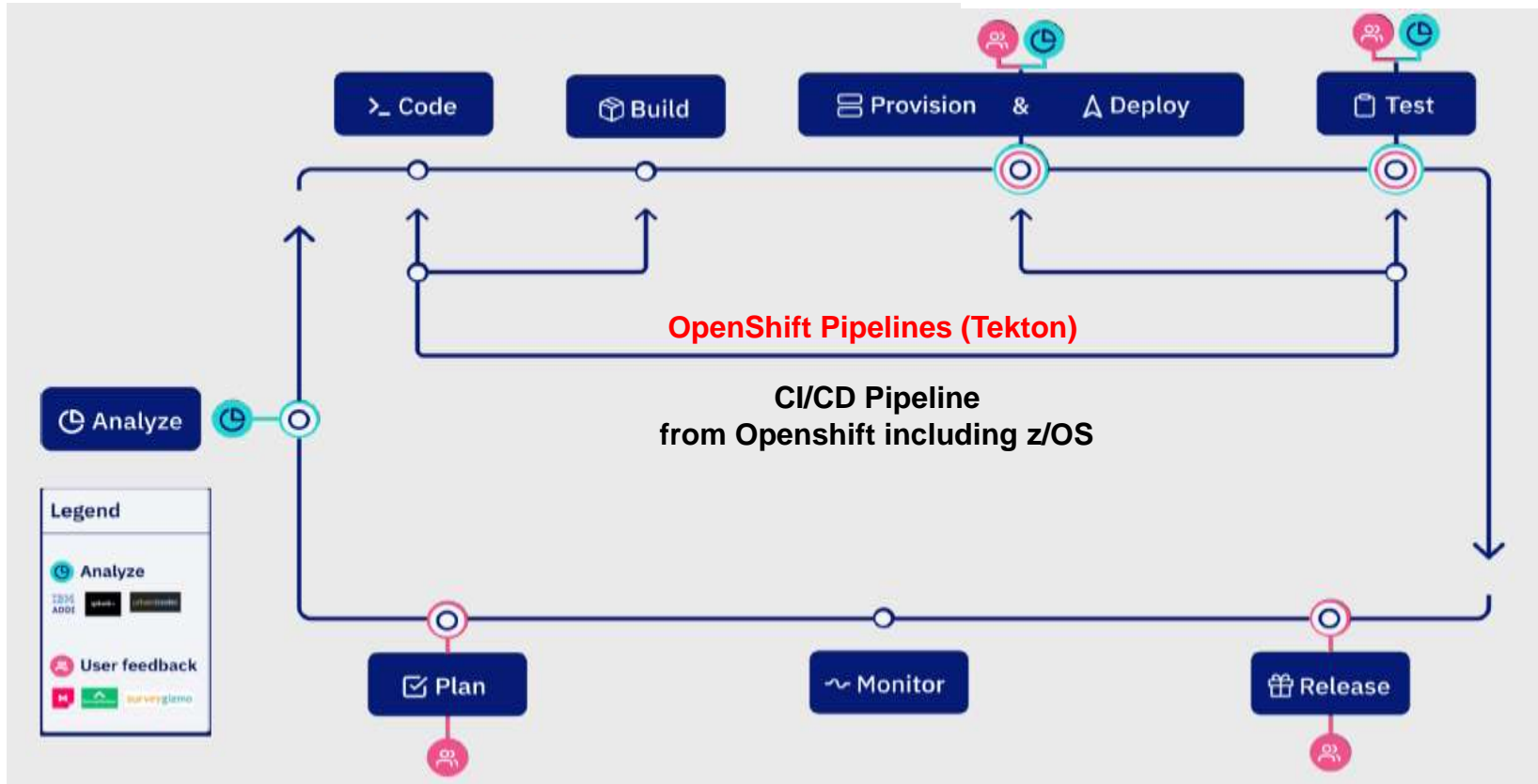**- IBM builded a trusted image registry**

