IBM Global Markets

IBM Cloud vision and strategy: Hybrid IT, DevOps, Containers.

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Cloud Adoption Leader – Europe

Bologna, 19th May 2017

Disruptors are reinventing business processes and leading their industries with digital transformations

Frontline Decision Making
Business Leaders go Mobile First

100%

of the LOB apps in customer-facing roles will be built for mobile-first consumption by 2017[1]

Real Time Insight Driven Processes
CIOs enable fast insight-driven decisions

70%

of CIOs say analytics and big data drive innovation at their firm[2]

Digital Innovation
Developers are rewriting the world in code

14000+

APIs published today, public APIs doubled in the past 18 months[3]

1) The Customer-activated Enterprise, *Insights from the Global C-suite Study*, IBM Institute for Business Value, 2013
2) IDC Directions, "How SaaS Gets Built" Doc # DR2014_T3_RM March 2014
3) See ProgrammableWeb, http://www.programmableweb.com/category/all/apis?order=field_popularity.

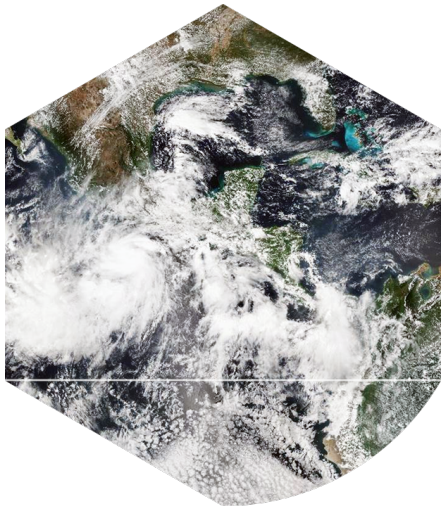
Will you disrupt or be disrupted?

AIRBUS

Bringing insight directly to their maintenance engineers via mobile

DELHAIZE GROUP

Using weather data to predict real time inventory needs



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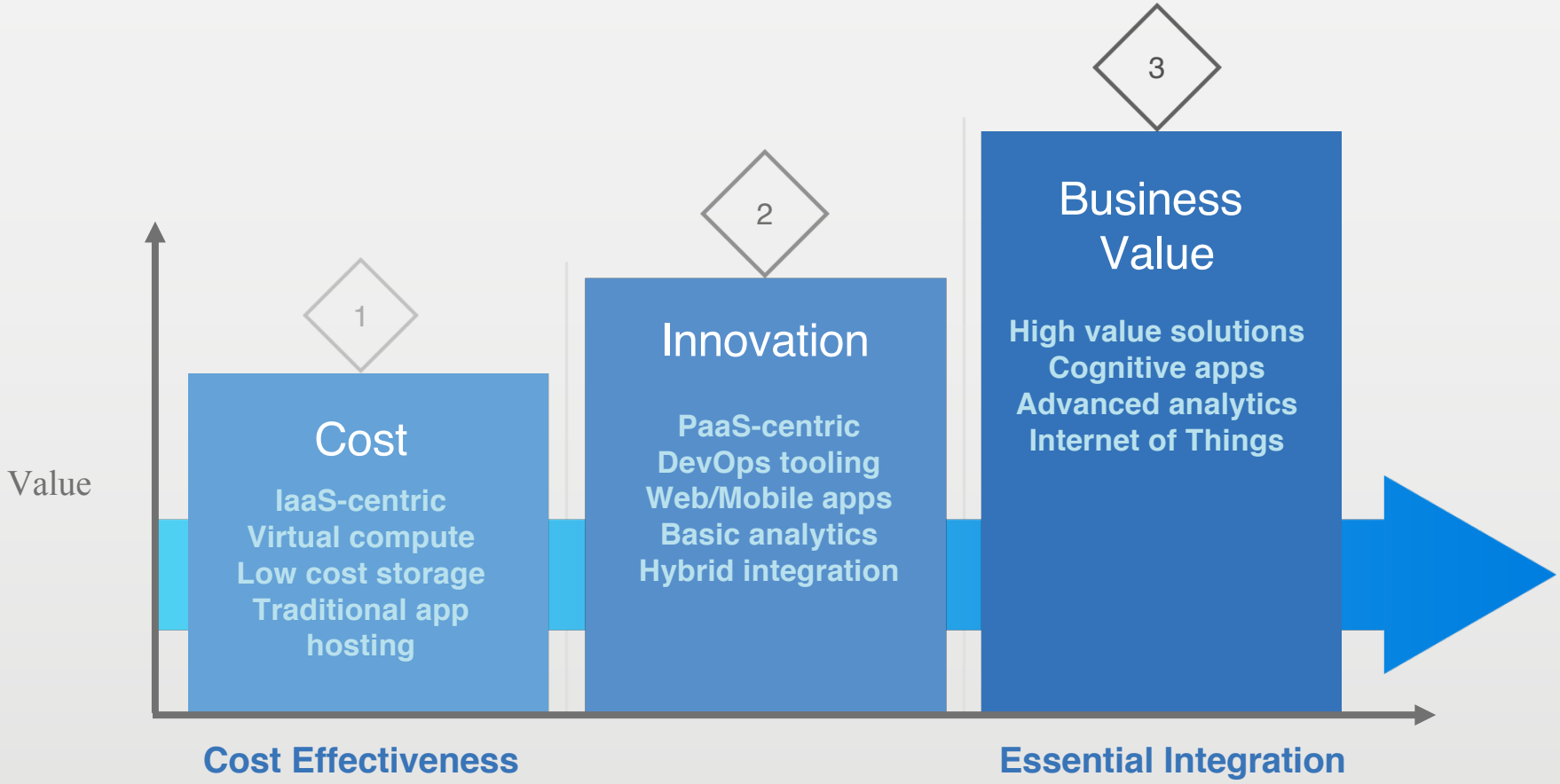
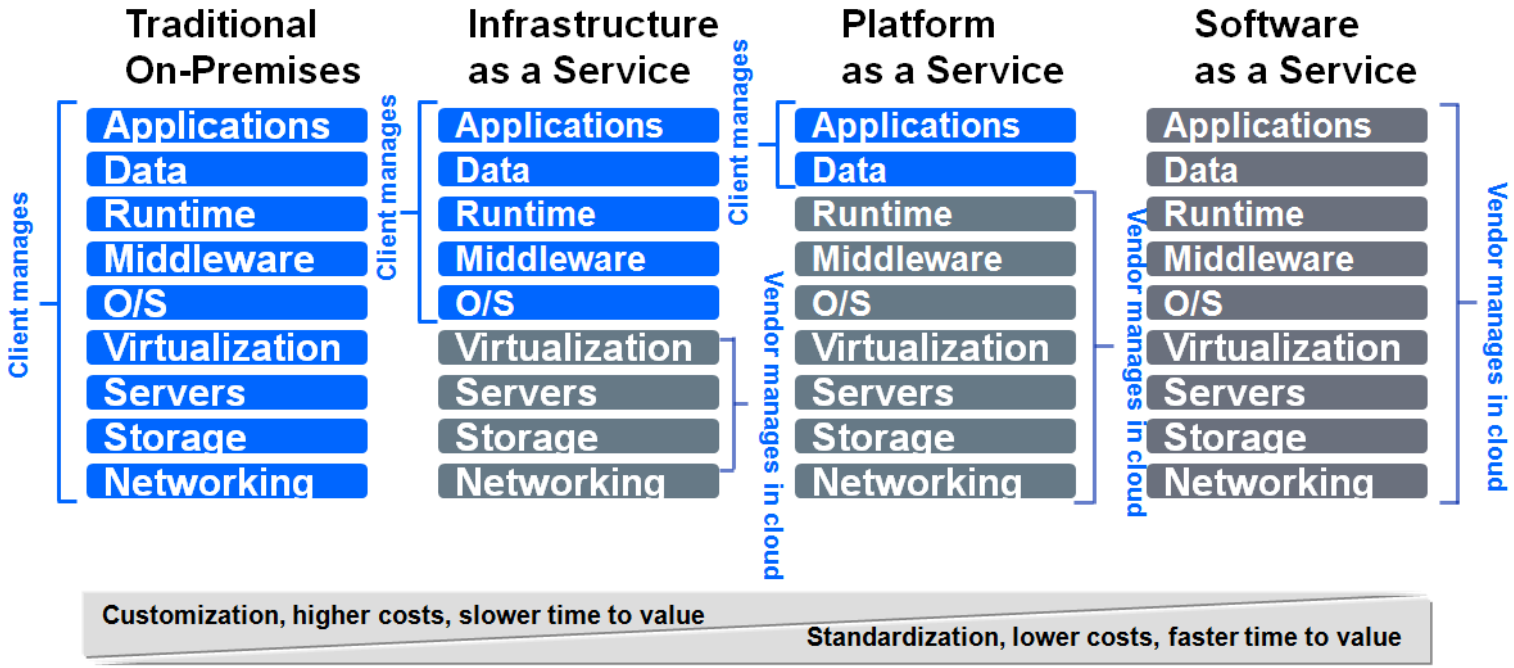
Sourcing new innovation from mobile developer communities

The role of the cloud is maturing into the environment for innovation and business value



Cloud computing and traditional IT

Cloud has three service models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS).

