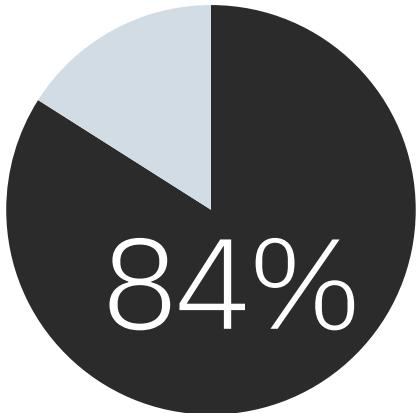


DevOps & Hybrid Cloud

Kirk Chadwick
IBM Global Executive – Build
Segment & Enterprise DevOps
Practice Leader
ktchadri@us.ibm.com

A hybrid cloud architecture integrates applications that run across multiple clouds, moving data securely across the cloud estate, and improving business processes and workflows that span multiple clouds.



... and yet

...of executives acknowledged their enterprise struggles in eliminating silo-to-silo handoffs

Hybrid Cloud goals:

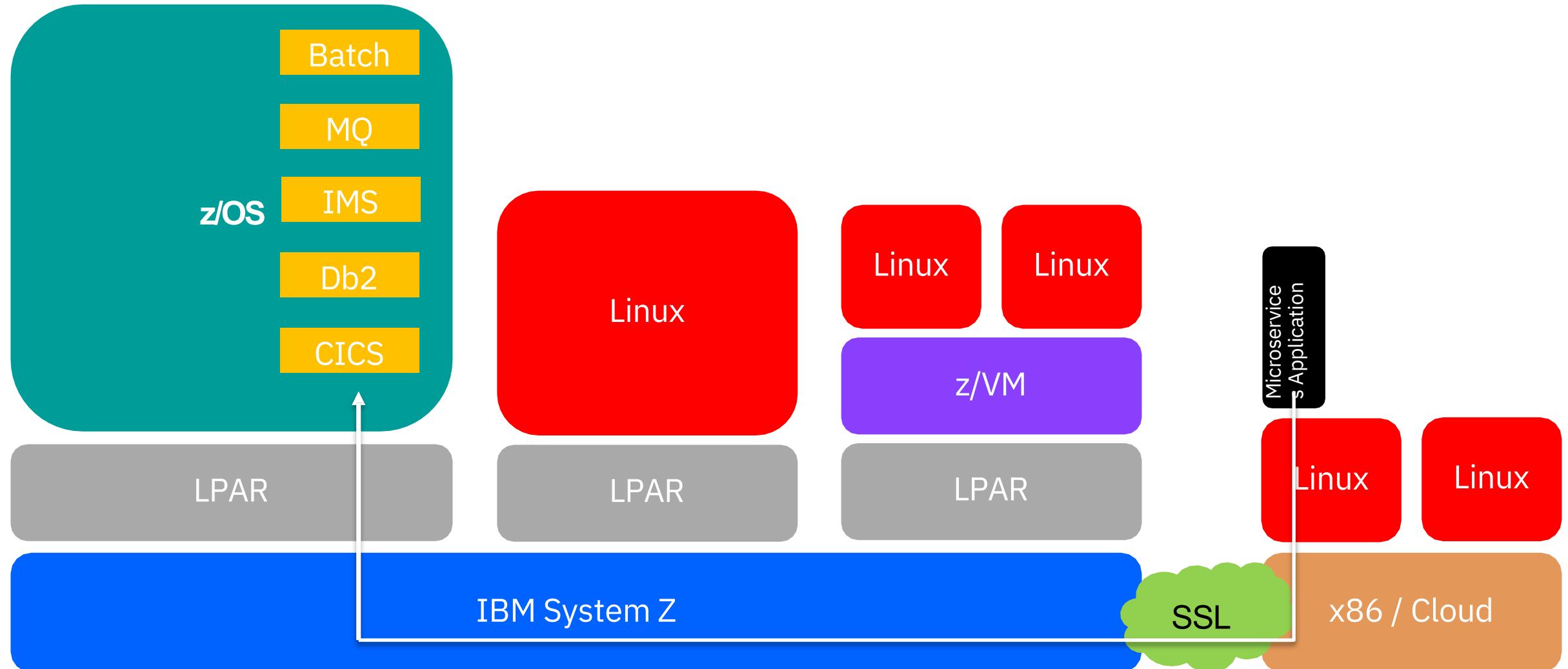
1.
Flexible Operations
innovate anywhere

3.
Improved ROI

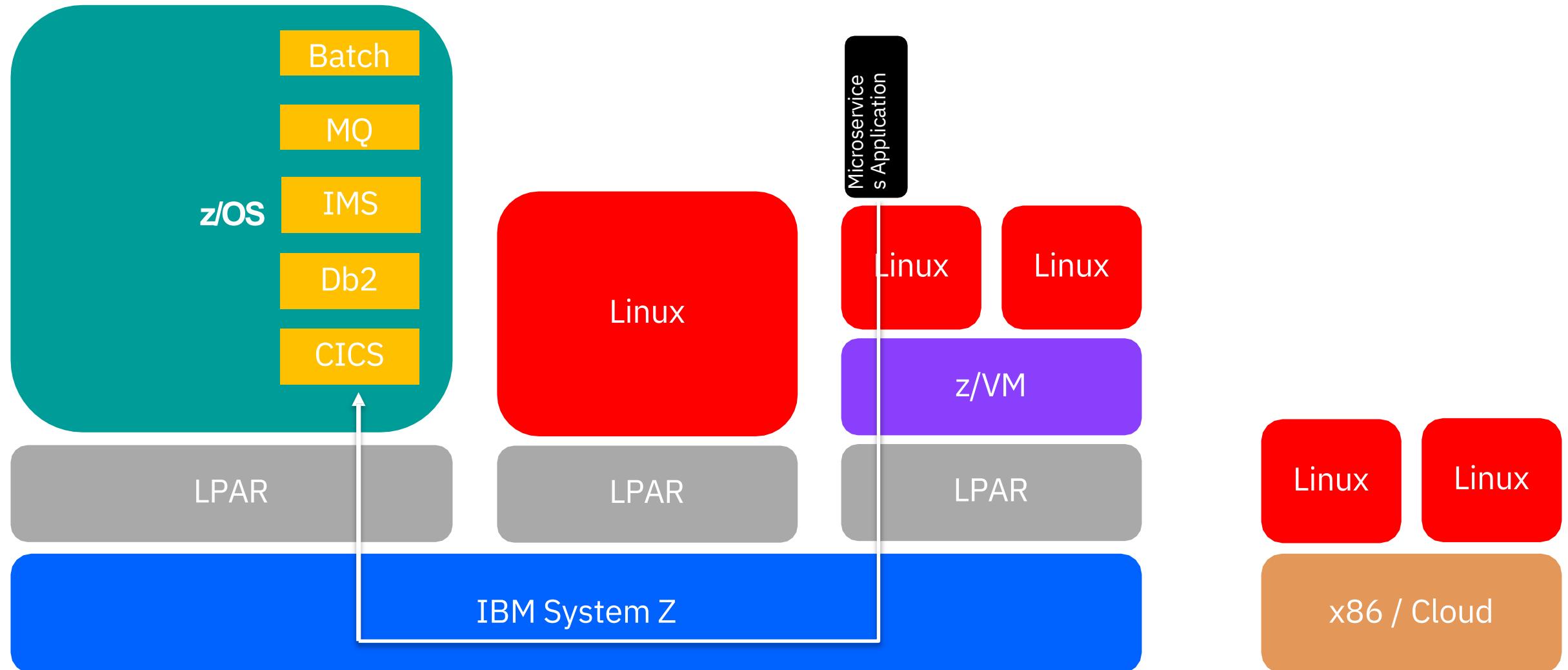
2.
Standardize Administration & Governance