Cross platform Application development consistency

Red Hat® OpenShift® Cluster

Red Hat Enterprise Linux CoreOS

Public Cloud

Red Hat® OpenShift® Cluster

Red Hat Enterprise Linux CoreOS

- Develop once
- Deploy multiple
- Run selective

Red Hat® OpenShift® Cluster

Red Hat Enterprise Linux CoreOS

IBM zSystems

Red Hat® OpenShift® Cluster
Red Hat Enterprise Linux CoreOS

X86
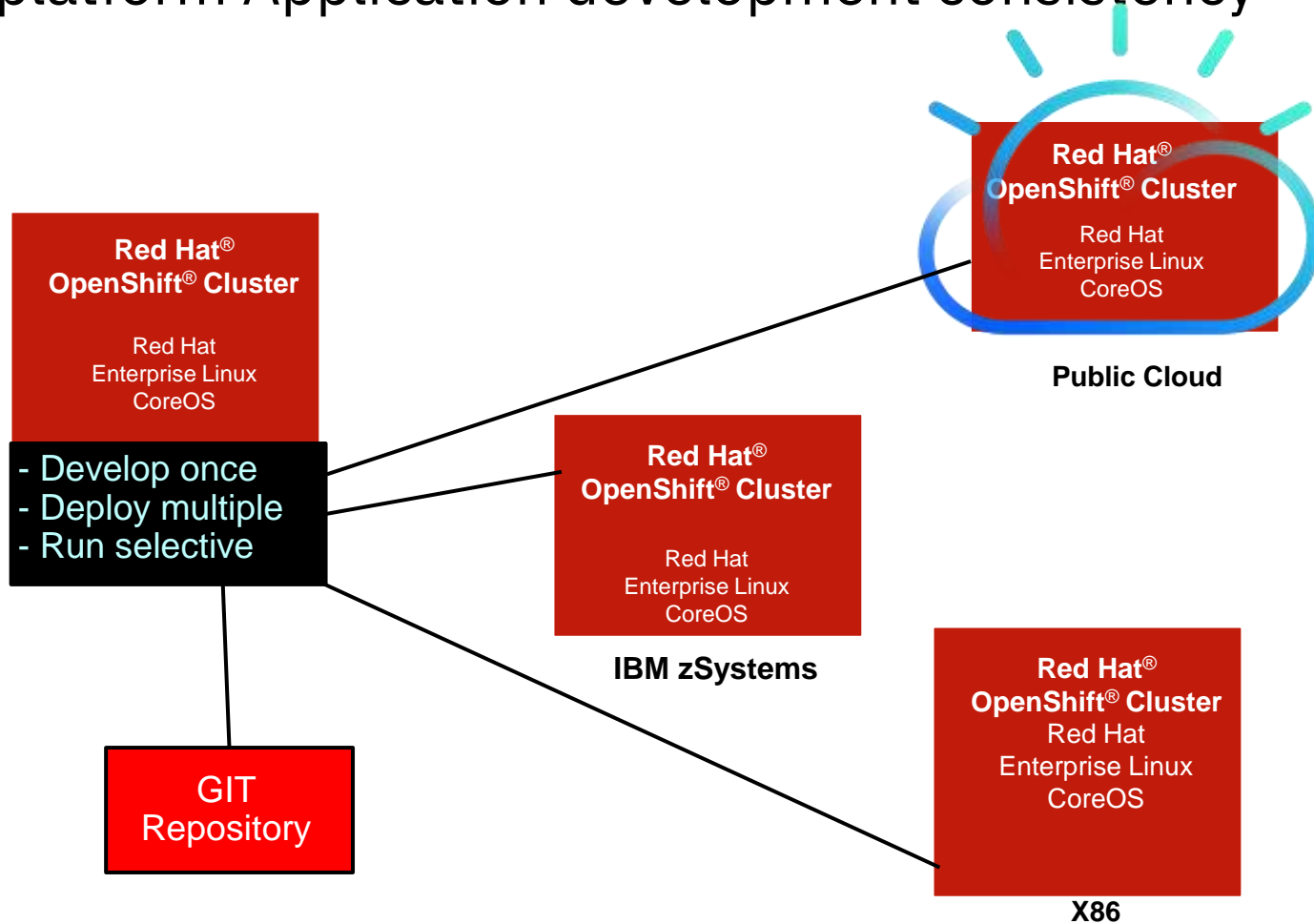
GIT Repository

Cross Platform Hybrid Application
Deployment Consistency

ArgoCD: Easily deploying a Kubernetes application on multiple cluster using "GitOps"
GitOps: Deploying and maintaining a Kubernetes application configuration from a Git repository

https://mediacenter.ibm.com/media/Multicluster-MultiArch+deployment+with+Red+Hat+OpenShift/1_9qjdhc96