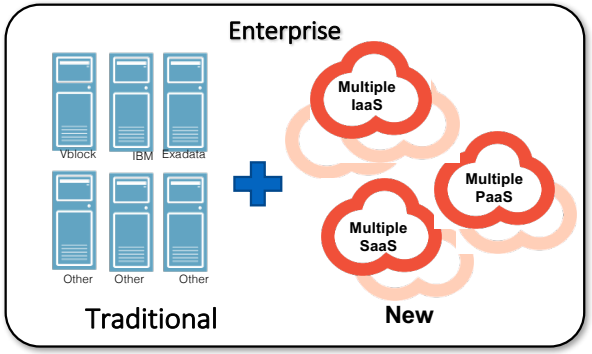


Multi speed and bimodal IT

The connection of one or more clouds to on-premises systems and/or to other clouds

The old, good rules:

- Availability
- Security
- Performance
- Support & SLAs



A whole new world:

- Rapidity
- Systems of Engagement
- Pay per use
- Elasticity

CONTROL

AGILITY

- Benefit from simplified infrastructure
- Require cost efficiency through improved virtualization and automation
- Drive controlled data growth

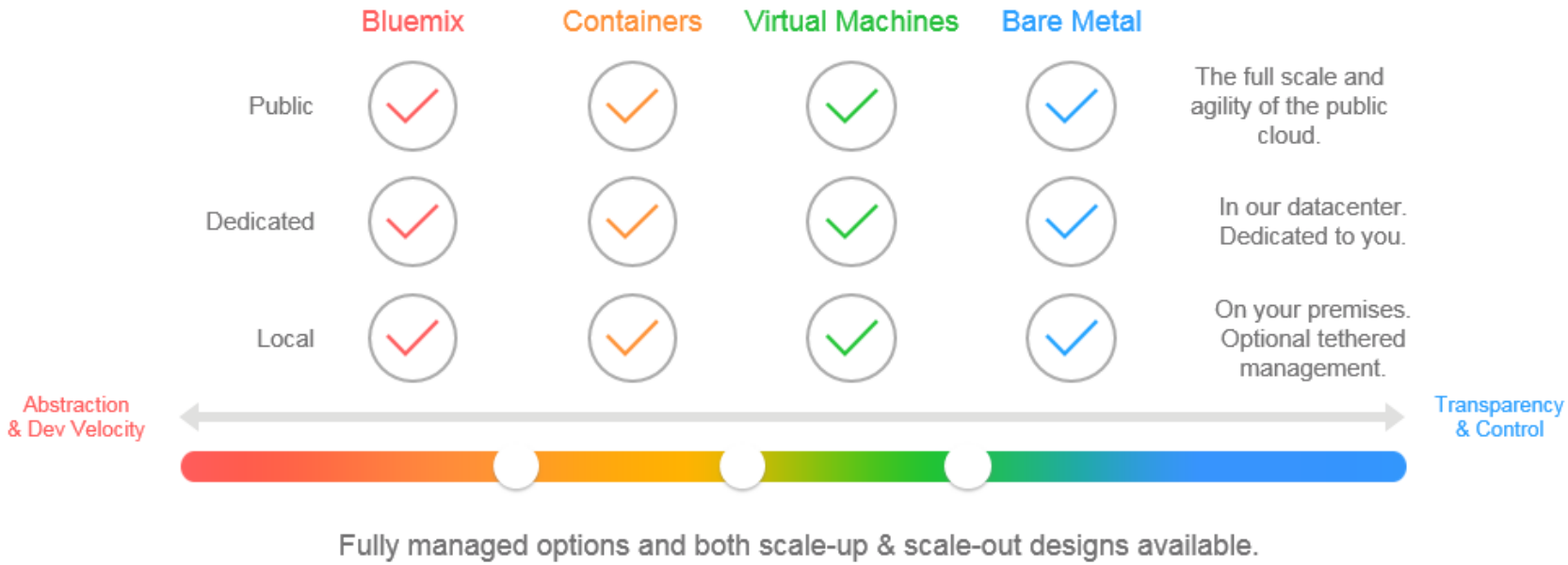
- Require massive scale and rapid pace
- Accelerate business insights
- Rely on data elasticity, supporting diverse hardware

Composable environments to rapidly build and deploy new cloud-native and mobile solutions

Flexibility to move apps to the cloud as-is or build cloud native solutions

Leverage existing investments by connecting them to cloud services

Run-times and delivery models to suit the full spectrum of enterprise needs



Connect To Cloud enables hybrid architectures to speed digital transformation

Enterprise Connections

WebSphere Connect, z/OS Connect,
DB2 Connect

1. **Expose & Publish** logic and data from Systems of Record as APIs
2. **Connect to cloud from** on-premises business logic to enhance applications (Watson API, Data services)

Bluemix Connections

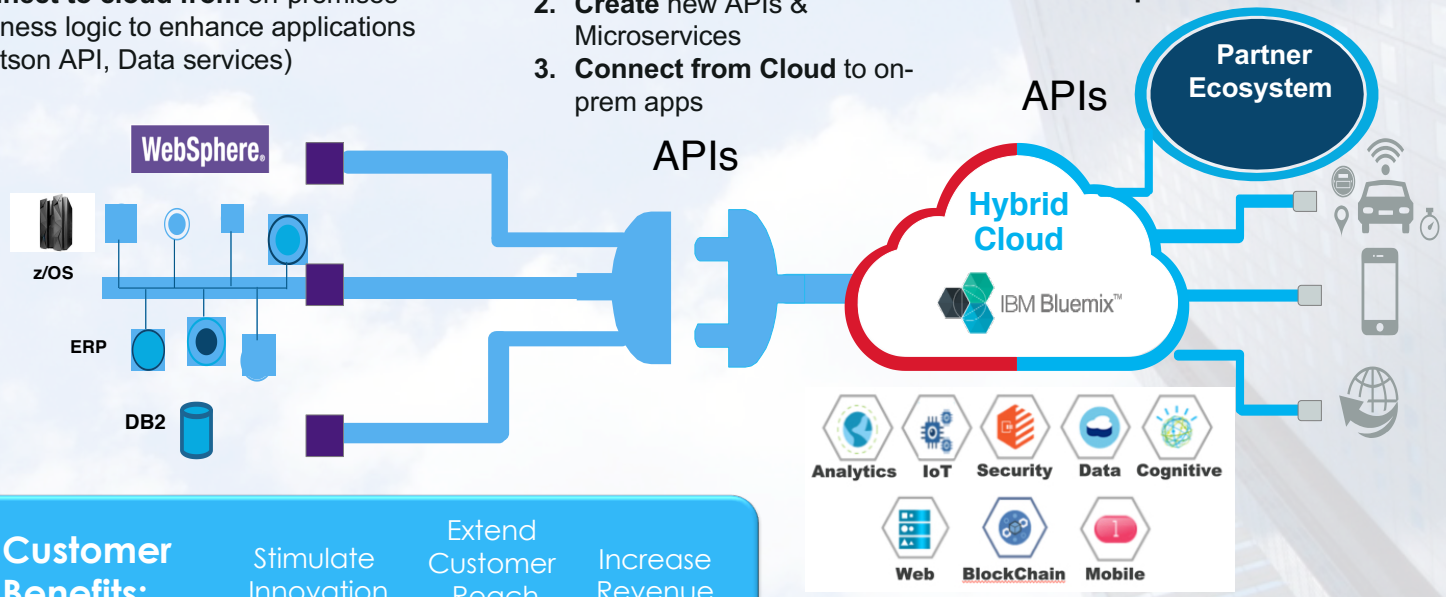
API Connect, App Connect, Message Connect, Business Operations Connect, DataWorks Forge,

1. **Discover & Consume** APIs
2. **Create** new APIs & Microservices
3. **Connect from Cloud** to on-prem apps

Analytics Connections

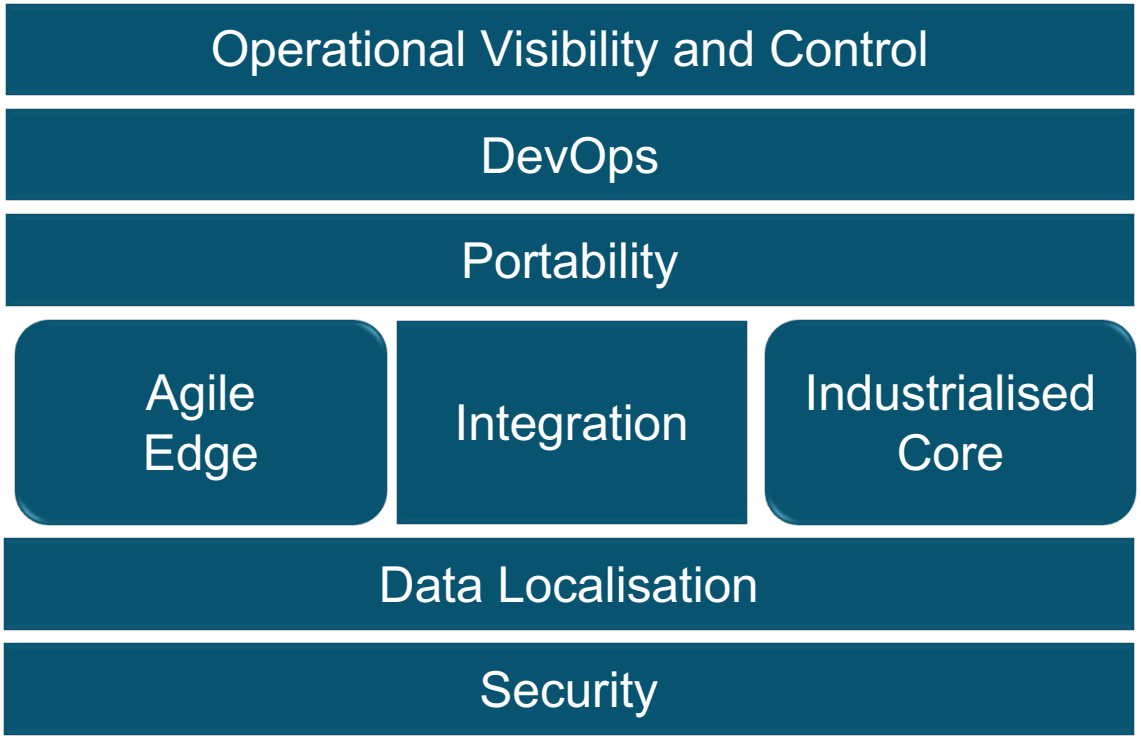
DB2 on Cloud, Analytics for Apache Spark

1. **Deploy** data stores built for volume and scale
2. **Transform, Combine and Shape** data



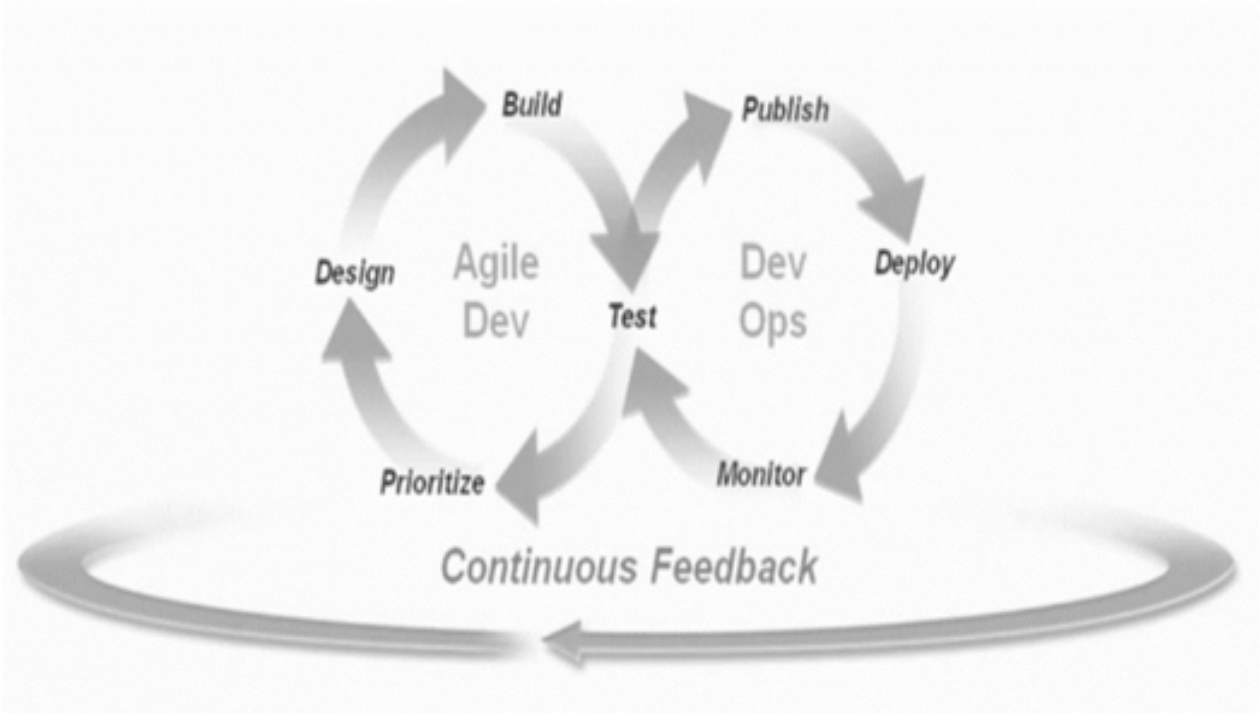
Customer Benefits: Stimulate Innovation | Extend Customer Reach | Increase Revenue