4.
Increase Agility & Business Performance

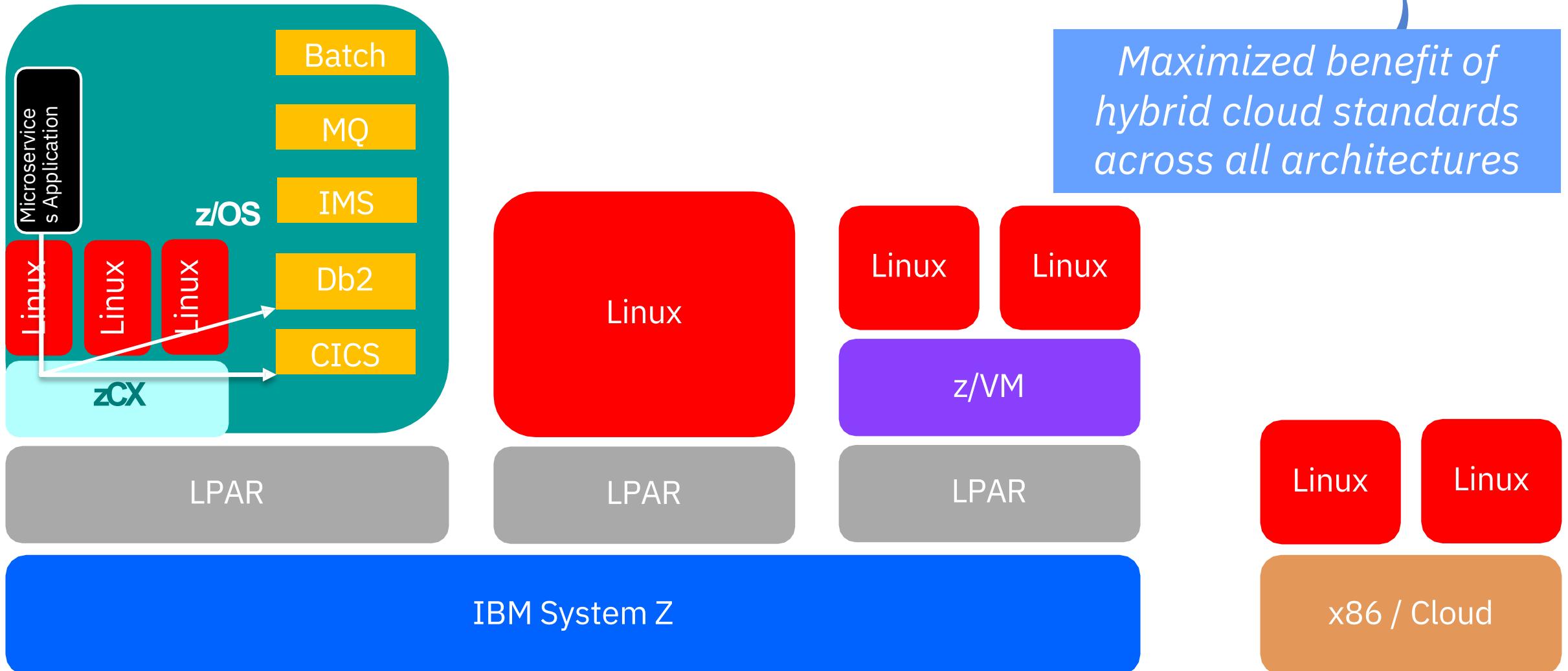
A hybrid cloud example of composite solution deployment



A hybrid cloud example of composite solution deployment IBM Z: offering **co-location benefits**



A hybrid cloud example of composite solution deployment IBM Z: offering **co-location benefits** and **operational consistency**



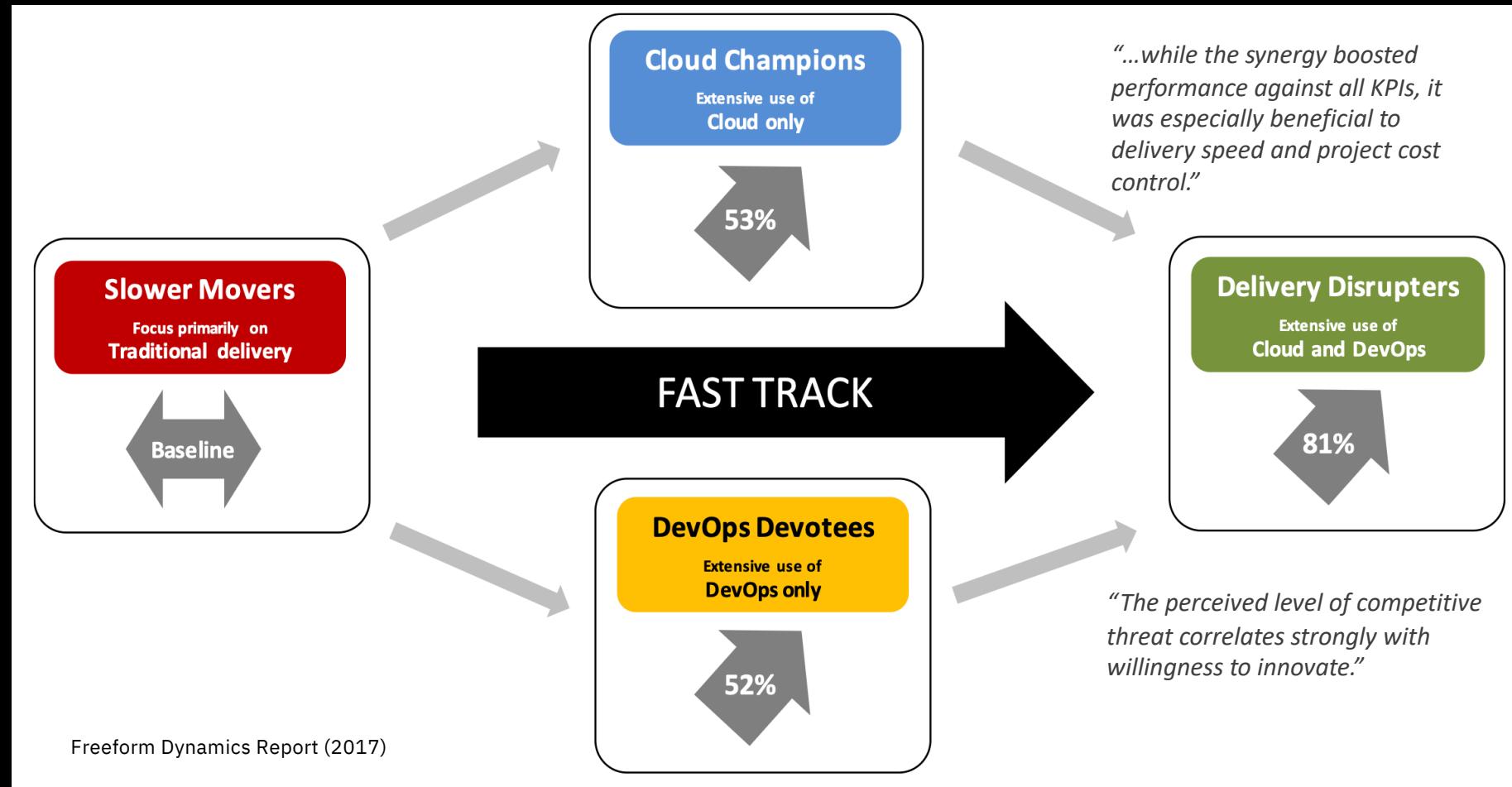
Cloud and DevOps are complementary accelerators to better performance



BNP PARIBAS

"The more we can expose applications and business logic running on IBM Z, the more value we can add to the business and to our clients"

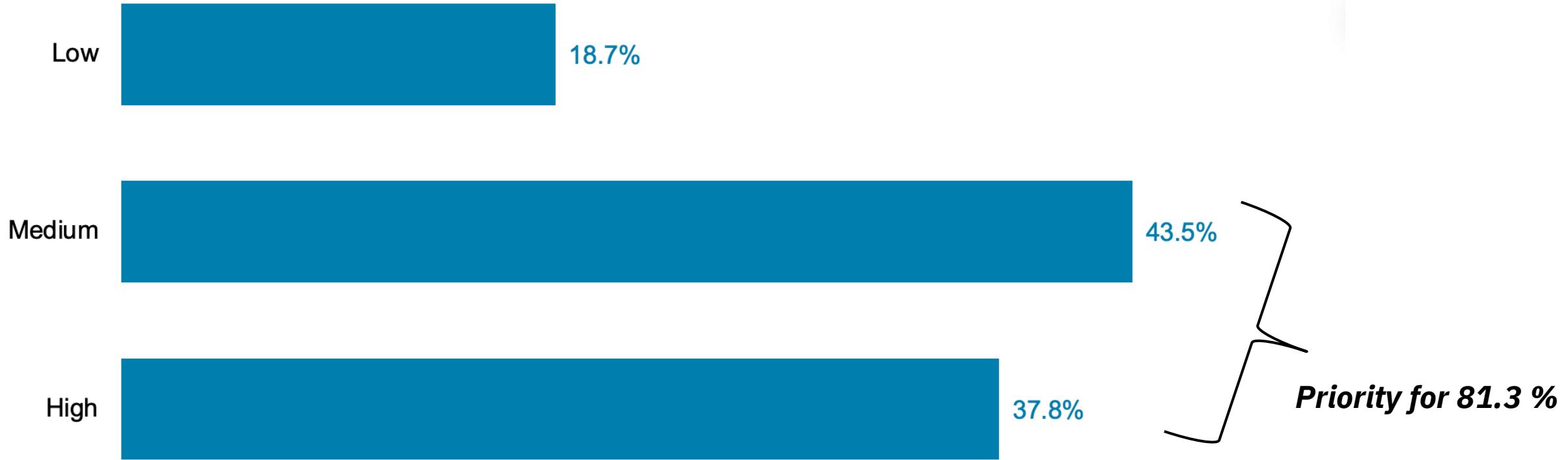
-- Abdelhakim Loumassine
Head of the Mainframe Division
BNP Paribas



“DevOps won’t have as much value without the cloud, and the cloud won’t do much without DevOps.”