What makes up DevOps and CI/CD

Continuous Integration and Continuous Delivery (CI/CD)
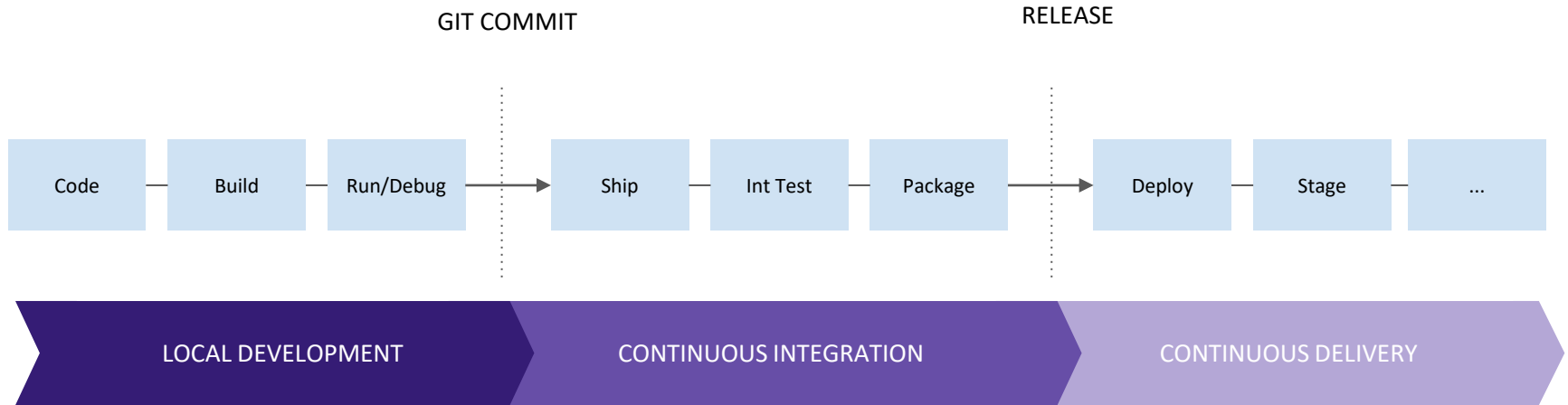
What is CI/CD and why Cloud-Native CI/CD?

Traditional CI/CD	Cloud-Native CI/CD
Designed for Virtual Machines	Designed for Containers and Kubernetes
Require IT Ops for CI engine maintenance	Pipeline as a service with no Ops overheard
Plugins shared across CI engine	Pipelines fully isolated from each other
Plugin dependencies with undefined update cycles	Versioning stable, curated pipeline images
No interoperability with Kubernetes resources	Native Kubernetes resources
Admin manages persistence	Platform manages persistence
Config baked into CI engine container	Configured via Kubernetes ConfigMaps

OpenShift Pipelines (Tekton): Architecture

Developer Tools

OpenShift Dev Console	Tekton CLI	OpenShift Dev Spaces	IDE (Visual Studio Code, IntelliJ)