Business Value: It Transformation – Solution Outline

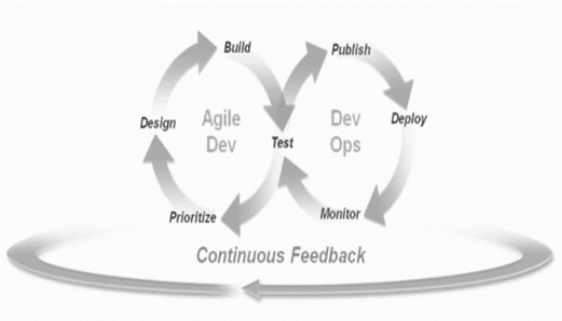


What is DevOps?

If you ask three people what they think DevOps is and chances are, they'll give you three different answers. There are lots of definitions of what DevOps means, but the diagram below is one of the best way to express how it can be described.



The two sides of DevOps



- This diagram shows how the "**left hand side"** of the issue, the Development cycle, has been revolutionized over the past ten years or so. We've got to a state where the dev cycles are short and snappy. Developers have lots of skills and toolsets available to them, such as agile development and continuous integration, which help them produce code ever quicker.

- However, the **"right hand side"** of the problem, Ops, is not working with the same level of agility. They are increasingly unable to keep up with the speed of deployment requests and are often unable to provide the quick feedback that the agile development system needs. This causes friction at the boundaries.

Defining DevOps

To grossly generalize:

•Devs think Ops are slow and
•Ops think Devs have no idea what they're asking to the Ops people

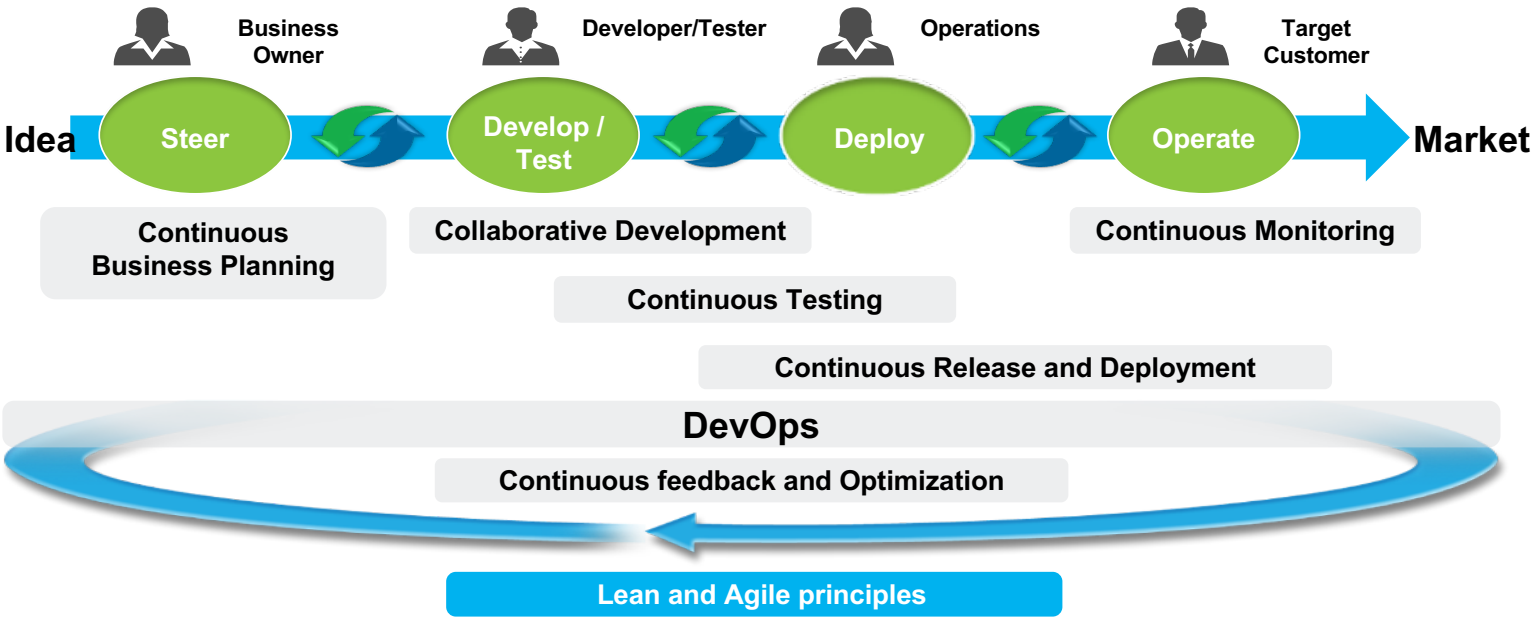
•DevOps reason to exist is to reduce that friction.

Its practical aim is to break down the glass wall between the two groups and make each other aware of the other's view point while also providing more tools on the "right hand side" of the problem to get Ops up to the same velocity as Devs.

In order to achieve this high *velocity* (an agile term) we will need to automate as much as we can throughout our entire software development process, regardless of whether it is for migration purpose or for new development objectives.

DevOps applies lean & agile practices across the app delivery lifecycle

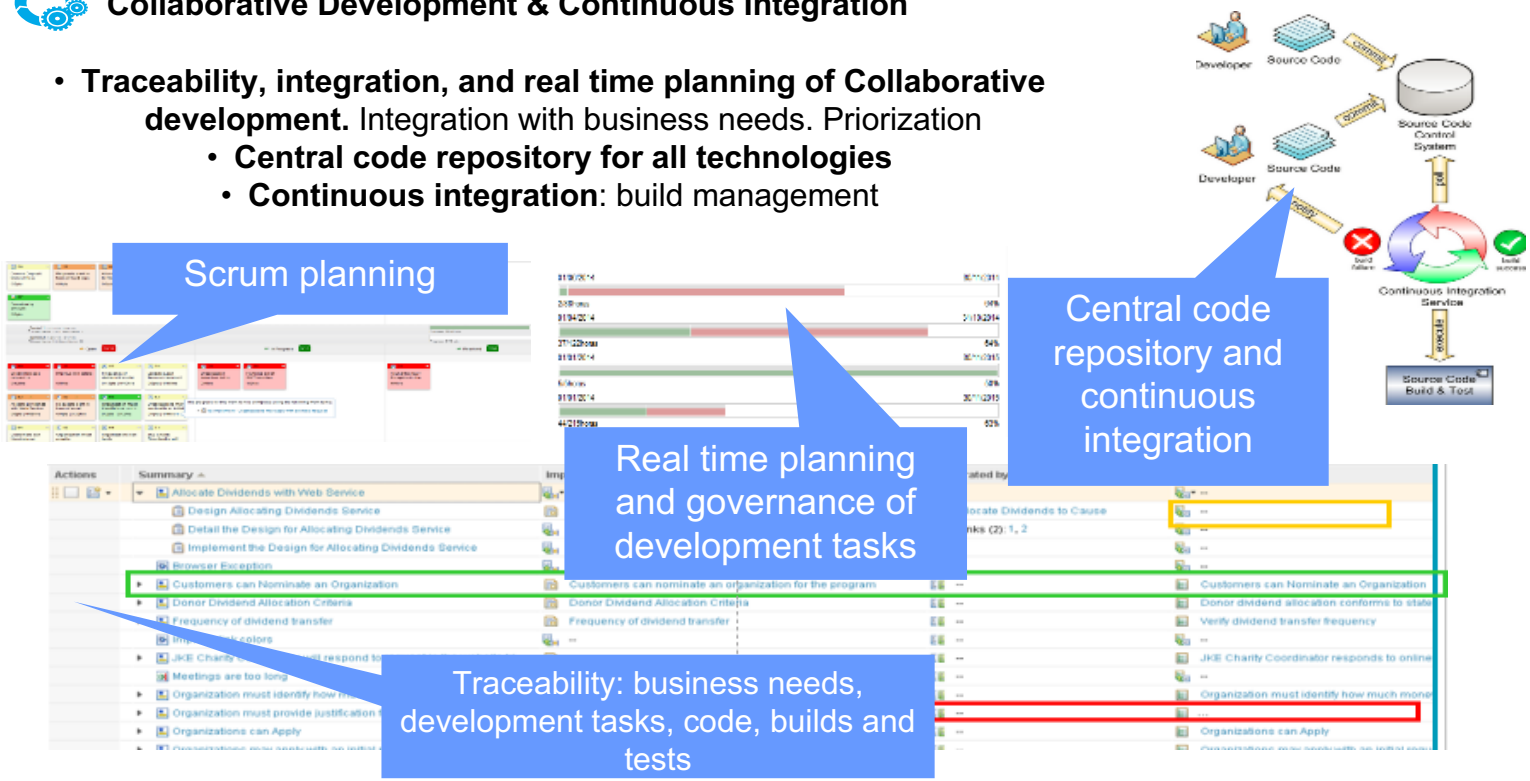
Closed-loop approach to application delivery