– 2020 Market Analysis DevOps.com

Please rate the investment priority for these IT automation tools for your organization in the next year. - Continuous integration/continuous delivery (CI/CD) (e.g., Jenkins, GitLab)



Q. Please rate the investment priority for these IT automation tools for your organization in the next year. - Continuous Integration/Continuous Delivery 'CI/CD' (e.g., Jenkins, GitLab)

Base: All respondents, abbreviated fielding (n=262)

Source: 451 Research's Voice of the Enterprise: DevOps, Workloads & Key Projects 2022

451 Research

S&P Global

Market Intelligence

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According to Gartner:

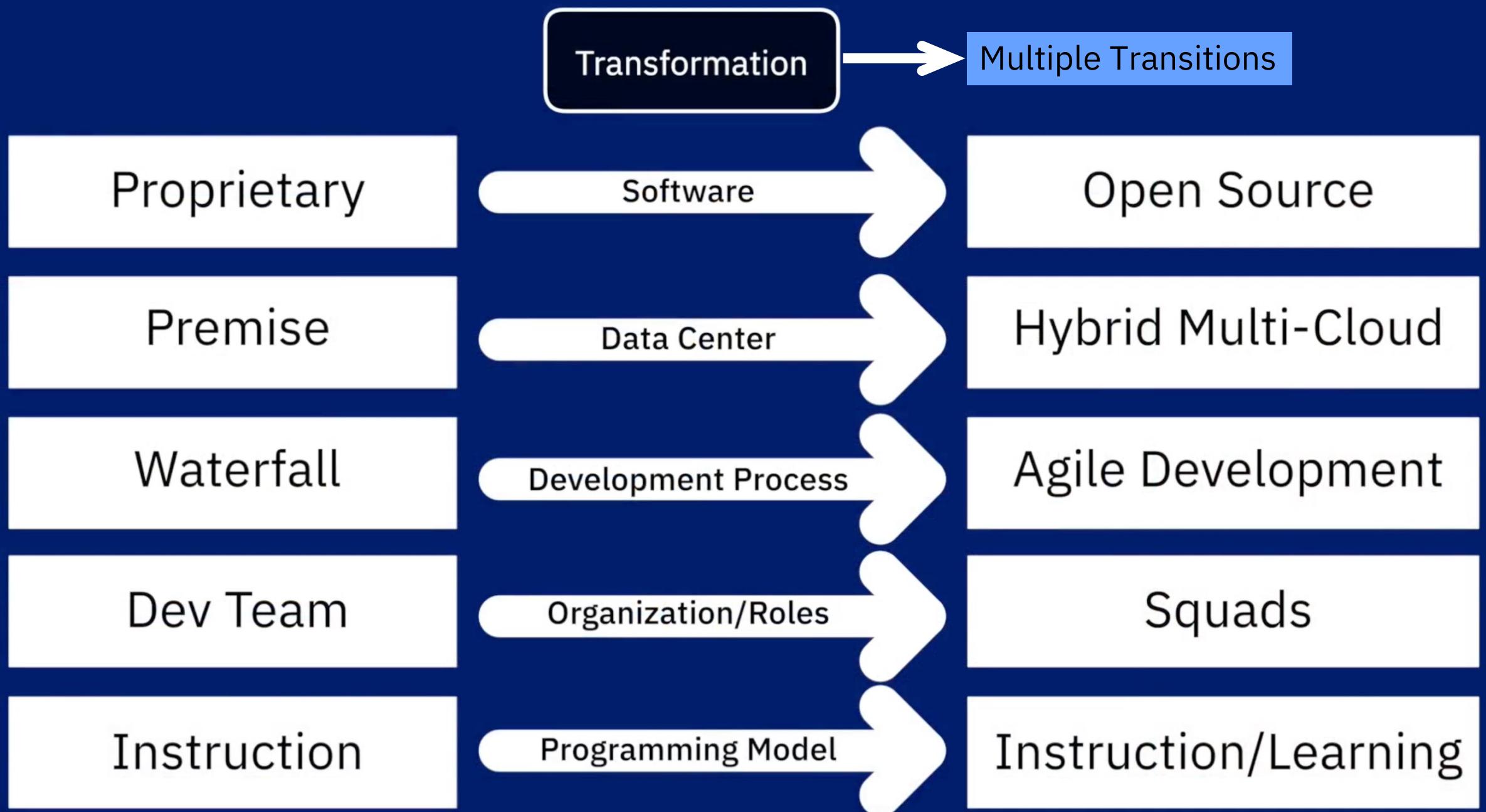
Application leaders responsible for a strategy to build a digital business platform should:



Exploit and extend the value of your legacy applications by removing obstacles, rather than viewing and treating those applications as a problem

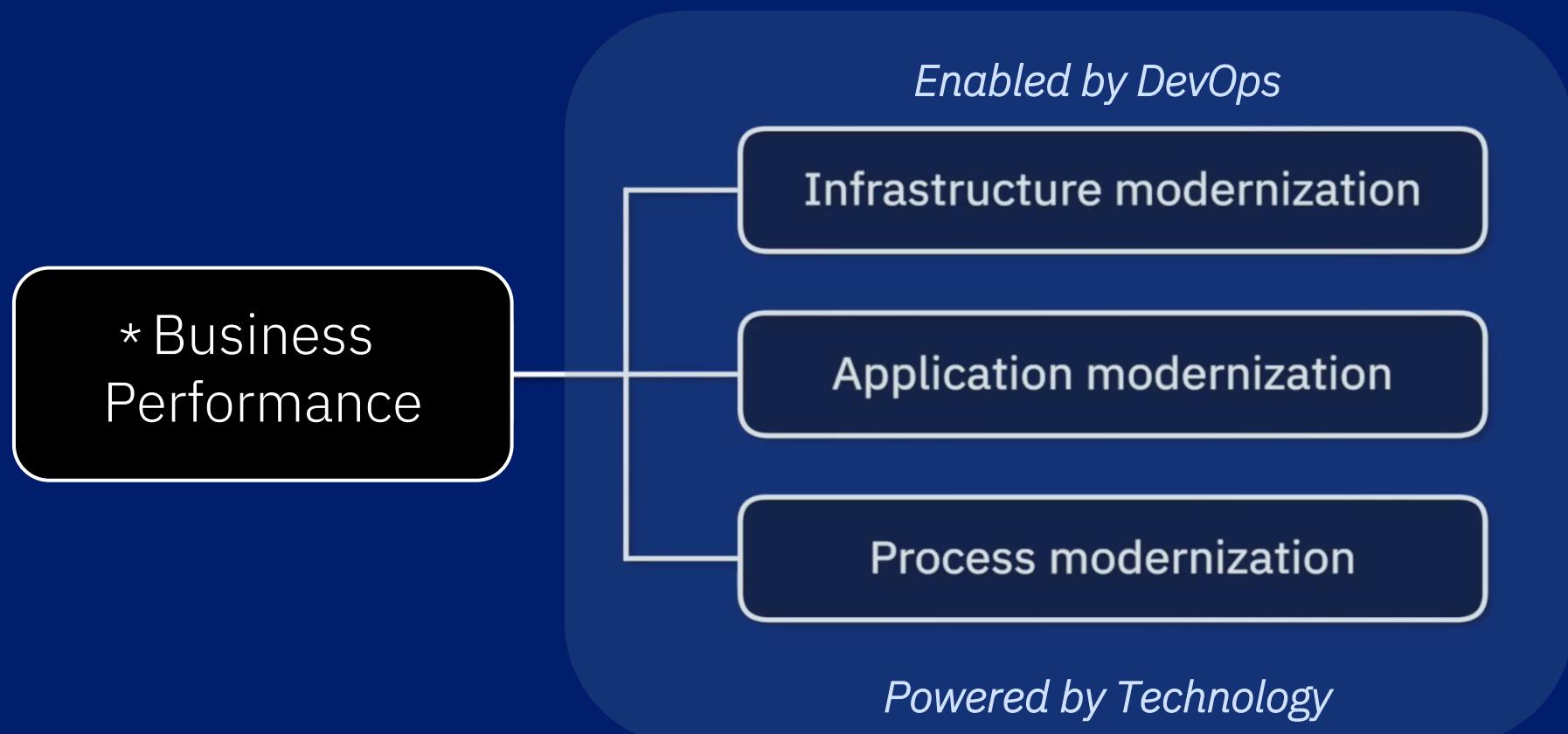
Use continuous modernization as an alternative to rip-and-replace programs which are often too costly, risky, or time-consuming

Modernization = Improvement? = Transformation?