CI/CD Core

OpenShift Pipelines

Operator	Extensions	Integrations	Task Library

Tekton Pipelines

Kubernetes
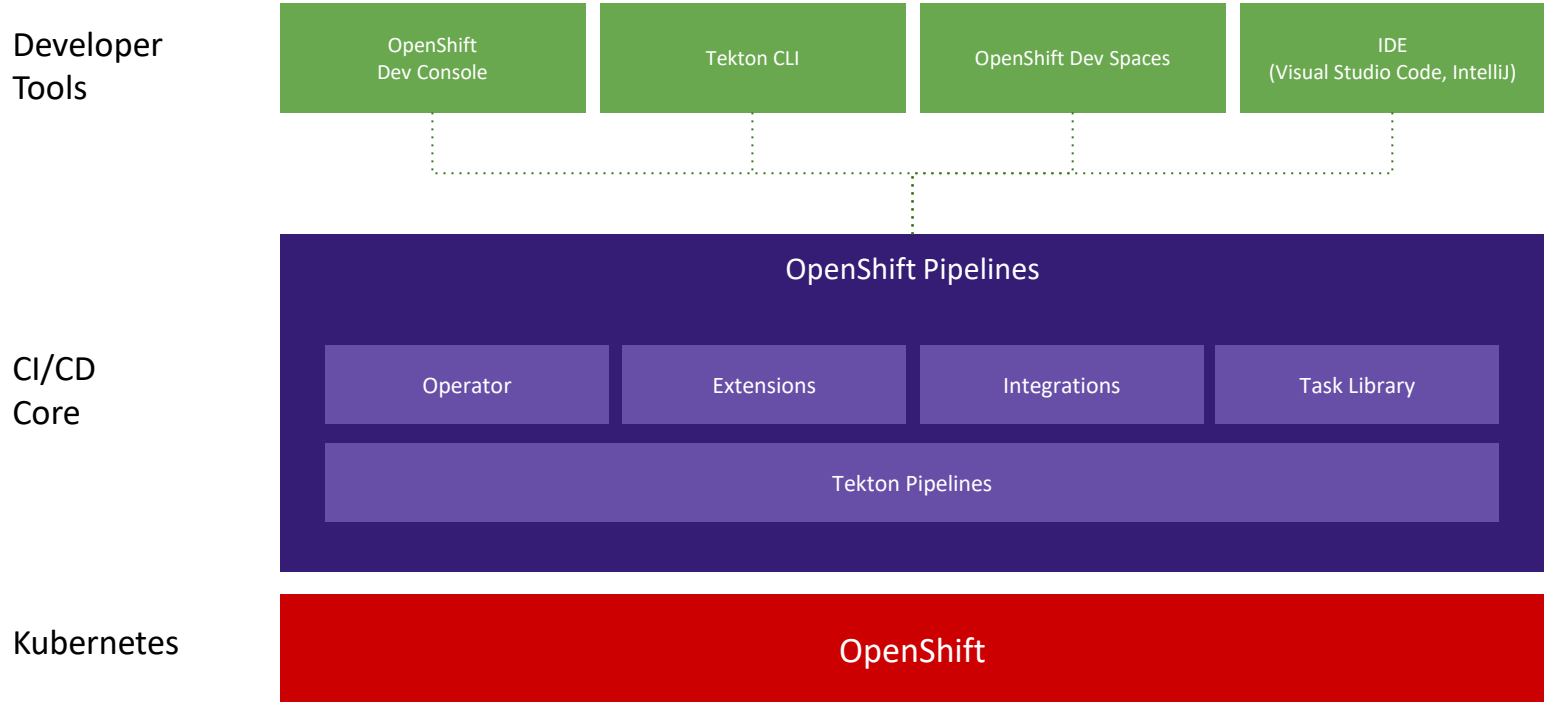
OpenShift

Main Concepts of OpenShift Triggers

Event

Eventlistener
- Interceptors
- Trigger Bindings
- Trigger Templates

PipelineRun/
TaskRun/
Other resources

Trigger

Start pipelines based on events: GitHub Webhooks Gitlab events, Cron jobs Custom event

Event Listener

A listener for events, which transforms them into some actions

Interceptor

An event processor for filtering, verification and transformation

Trigger Binding

A mapping between event payload and Trigger Template parameters

Trigger Template

A template for resource to create based on event info

35

LEGEND

● Analyze

● Feedback, approvals

Note: Starting from the upper left, products and significant capabilities appear once, the first time they are used in the pipeline. Products and capabilities are used at multiple points.