Continuous Business Planning & Collaborative Development

Collaborative Development & Continuous Integration

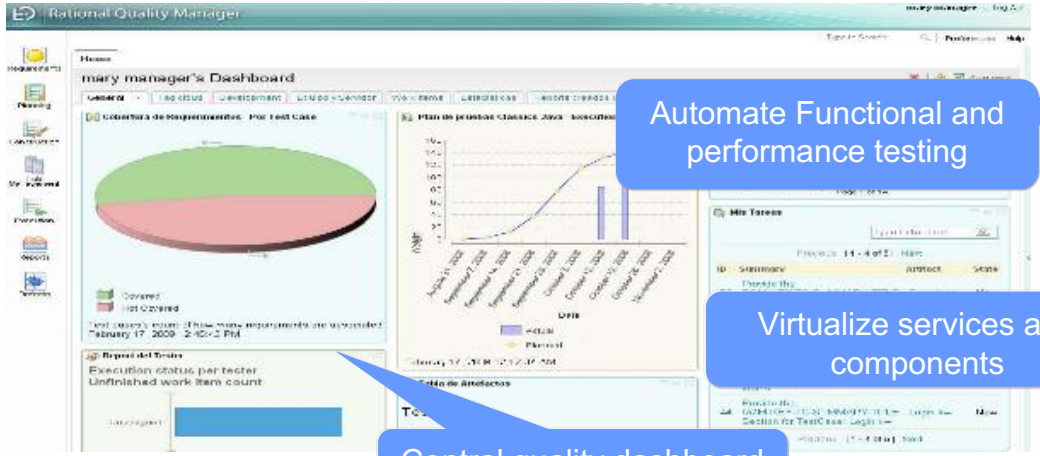
- **Traceability, integration, and real time planning of Collaborative development.** Integration with business needs. Priorization
  - **Central code repository for all technologies**
  - **Continuous integration**: build management



Continuous Integration & Testing

Continuous Testing

- **Central Quality management**
- **Automate** Functional and performance tests
- **Virtualize services and components** not available
- **Data Management** to automate your tests



Automate Functional and performance testing

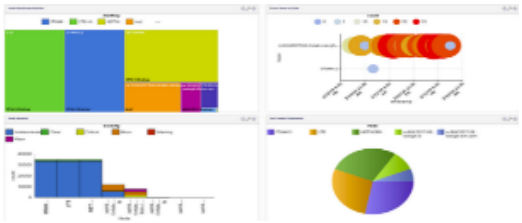
Virtualize services and components

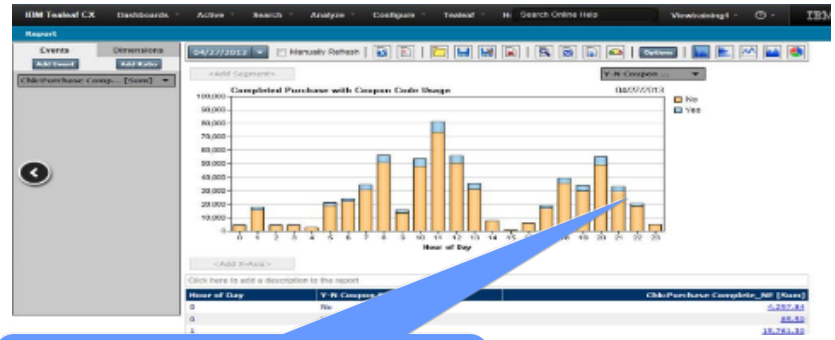
Central quality dashboard

Continuous Monitoring

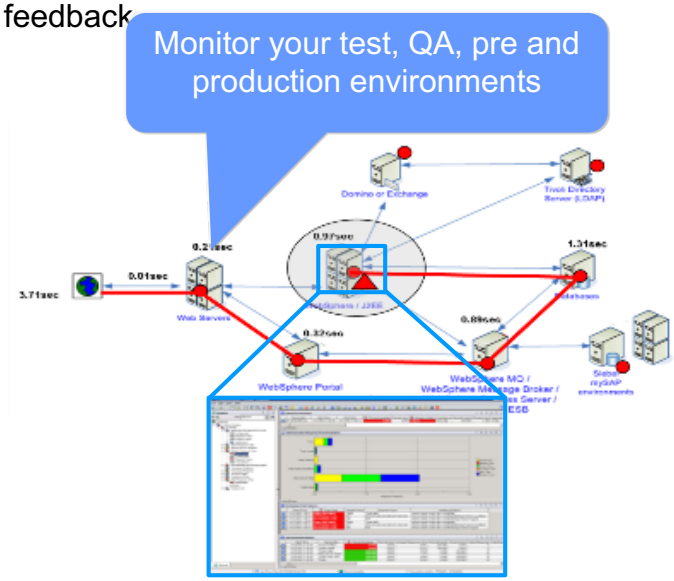
Continuous Monitoring

- **Continuous monitoring** of your test, pre and production environments
- **Log analysis** to identify potential problems proactively
- **Analyze client experience** and their behavior to understand better their needs
- **Report problems** to development teams and provide feedback





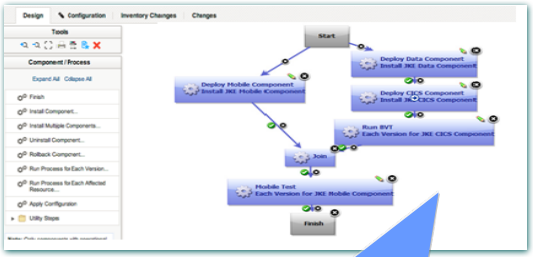
Analyze end user experience to understand behaviours



Continuous Release & Deployment

Continuous Release and Deployment

- **Automate environment provisioning**
- **Automate your deployment processes,** including software and configuration
- **Central goverment of deployment processes**



Automate your deployment processes

2

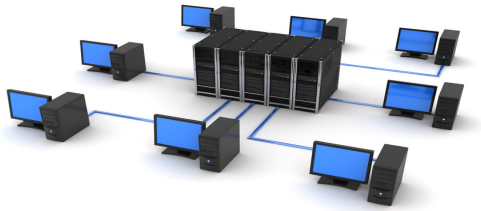
Central dashboard to manage your environments and deployments

3

1

Automatic environment provisioning

Cloud Ready vs Cloud Native applications

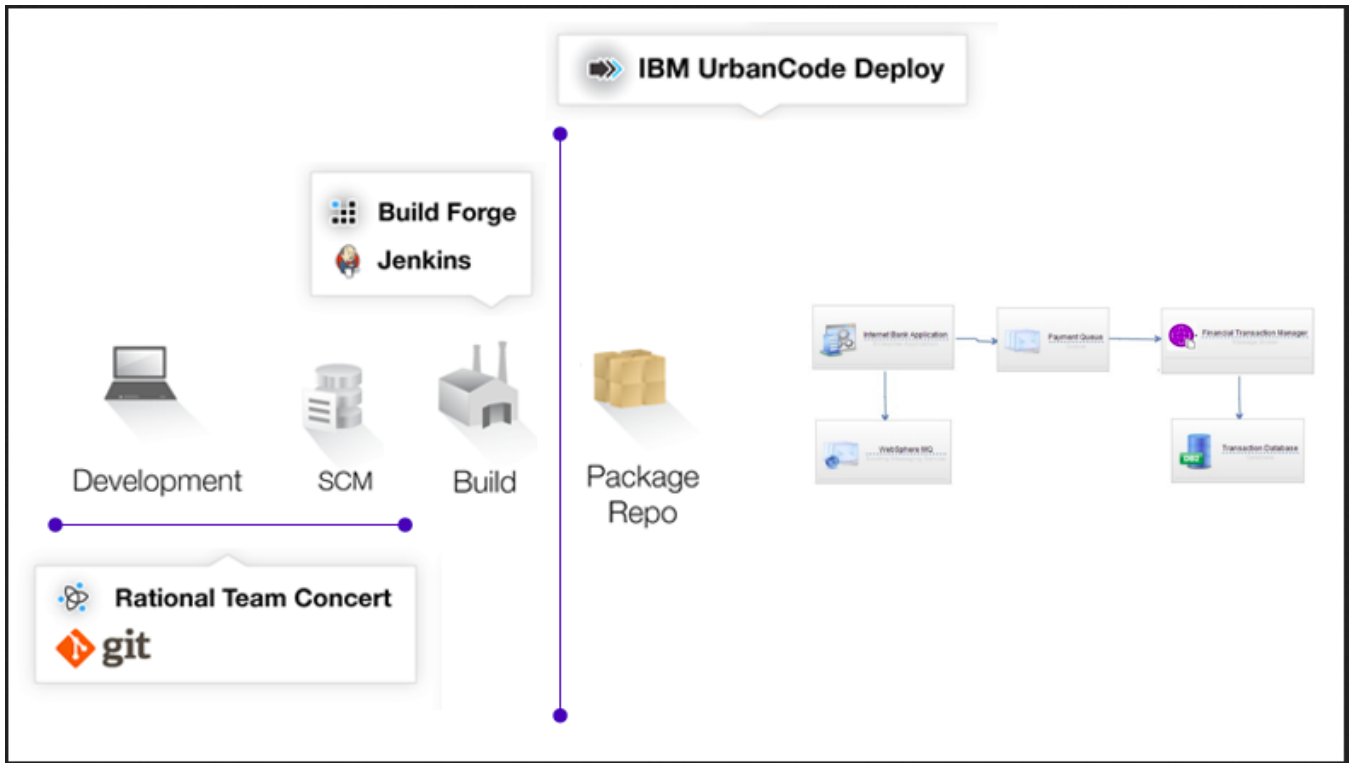


- Industrialized Core (Cloud Ready) Assumptions
  - The infrastructure provides NFR's.
  - The infrastructure is stable.
  - The components of the application are co-located.
  - The ops team controls the production servers.
  - If a disaster happens, it's someone else's responsibility to fix it.
- Innovation Edge (Cloud Native) Assumptions
  - Application and Services provide NFR's.
  - The infrastructure is constantly changing (elastic).
  - The application components may be globally distributed.
  - Dev/Ops team members control the production servers.
  - If a disaster happens, it's Dev/Ops team responsibility to make sure the app stays up.