Mainframe Continuous Improvement

...from connected to transformed to reimagined



* *Execution should be iterative and prioritized to deliver key outcomes earlier*

The Business Value of DevOps Performance

Elite performers now make up 26% (up from 7% in 2018) of teams in our study, and have decreased their lead times for changes to production. The industry continues to accelerate, and teams see meaningful benefits from doing so.

IBM Z:

**64% more code releases
44% less time per release**

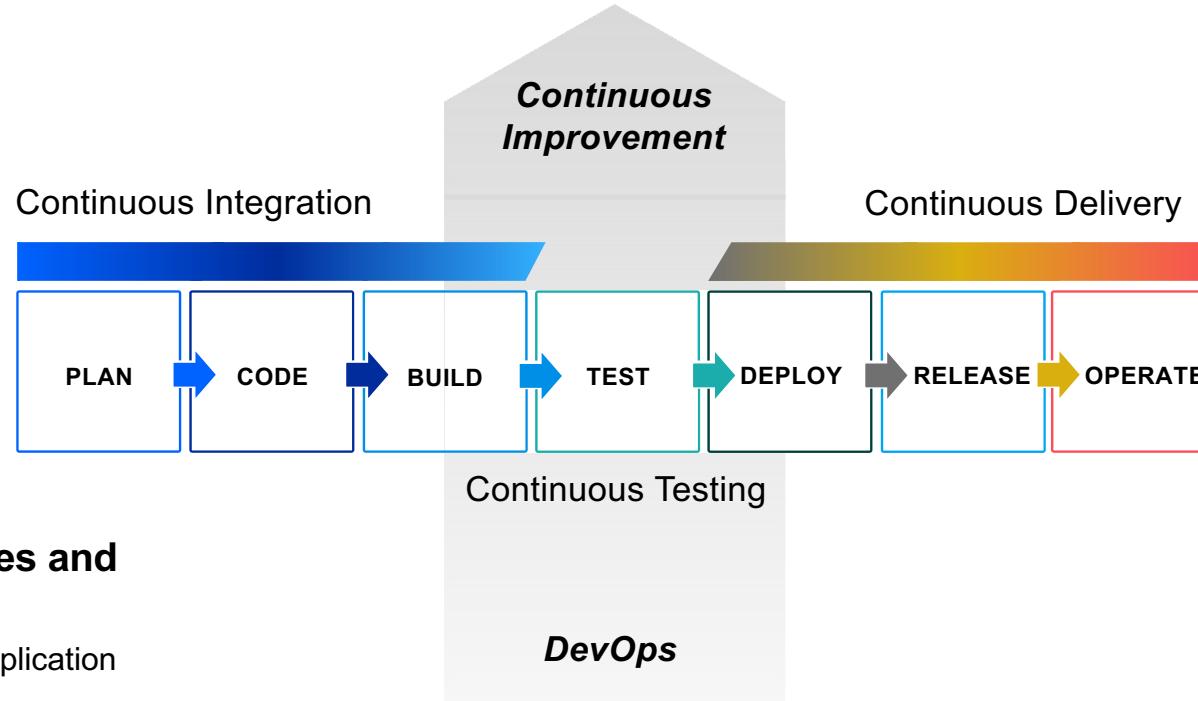
Software delivery performance metric	Elite	High	Medium	Low
⌚ Deployment frequency For the primary application or service you work on, how often does your organization deploy code to production or release it to end users?	On-demand (multiple deploys per day)	Between once per week and once per month	Between once per month and once every 6 months	Fewer than once per six months
🕒 Lead time for changes For the primary application or service you work on, what is your lead time for changes (i.e., how long does it take to go from code committed to code successfully running in production)?	Less than one hour	Between one day and one week	Between one month and six months	More than six months
⌚ Time to restore service For the primary application or service you work on, how long does it generally take to restore service when a service incident or a defect that impacts users occurs (e.g., unplanned outage or service impairment)?	Less than one hour	Less than one day	Between one day and one week	More than six months
⚠ Change failure rate For the primary application or service you work on, what percentage of changes to production or released to users result in degraded service (e.g., lead to service impairment or service outage) and subsequently require remediation (e.g., require a hotfix, rollback, fix forward, patch)?	0%-15%	16%-30%	16%-30%	16%-30%

Ref: DORA, DevOps Research and Assessment, Accelerate State of DevOps 2021

DevOps for IBM Z and Cloud

Enterprise-wide Standardization

Platform neutral, continuous integration and deployment pipeline across the enterprise – on premises or on the cloud
75% of enterprises recognize the benefits of as-a-service consumption⁵



Modern Development Practices and Developer Autonomy

Self-service provisioning, advanced application intelligence, modern development IDEs

20-50% productivity benefits for typical development tasks¹

Successful DevOps transformation results in 7x lower software delivery change failure rate³

People and processes

Adapting the right tooling and processes for the right audience

Automated Testing

Powerful and automated testing as part of a continuous delivery pipeline
50-90% time savings on test cycles²

Strong Integration with Open Source → 84% of developers prefer to use open source over closed or proprietary tools⁴



Jenkins



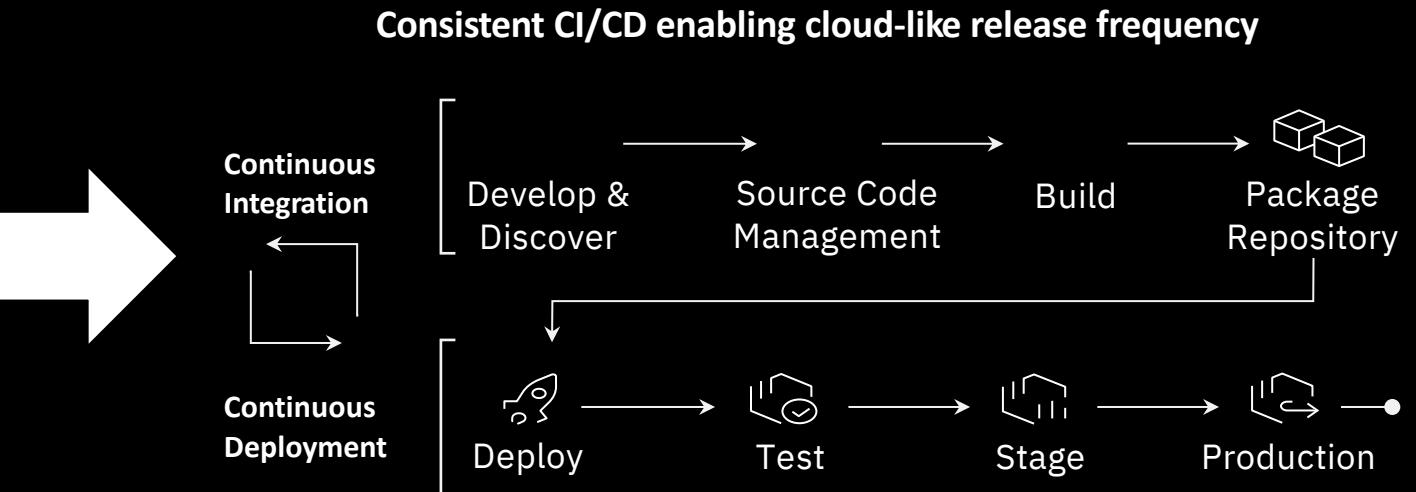
OPEN TOOL CHAIN



ANSIBLE



Git based workflow is a key to unlocking velocity and agility



Branching enables teams to separate and isolate different development requests like hot-fixing, maintaining the current release, or developing for a future release. It also provides greater flexibility to select features for a certain release and moving features between releases.