CI/CD Pipeline

VS Code, Eclipse Che (BYOI)
GitHub
GitLab

Code

podman
JUnit 5
Maven
GitLab Jenkins
sonarqube

Build

Tekton
Jenkins
ANSIBLE

Provision   **Deploy**

JUnit
Serenity

Test

GitLab   Jenkins   JFrog ARTIFACTORY   Nexus

splunk>

Analyze

Jira
Confluence
Trello

Plan

Prometheus
Grafana
APPDYNAMICS

Monitor

urban {code}
cloudbees

Release
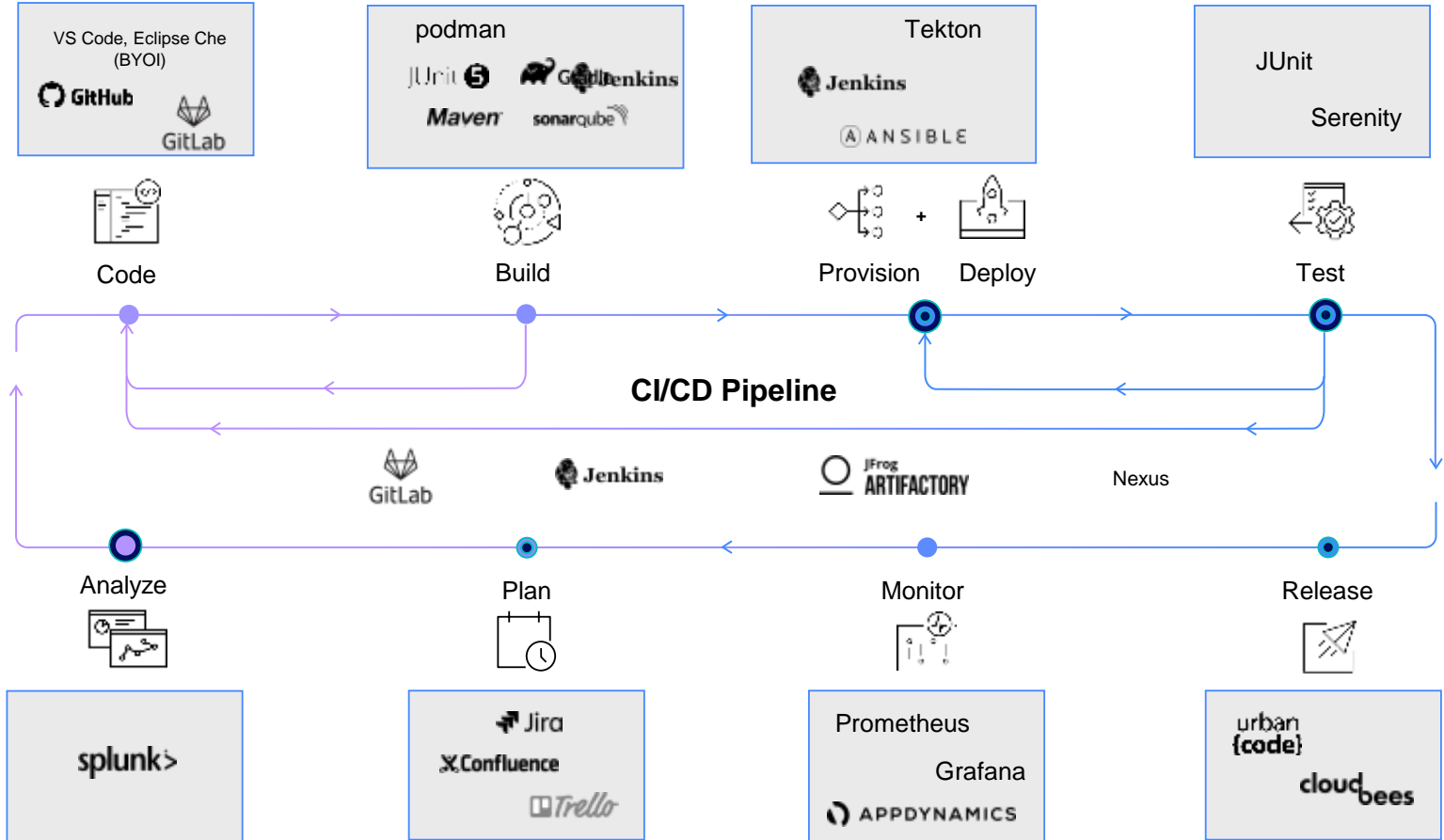
How to ensure continuous operation of a solution