Choosing one or the other has an effect on your team composition and roles

UrbanCode Deploy: filling the gap

between automated development and automated Solution infrastructure



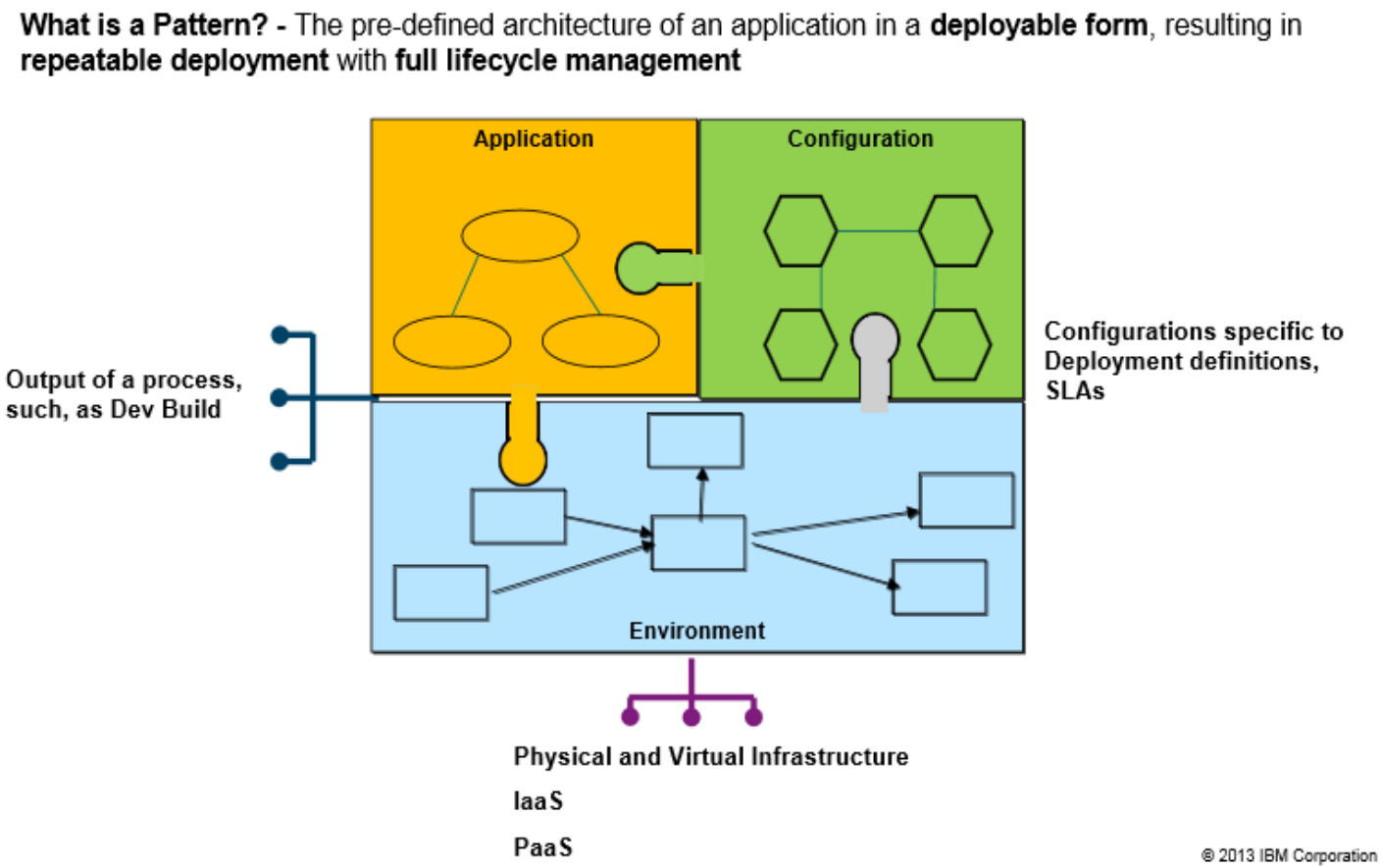
UrbanCode Deploy: filling the gap

between automated development and automated Solution infrastructure

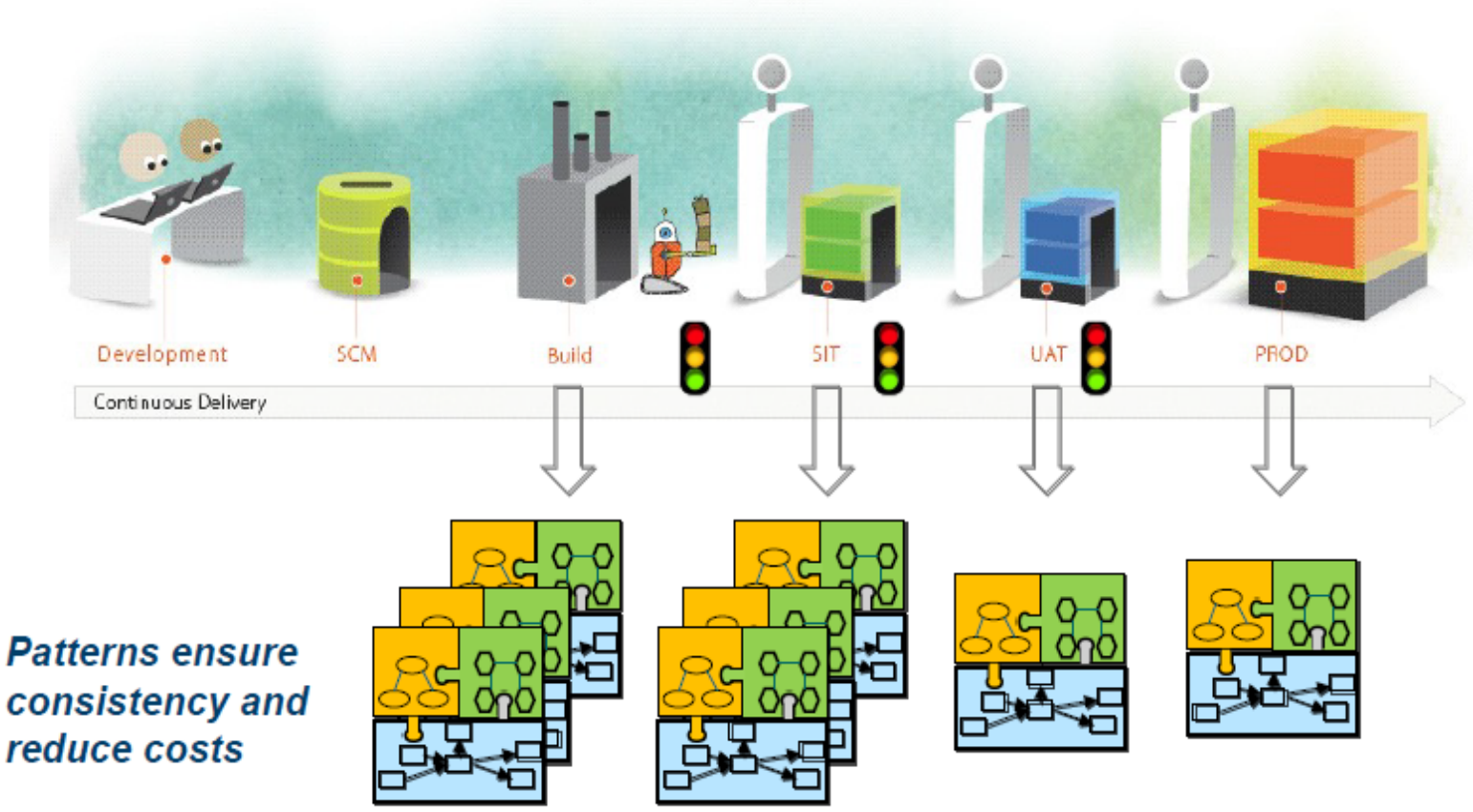
- **UrbanCode Deploy (UCD)** fits into the space between the automated development and build processes on the left hand side of the problem and the automated Solution infrastructure piece on the right hand side.
- **UCD** helps to deploy solutions coming from the build systems (the dev or left hand side) to the solution platform itself (the ops or right hand side).
- It permits to attach the infrastructure requirements of an artifact to the artifact itself.
- **UDC** allows to talk about a solution as a single entity.
  - Traditionally solution artifacts (EAR files etc.) are usually deployed as just that, single artifacts. UDeploy allows us to say “all these artifacts make up this solution” and keep track of the whole solution instead of individual artifacts.
- Thanks to this level of governance a company is in the position to migrate an entire solution easily from one environment to another.

Work with Patterns

- **Both new development and migration** implies several activities that span from environment (infrastructure + middleware), configuration, applications code.



Patterns enable a Continuous Delivery pipeline



DevOps and UrbanCode Deploy with Patterns

✓ **Continuous delivery of applications in the cloud**

Automation the continuous delivery of applications and support scaling of your application's growth. Make it easier to deploy EVERY build by making applications and environments elastic

✓ **Full Stack Environment Design and Provisioning**

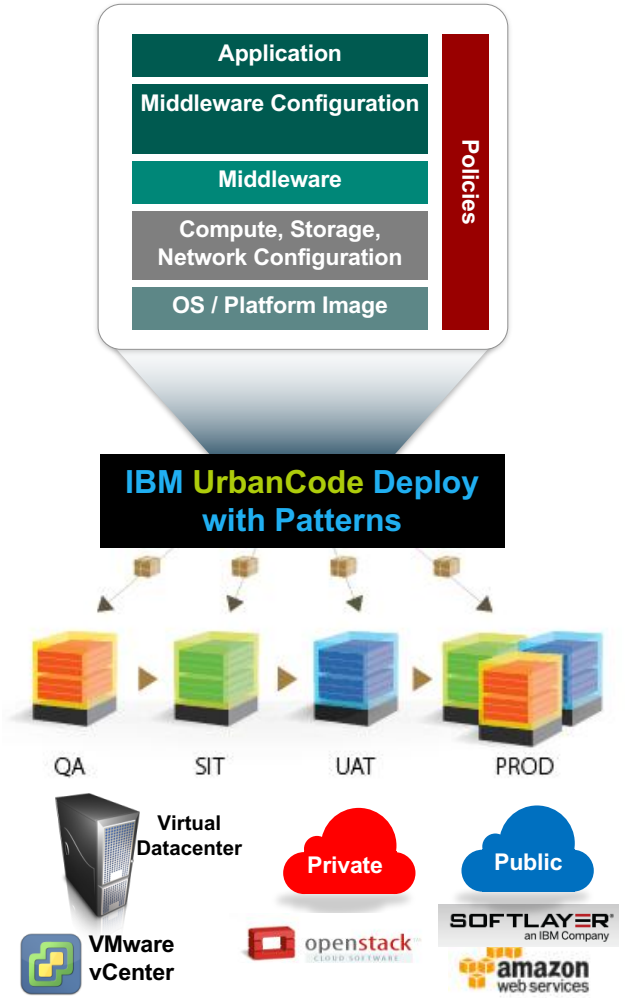
Design complete environment patterns that include applications, infrastructure and middleware. Design and deploy immediately

✓ **Portability to heterogeneous clouds**

Update your running environment in-place. Work across multiple clouds including Softlayer, AWS, Openstack, and VMWare.

✓ **Hybrid clouds: SaaS or on-premises**

Supports automation delivery to different cloud providers and to on-premise. Cloud agnostic environment patterns.