Reliable, repeatable, standardized automation:

“Everything-as-Code”

- Infrastructure-as-Code
- Pipeline-as-Code
- Deployment-as-Code
- Compliance-as-Code

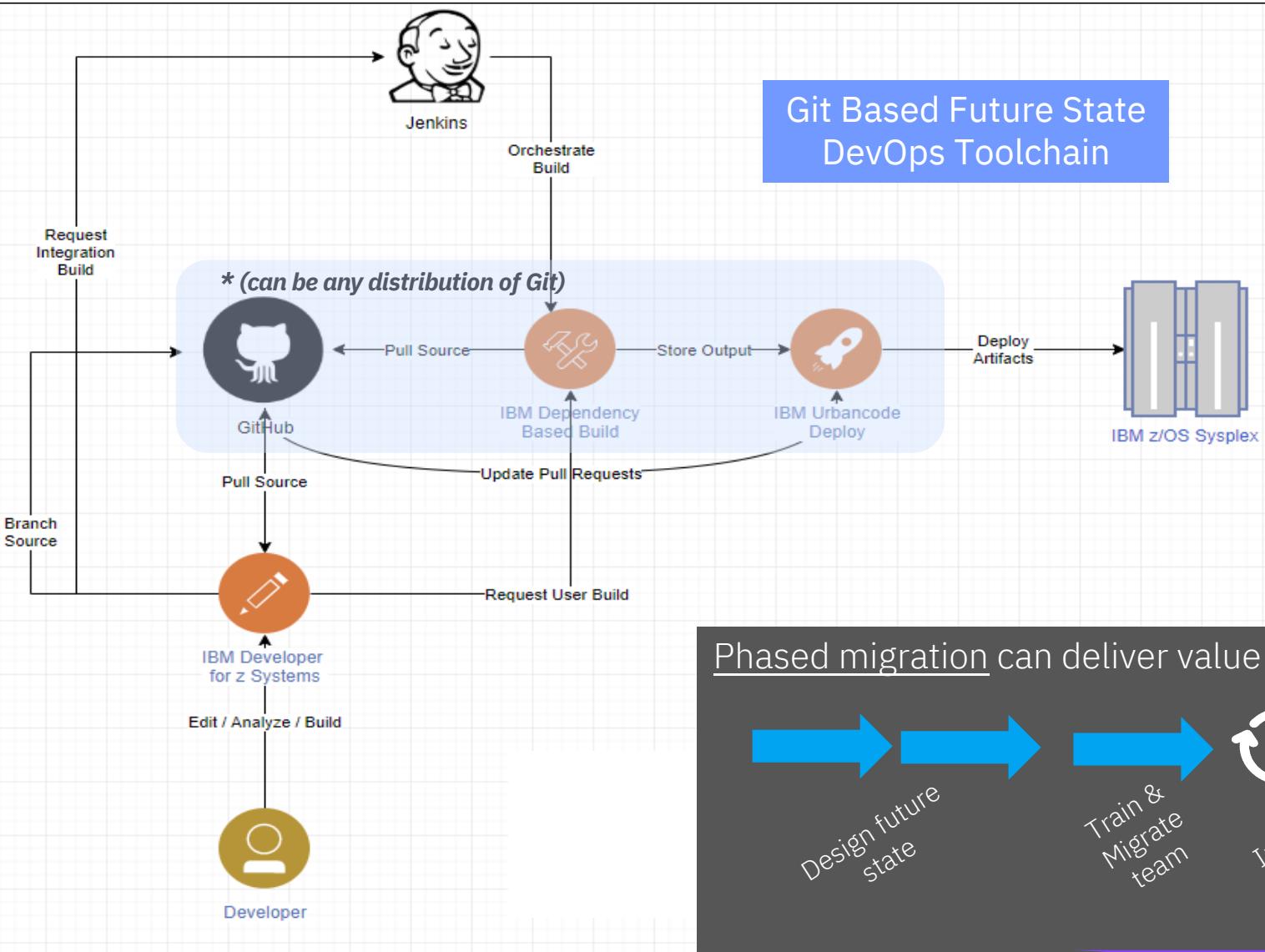
“Everyone is a developer”

“GitOps”

Git workflow allows for expansion of partnership opportunities (example partners)

Integrating the mainframe across these domains opens the door to an array of industry partners

Languages & Runtimes	Cloud & Container Services	Big Data, Observability, Analytics	DevOps/Automation	Linux Distributions & Virtualization
Java JS R Ruby Golang python Scala node ERLANG RAILS OCaml Apache Tomcat Swift FABRIC TensorFlow WildFly Clojure	docker LXD openstack. kubernetes minikube HELM okd OPENSHIFT APACHE HTTP SERVER PROJECT MARATHON Sysdig	Flink Apache Solr kafka Grafana elasticsearch logstash kibana	splunk Apache Spark Ignite fluentd logstash kibana	SALTSTACK CHEF ANSIBLE puppet Jenkins Travis CI Maven Gradle Zowe GitLab
		Databases	Middleware	Community Versions
		mongoDB MariaDB redis CouchDB PostgreSQL MySQL cassandra SCYLLA Couchbase	ACTIVEMQ Camel muleESB RabbitMQ APACHE GEODE mosquitto HIBERNATE	Red Hat ubuntu SUSE KVM debian CentOS fedora openSUSE alpine
				Networking & Monitoring
				NGINX etcd MESOS ZABBIX Prometheus ZooKeeper HAProxy



High level example of a Git based solution for z/OS

Phased migration can deliver value faster while controlling risk



Legacy SCM (Library Manager)

Git based CI/CD Pipeline

Iteratively migrate teams and their applications to the new pipeline, while establishing processes that consider build dependencies across both systems.

DevOps transformation journey with IBM's **DevOps Acceleration Program**

https://ibm.github.io/mainframe-downloads/DevOps_Acceleration_Program/devops-acceleration-program.html

Assessment

Maximize the value of transformation efforts

Training

Know our DevOps products and strategy

Instructor led remote and self paced training

Deployment

Install and customize products

Adoption

- Discovery and Design workshop
- SCM migration
- CI/CD pipeline
- DevOps adoption

Value Stream Assessment

Executed by IBM's Sales SWAT team
Onsite workshop to capture current state and create a transformation roadmap

Training

ILT virtual or self paced training

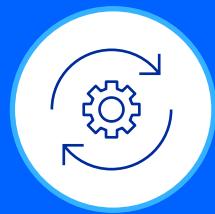
Deployment

Delivered through **Deployment Project Office (DPO)** - Remote assistance of approximately 50 hours to install products

Adoption

Delivered through **DevOps Acceleration Team (DAT)** - SCM Migration, CI/CD, DevOps adoption

This is IBM's Initiative to partner with you and accelerate the transformation



Continuous Integration

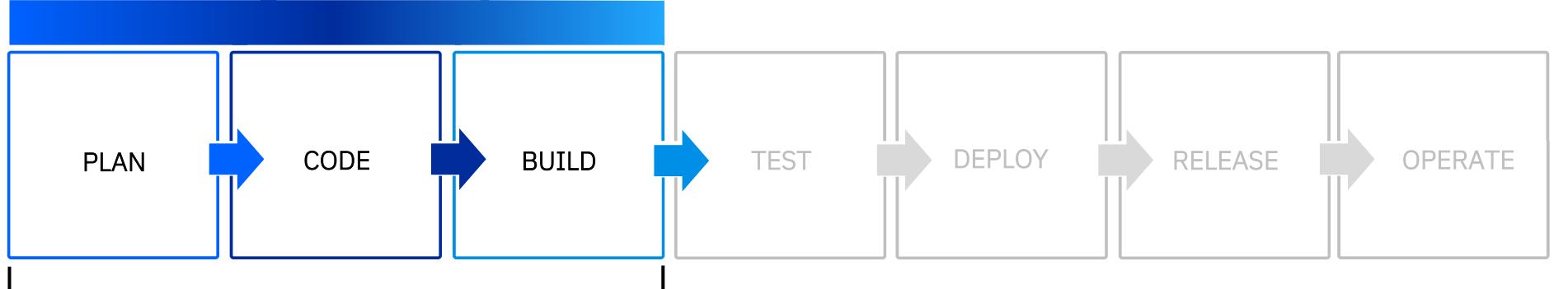
Application discovery and analysis

Bring your own IDE, leverage existing tools, with choice of dev environment

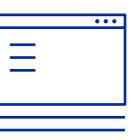
Self-serve provisioning and unit test

Enable automated Build with developer testing as part of the build process

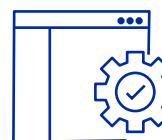
Maintain a single Source Repository with modern branching workflow



Enterprise discovery across applications



BYO IDE, code, edit and debug



Unit Test



Build

IBM Application Discovery and Delivery Intelligence (ADDI)