Steps in development to ensure continuous operation:

1. **Implement a DevOps or DevSecOps process**

2. **This process should include Continuous Integration & Delivery (CI / CD)**

3. **That requires automation for software & container image build & deployment**

4. **It requires the loop back if Key Processing Indicators (KPI) fail**

5. **For HA it requires the definition in RHOCP of Replica Set for continuous operation for traditional applications – the integration in the HA process**

Docker-Hub containerized software for Linux on IBM Z & IBM LinuxONE

https://hub.docker.com/search?q=HTTPd&type=image&architecture=s390x

The search provides public container images that have been built for Linux with version of Linux on Z and LinuxONE

Open-source containerized Software for Linux on IBM Z & IBM LinuxONE

https://www.ibm.com/community/z/open-source-software/

Validated Open Source Software

The table below provides up-to-date information on open source packages that have been ported and/or validated on corresponding distro versions by IBM.

Log in or Sign up

What is in the table?

The table provides up-to-date information on open source packages that have links to packaged binaries and/or document for building them on Linux on IBM packages. Binaries/Docker images once made available by community, are no

How up-to-date is it?

As we continue to port/test new packages, this table will be updated wheneve

What if a package I'm interested in is not in the table?

Please submit request via email or in our group. We will prioritize based on bu them work out of box, especially those written in languages that don't need to not in this table doesn't necessarily mean it doesn't work on the platform, the

| Search | Search packages | | Package | All packages | OS | 7 shown | 110 of 110 packages | Clear filters |

Packages	RHEL 8.x	Ubuntu 20.x	SLES 15.x	Dockerfile/Image	RHEL 7.x	Ubuntu 18.x	SLES 12.x
Alfresco	7.x	7.x	7.x	Via 7.x	7.x	7.x	7.x
Ansible	Distro Latest	Distro Latest	Distro Latest	NA	Distro Latest	Distro Latest	Distro Latest
AntLR	4.x	Distro 4.x	4.x	NA	3.x, 4.x	Distro 3.x, 4.x	3.x, 4.x
Apache ActiveMQ	Latest	Distro Latest	Latest	NA	Latest	Distro Latest	Latest
Apache Camel	Latest	Latest	Latest	NA	Latest	Latest	Latest
Apache Cassandra	3.x	3.x	3.x	3.x Image	2.x, 3.x	2.x, 3.x	2.x, 3.x
Apache Flume	Download	Download	Download	NA	Download	Download	Download

Red Hat catalog with container images

IBM zSystems and LinuxONE Container Registry

*foundational distros**

languages

registries, scanners

dashboards, UIs

shell, utilities
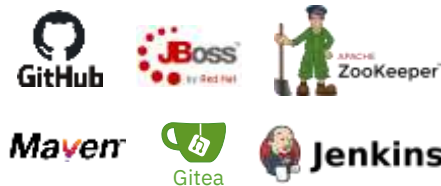
CI/CD infrastructure

messaging

Many images, multiple versions, chosen based on customer input

* Red Hat base image available at Red Hat Marketplace

databases/datastores
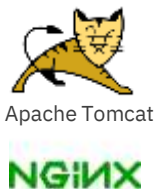
web serving

Elastic stack

Top 10 Containers

- Kafka
- Development-workspace
- Elasticsearch
- Logstash
- Ubuntu
- Grafana
- OpenJDK
- Alpine
- Portainer
- Tensorflow

Images in the pipeline

Official interface made available end of October, 2021

https://ibm.biz/BdfAdW

Questions?

Wilhelm Mild

IBM Executive IT Architect

IBM

IBM Deutschland Research
& Development GmbH
Schönaicher Strasse 220
71032 Böblingen, Germany

Office: +49 (0)7031-16-3796
wilhelm.mild@de.ibm.com

The Open Group
OPEN Certified
Distinguished Architect

IT Architecture
Chief/Lead IT Architect

Twitter: @mildw

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