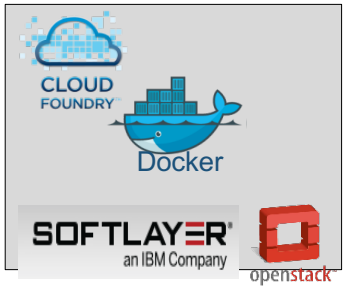


Hybrid Cloud Deployments through a Single Point of Control

Manage application deployment across dev, test, and production spanning multiple clouds

UrbanCode Deploy

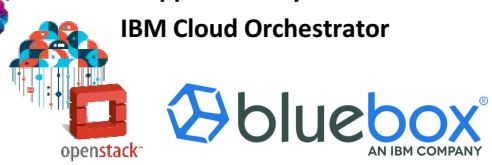
IBM **Bluemix**



IBM Dev-Test Environment as a Service (IDTES)

IBM PureApplication System

IBM Cloud Orchestrator

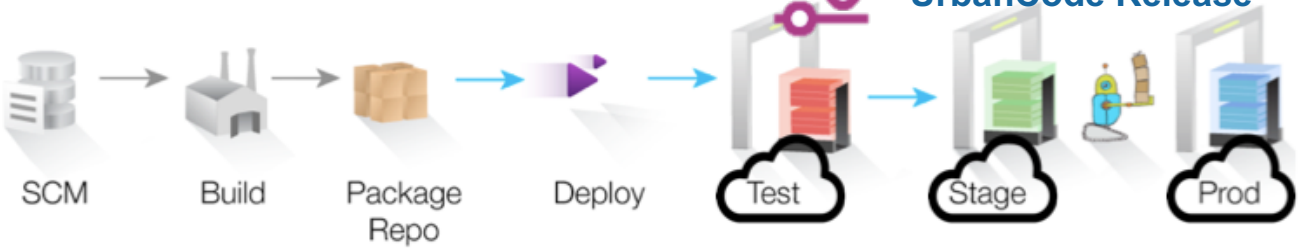


Key Points:

- Enable full stack deployments (OS, patterns and applications) across hybrid cloud applications
- Establish common toolchain framework with plug points to support continuous delivery

On-prem Traditional IT

UrbanCode Release

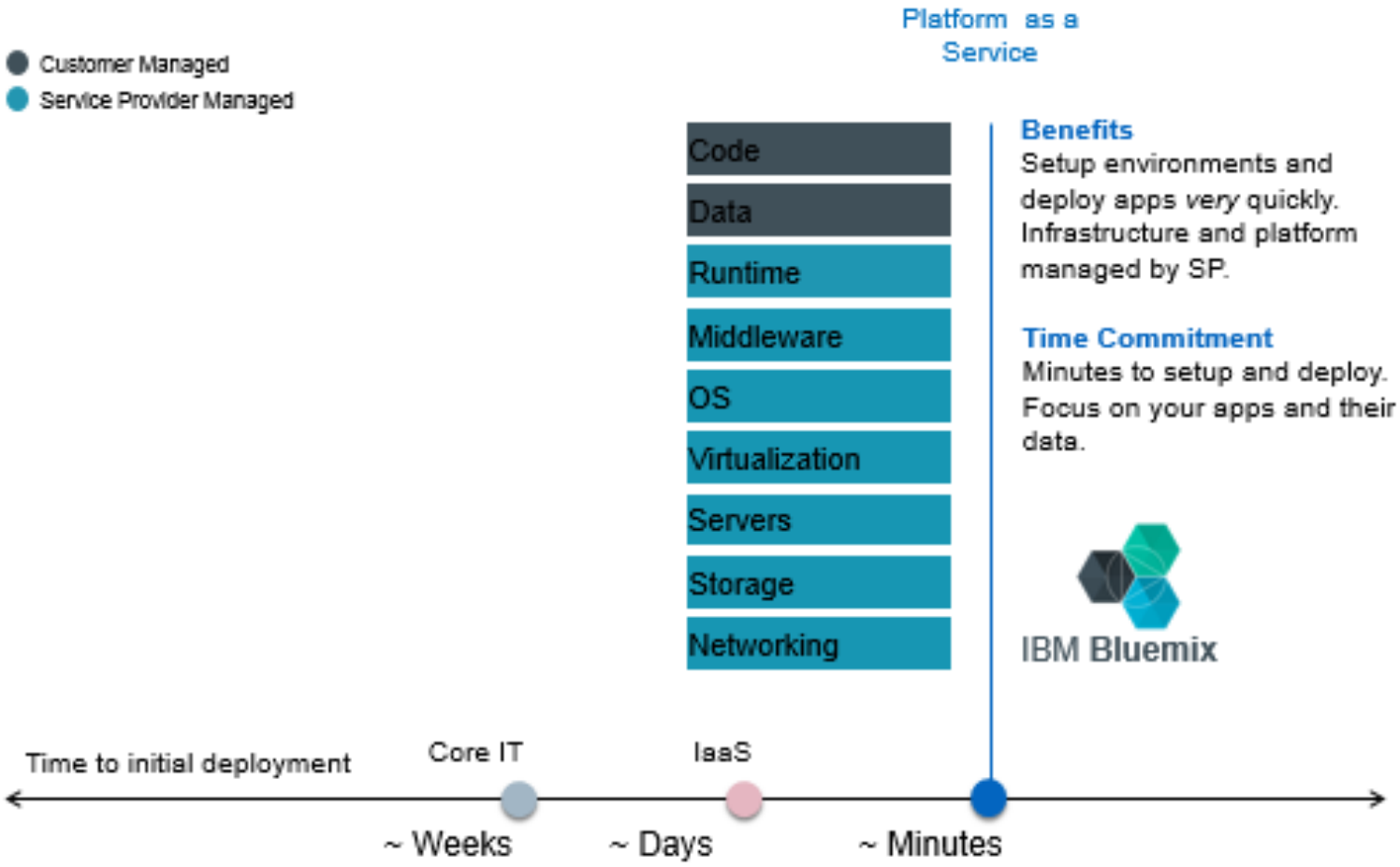


App development is about speed and choice

Developers' expectations have evolved

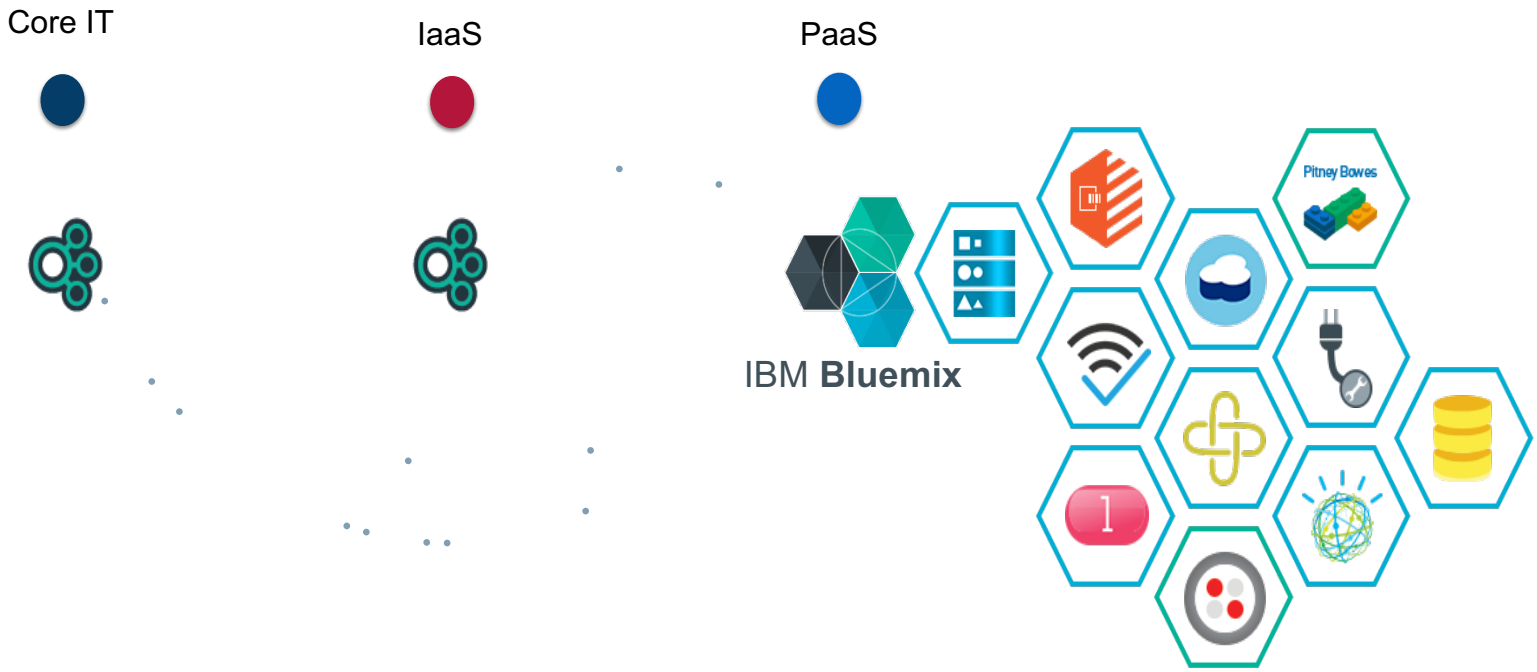
Timing is critical …

Today's apps must keep up with the speed of the app revolution.



… so are all of other investments

Leverage the power of Bluemix **without abandoning** what already in use.



What is Bluemix? IBM's Cloud Platform

Build, run, scale, manage, integrate & secure applications in the cloud

Developer experience

- Rapidly deploy and scale applications in any language.
- Compose applications quickly with useful APIs and services and avoid tedious backend config.
- Realize fast time-to-value with simplicity, flexibility and clear documentation.

Built on a foundation of **open technology.**

Enterprise capability

- Securely integrate with existing on-prem data and systems.
- Choose from flexible deployment models.
- Manage the full application lifecycle with DevOps.
- Develop and deploy on a platform built on a foundation of open technology.