IBM Z and Cloud Modernization Stack, IDzEE, Wazi-aaS, ZD&T

IDzEE(ZUnit), ZVTP Wazi-aaS, ZD&T

IBM Z and Cloud Modernization Stack, IDzEE, Wazi-aaS, ZD&T

GIT-based workflow / Gitlab Ultimate



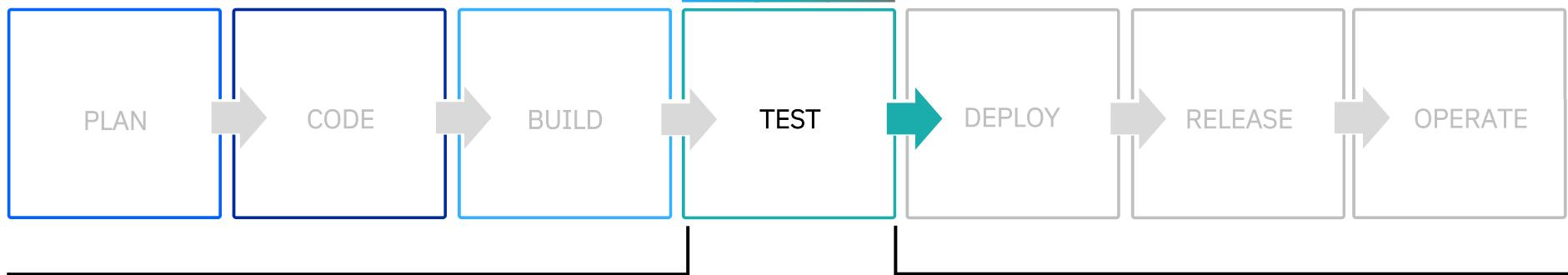
Continuous Test

Enable automated build with developer testing as part of the build process

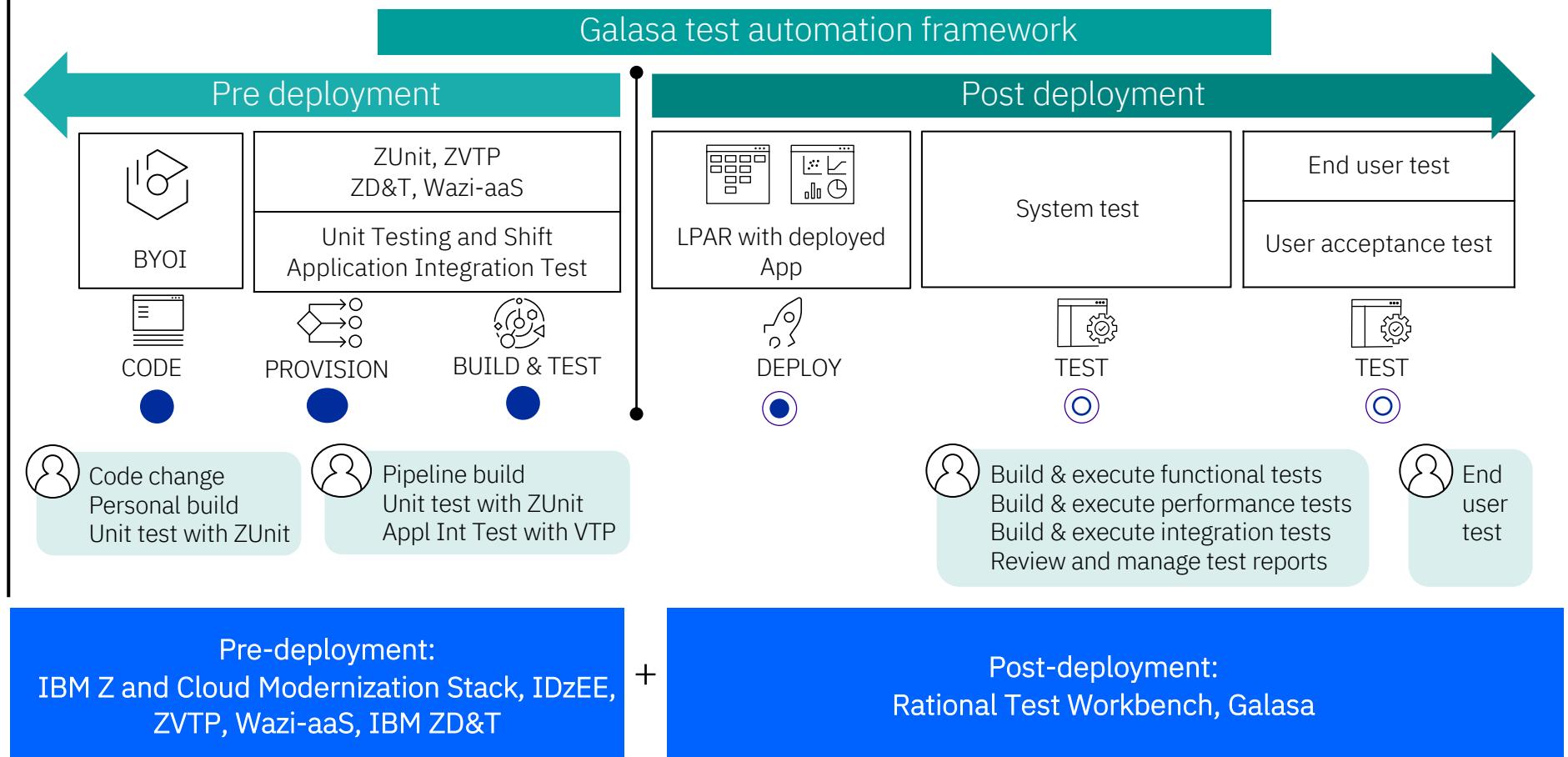
Allow self testing capabilities for developers

Simplified testing with minimal environmental dependencies

Sandbox environments for prototyping and z/OS software version-to-version migration



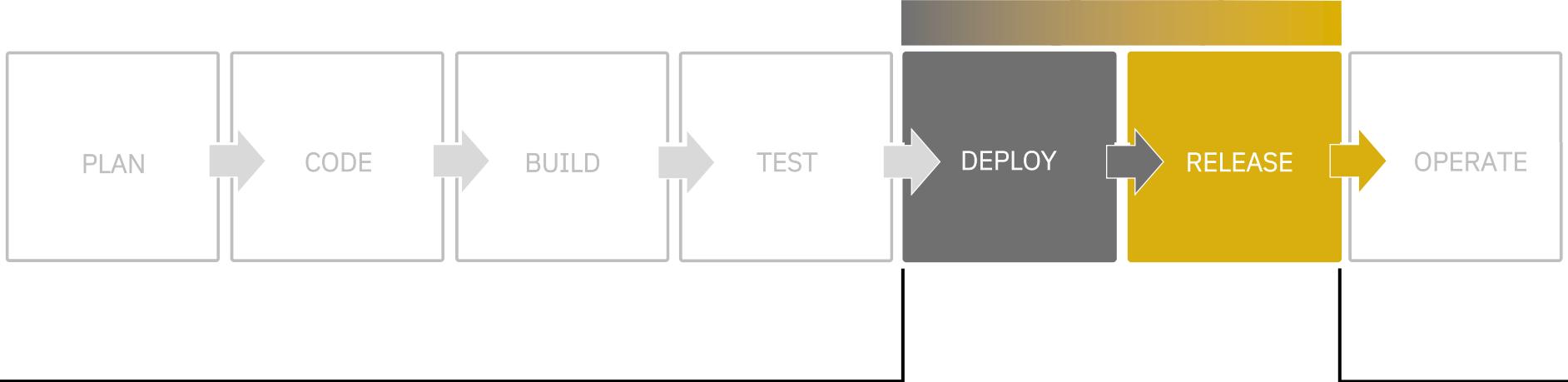
IBM is developing solutions to test z/OS-powered hybrid applications end to end



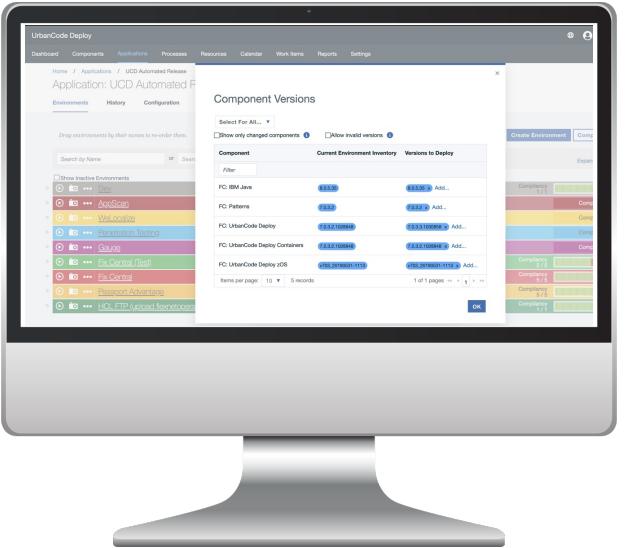


Continuous Delivery

Automated building, testing, and releasing of software with greater speed and frequency



UrbanCode Deploy automates application deployments, middleware configurations and database changes to on-premise and cloud-based dev, test and production environments



- **Continuous Delivery Automation**

Automated, consistent deployments and rollbacks of applications. Integrate with build and test tools to automatically deploy, test, and promote new builds.

- **Hybrid Application Support**

Support for all platforms: from IBM zSystems to distributed to microservices, both on-prem and cloud based. Applications that are a mix of traditional and cloud-native.

- **Governance and Visibility**

Easily identify the “who, what, when, where, and how” of deployment automation. With clear visibility into apps deployed, including where and who changed them, ensuring compliance and auditing is a breeze.