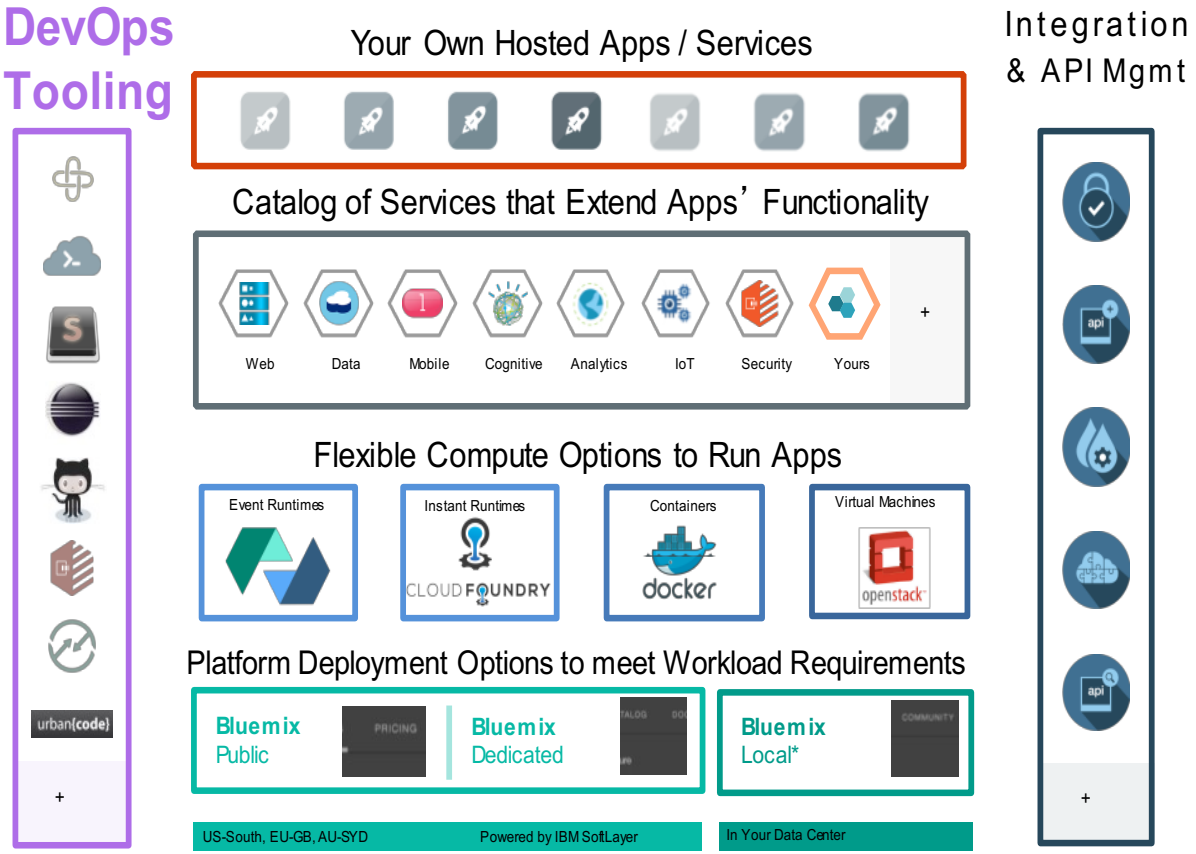
Bluemix service categories

- Network
- Storage
- Data & Analytics
- Watson
- Integrate
- DevOps
- Security
- Application Services
- Mobile
- Internet of Things

Bluemix architecture

Bluemix is built on 4 key open compute technologies: **OpenWhisk, Cloud Foundry**, **Docker**, and **OpenStack**, and delivered by 3 deployment options: **Public, Dedicated** and **Local**.

It extends each of these with a growing number of **services**, robust **DevOps tooling**, **integration** capabilities, and a seamless **developer experience**.



Run apps in seconds

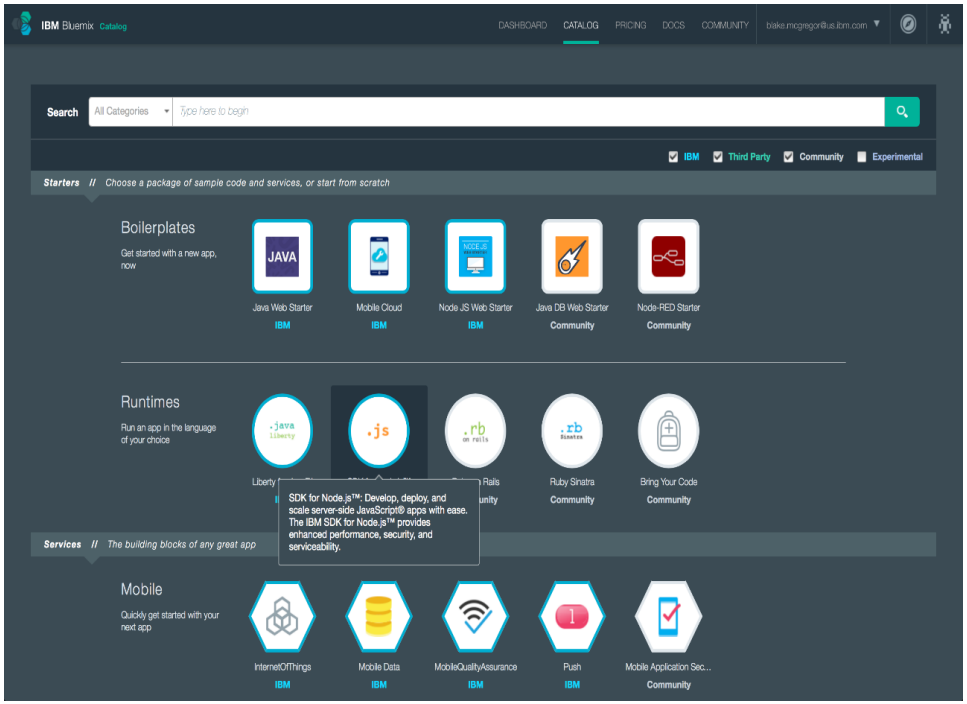
Zero to production in one command. Setup made simple.

No VM or middleware setup

- Provision runtimes in seconds
- Auto and manual scaling options

Multiple language support

- Java Liberty, JavaScript, and Ruby provided
- Bring any language from the community



IBM Containers Service

Bluemix is built on 4 key open compute technologies: **Cloud Foundry**, **Docker**, **OpenStack, & OpenWhisk**.

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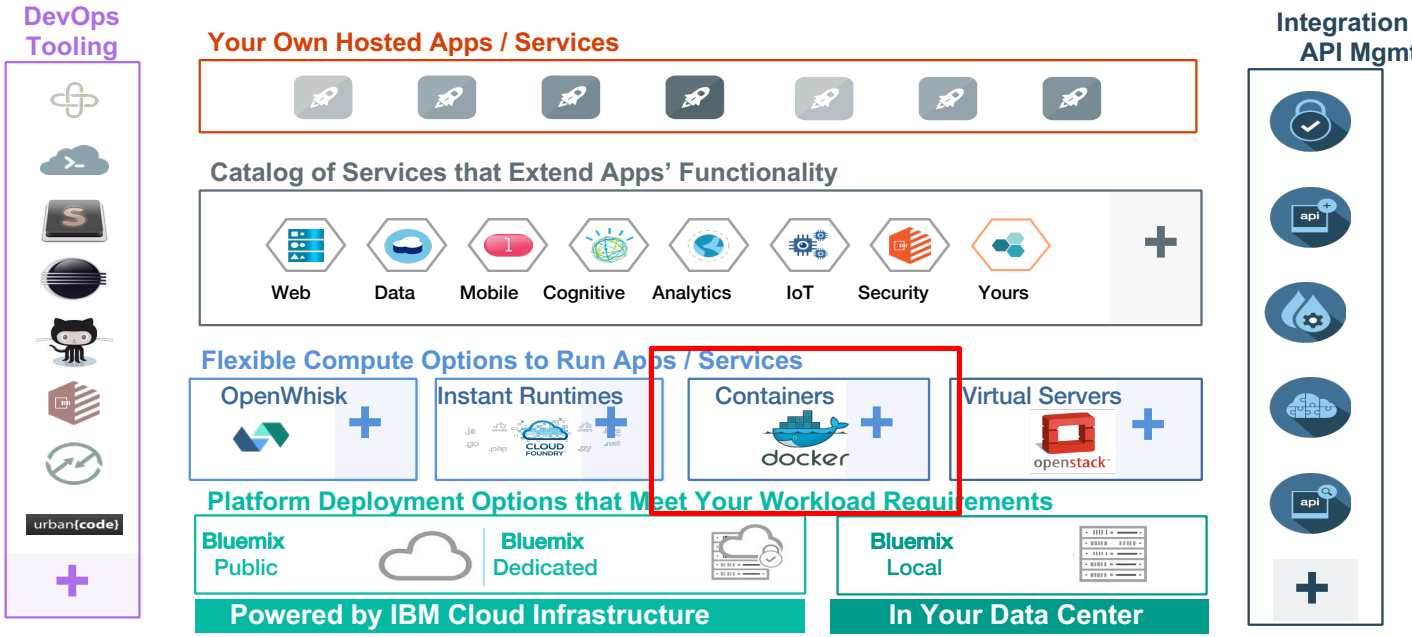


Containers

A standard way to **package** an application **and all its dependencies** so that it can be moved between environments and **run** without changes.

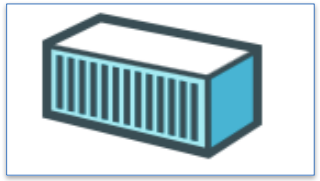
Containers work by isolating the differences between applications **inside** the container so that everything **outside** the container can be standardized.