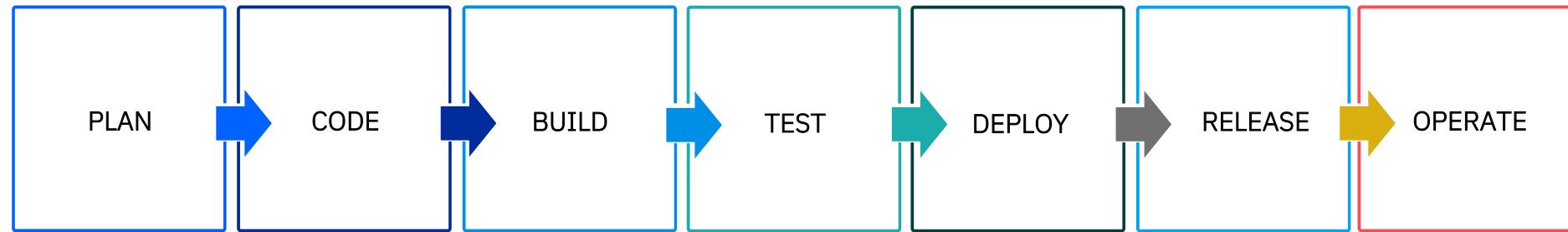
Enterprise DevOps across IBM Z and Cloud

Quickly discover data and application dependencies

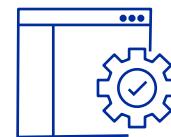
Modernize hybrid cloud applications, leveraging a GIT based workflow

Automate testing lifecycle process to enable an agile CI/CD pipeline

Maintain control of complex releases & supply software faster



Analyze, code, build, edit and debug



Automate testing lifecycle



Control and automate delivery

Continuous Integration

IBM Z and Cloud Modernization Stack, Wazi-aaS, IDzEE

Continuous Testing

IBM ZUnit (IDzEE)
IBM Z Virtual Test Platform
Rational® Test Workbench

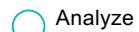
Continuous Delivery

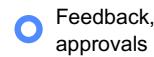
UrbanCode Deploy, Ansible , AIOps

GIT-based workflow / Gitlab Ultimate

ADDI (Enterprise level discovery across applications)

LEGEND

 Analyze

 Feedback, approvals

Note:

- Products and significant capabilities appear once, the first time they are used in the pipeline.

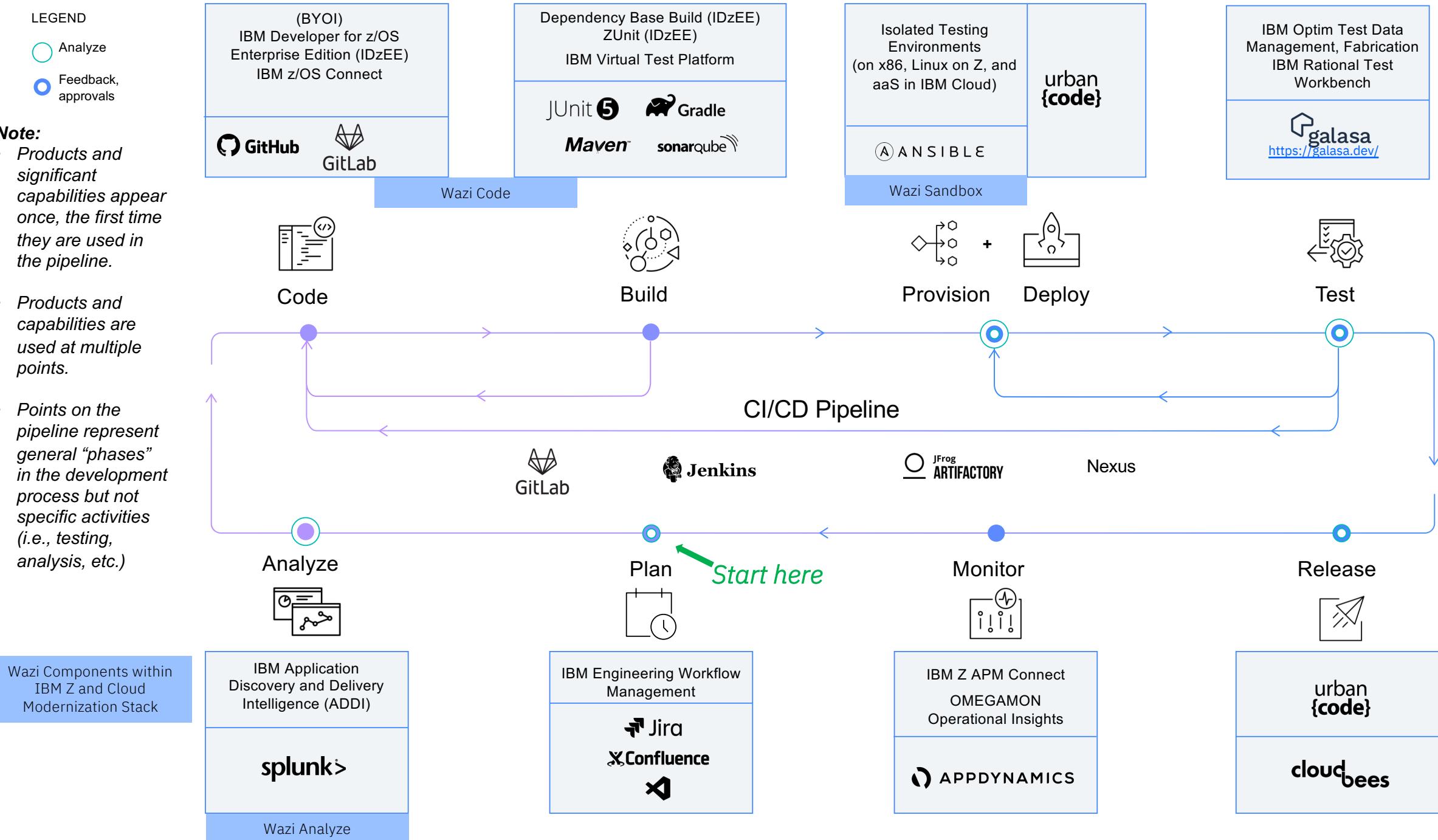
- Products and capabilities are used at multiple points.

- Points on the pipeline represent general “phases” in the development process but not specific activities (i.e., testing, analysis, etc.)

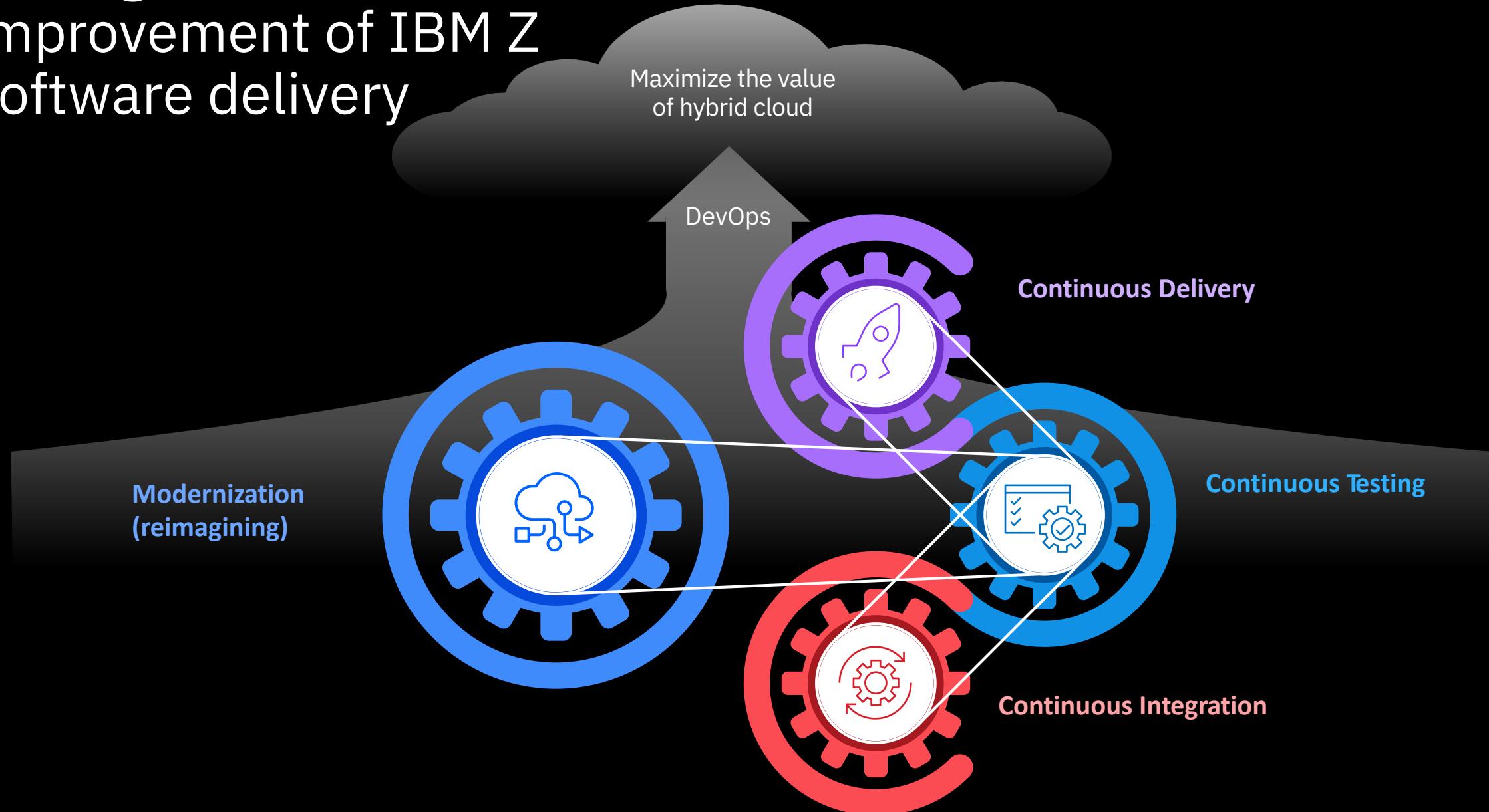
Wazi Components within IBM Z and Cloud Modernization Stack

splunk>

Wazi Analyze



Driving continuous improvement of IBM Z software delivery



Thank you

Simplify and coordinate with common approach to hybrid cloud

Idea (BACKLOG)	Source Code Management	CI / CD Coordinator	Artifact Repository	Test and Virtualization	Application Deployment	Release
<ul style="list-style-type: none">• Single repository for dashboards and visibility• Encourage transparency and collaboration across all team members	<ul style="list-style-type: none">• Pick one for all source as the strategic direction so you have one place for audit compliance and security review	<ul style="list-style-type: none">• Single solution to drive automation across all platform pipelines	<ul style="list-style-type: none">• Single artifact repository for all artifacts, streamlining the pipeline integrations, and simplifying audit and reporting support	<ul style="list-style-type: none">• Automation• Reuse of virtualized services and providers• Will also have specialized tools	<ul style="list-style-type: none">• Cross platform support to address the breadth of your applications• Includes all configuration changes including security	<ul style="list-style-type: none">• Manage the complexity of coordinating multiple releases, interdependencies and schedules

Many organizations are making the transition
(Data from our DevOps Acceleration Program)

150+

of customers assisted in their Git based DevOps transformation initiatives

67

of completed z/OS DAP engagements facilitating GIT migration and product deployment

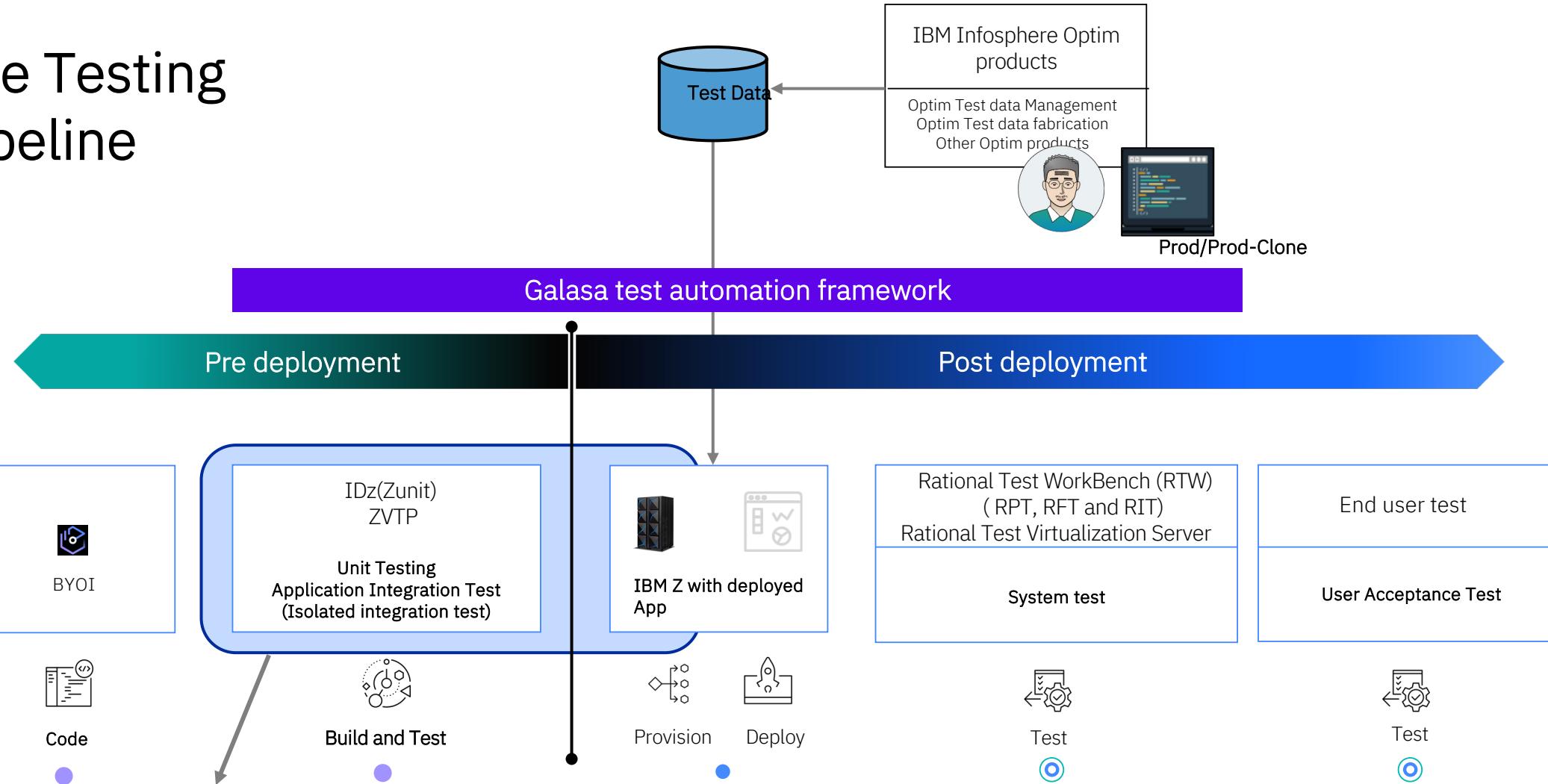
18

of z/OS customers in production, using a Git based CI/CD pipeline

6

of mainframe customer references

The Testing Pipeline



Real z/OS Isolated Testing Environments

- *IBM Z Development & Test – ZD&T (x86 Linux based)*
- *Wazi Sandbox (x86 Linux based in RH OpenShift container)*
- *Wazi aaS (Linux on Z based in Virtual Server on IBM Cloud)*
- *IBM Z Virtual Development & Test (ZVDT)*

IBM Isolated Developer Testing Environments Matrix for z/OS

Characteristics	IBM ZVDT (IBM Virtual Dev and Test for z/OS)	Wazi aaS (z/OS Developer Testing on VSI)	ZD&T (IBM Z Dev and Test)	Wazi Sandbox (part of IBM Z & Cloud Mod Stack)
Platform	Linux on Z	IBM Cloud as a Service, IBM Z Hardware	x86	Openshift only (x86)
Supported OS	Ubuntu, RHEL(4Q)	NA	Ubuntu, RHEL, OpenShift	OpenShift only (x86)
Architecture	No CPU Emulation	No CPU Emulation	CPU is Emulated	CPU is Emulated
Licensing model	Perpetual and CTL RVU	IBM Cloud Subscription Pay for what you use	Perpetual and CTL RVU	VPC
IBM Provided Image	ADCD ¹	Stock Image ²	ADCD ¹	ADCD ¹
Tools for custom Image	Yes	Yes	Yes	Yes
Infra Management	Customer owned	VSI and underlying architecture managed by IBM	Customer owned	Customer owned
Key differentiator	Best Performance for on prem solution	Supported aaS model on IBM Cloud	Viable for other cloud providers such as AWS or Azure	Individual developer testing container certified for RH OCP
Performance comparison				
General workload	●	●	○	○
Java workload	●	●	●	●
Use cases				
Testing Type	ZVDT	Wazi aaS	ZD&T	Wazi Sandbox
Unit Test	✓	✓	✓	✓
Early Integration	✓	✓	✓	✓
Regression	✓	✓	✓	✓
Infra testing	✓	✓	✓	✓

Licensee may not use the Program for production workloads of any kind, including without limitation, production module builds, pre-production testing, stress testing, or performance testing.

1 – ADCD - Qtrly or half yearly refresh. Link to SW list - > <https://www.ibm.com/docs/en/zdt/13.3.x?topic=reference-adcd-zos-v2r4-may-edition-2021>

2 – Stock Image (IBM Cloud only version) with Monthly refresh and a slimmed down version from SW perspective. (Link to be published for SW list)