Introduction to Docker

*Enabling application development **efficiency**, making deployment more **efficient**, eliminating vendor 'lock-in' with true **portability***

- **Open Software**
  - Launched **March 2013**
  - **2.0+ billion** downloads of Docker images
- **Open Contribution**
  - **2000+** contributors
  - **#2** most popular project
  - **185** community meet-up groups in 58 countries
- **Open Design**
  - Contributors include IBM, Red Hat, Google, Microsoft, VMware, AWS, Rackspace, and others
- **Open Governance**
  - **12** member governance advisory board selected by the community

Docker Basics – A shipping container for code

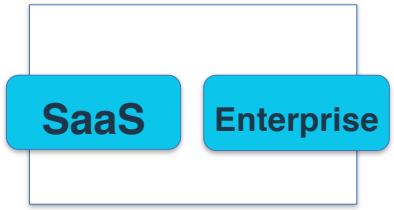


Container

- The standard unit in which the application service resides

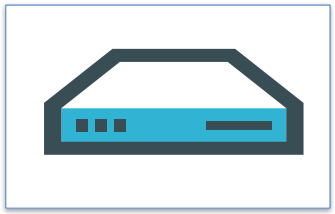
Image

- A read-only snapshot of a container to be used as a template for building containers



Docker Hub

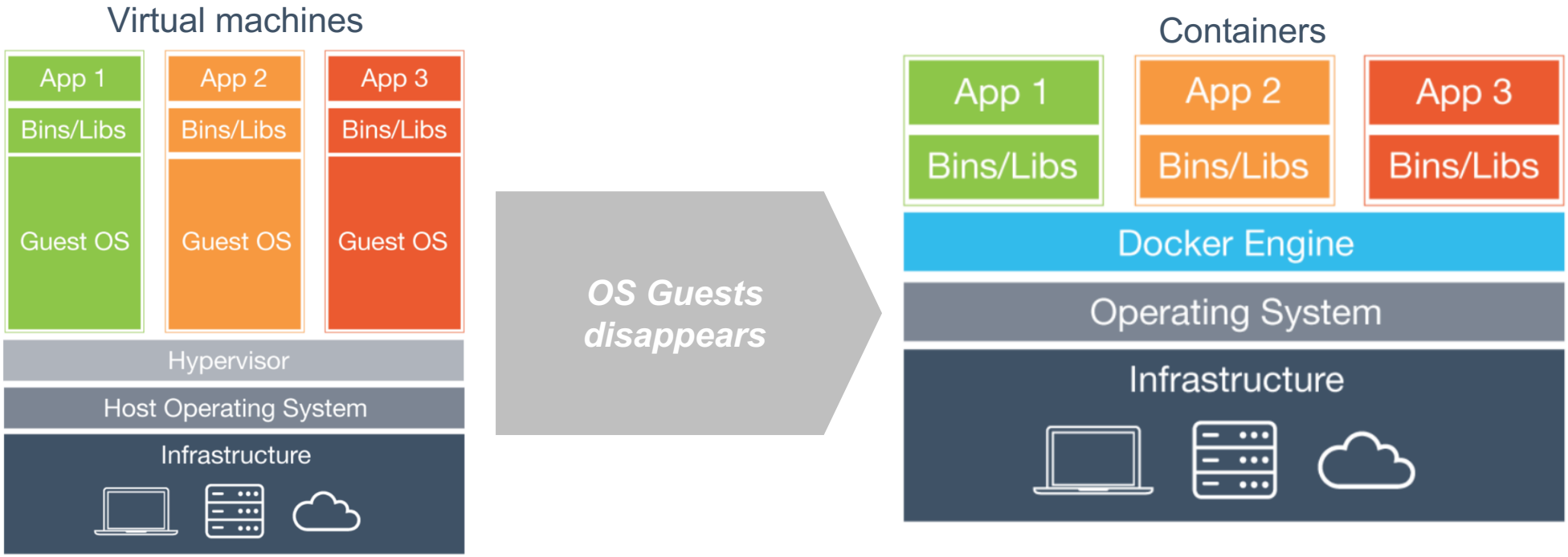
- Available in SaaS or Enterprise to deploy anywhere you choose
- Stores, distributes and shares container images



Docker Engine

- A program that creates, ships and runs application containers
- Runs on any physical and virtual machine or server locally, in private or public cloud
- Client communicates with Engine to execute commands

Virtual Server versus Container



DOCKER KEY ADVANTAGES :

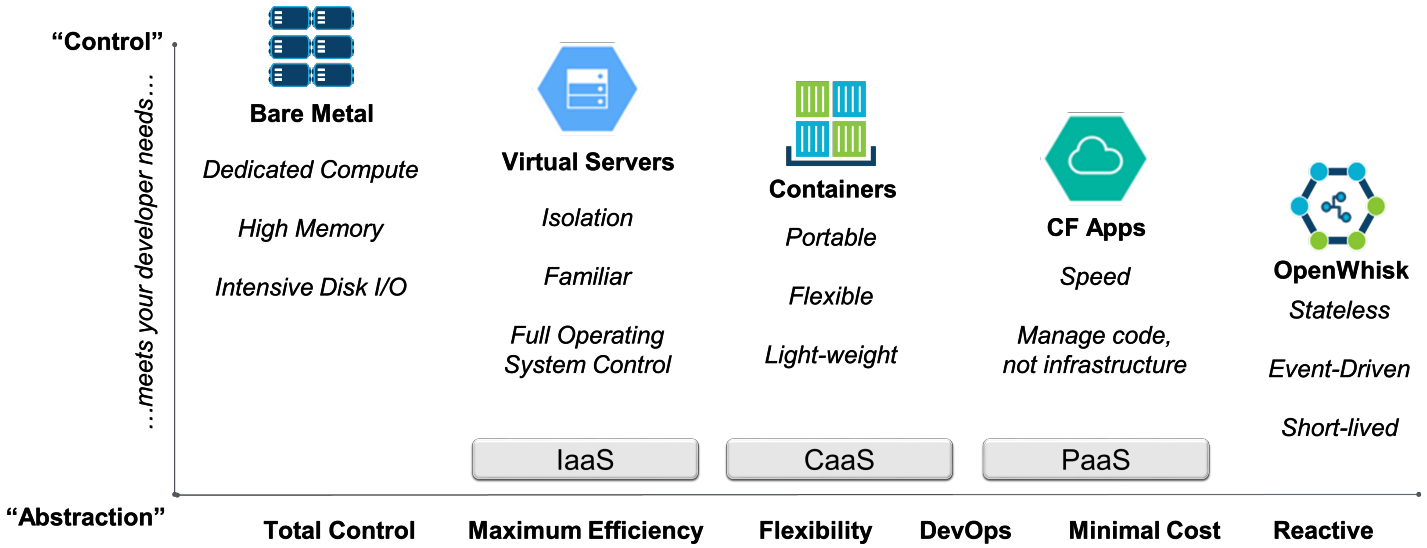
- Better resources utilization (less overhead) : CPU, RAM
- Faster to stop/start applications (seconds)
- Enable powerful portability
- Lightweight – higher density
- No hardware emulation – No hypervisor

Why do customers care about Containers?

Pain points	User scenarios	How Containers help
Need resources faster	Get a working environment up and running in minutes, not hours or weeks	Users can instantiate new container instances in seconds with the consistent experience working directly with Docker
Ability to migrate workload from heterogeneous infrastructure	Changes made on developer's local image is ready to deploy to production cloud	Portability as images can be developed on a local workstation, tested in a staging cloud on-premise, and finally to the production off-premise cloud
No lock-in	Avoid lock-in with any kind of infrastructure	At infrastructure layer Containers apply the "build once, ship-and-run everywhere" paradigm
Environment to facilitate incremental production deployment	Business wants to deploy in a phased approach to validate the expected experience of the new version	Users can deploy new releases in a controlled manner enabling them to monitor the performance and behavior with the ability to roll back if needed
Innovation requires agility and DevOps	Continuous delivery pipeline	Containers integrated with cloud apps to provide a continuous delivery pipeline, partnered with the fast deployments of containers

IBM Containers Service

Bluemix promotes portability and consistency of application images, regardless of where they are run

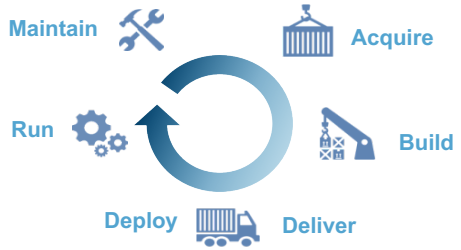


Container ecosystem

A single container is not enough to guarantee a production-ready solution.

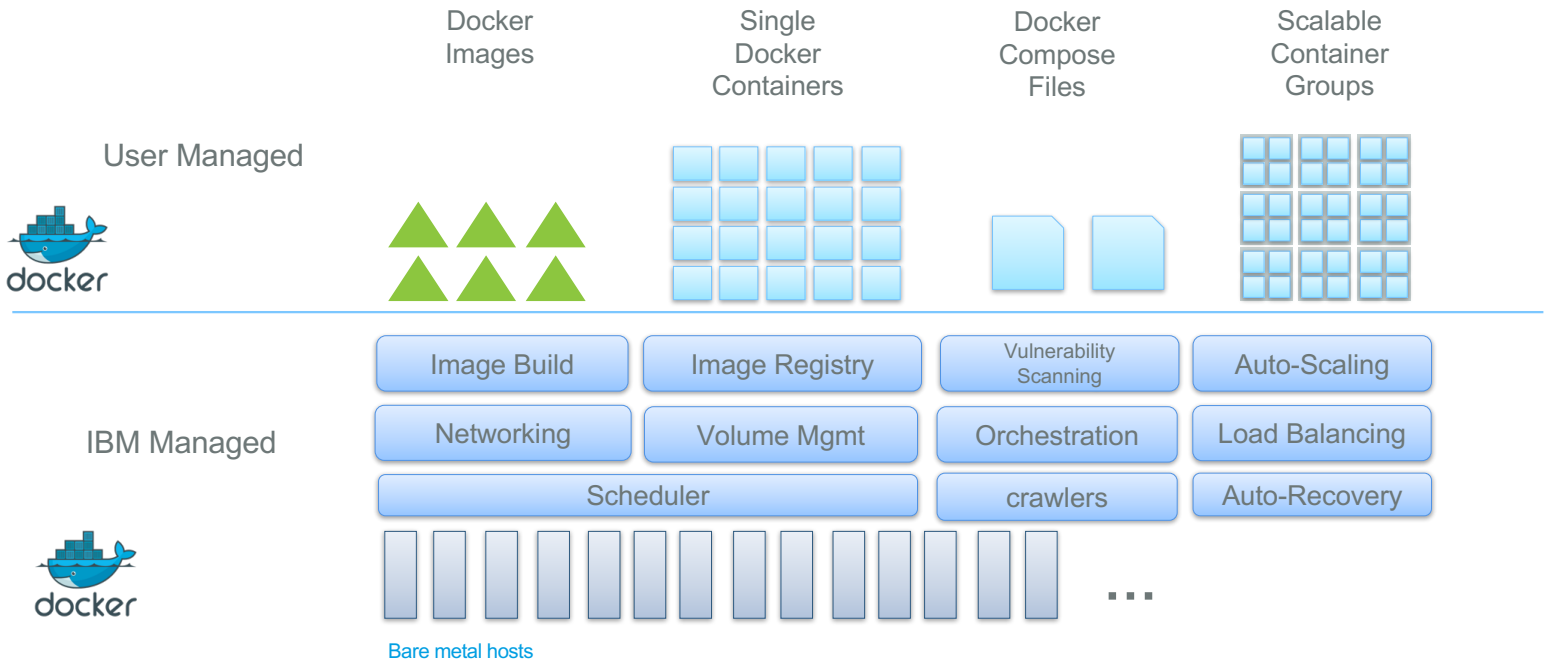
- From a single container to a real production environment:
  - Group (cluster) of containers
  - Container orchestration
  - Load balancing
  - Composition of containers

- Addition life-cycle processes and services
  - Build, ship and deployment
  - Private image registry
  - Security and vulnerability check
  - External persistent storage
  - Monitoring and Log analytics
  - Support
  - Container standardization



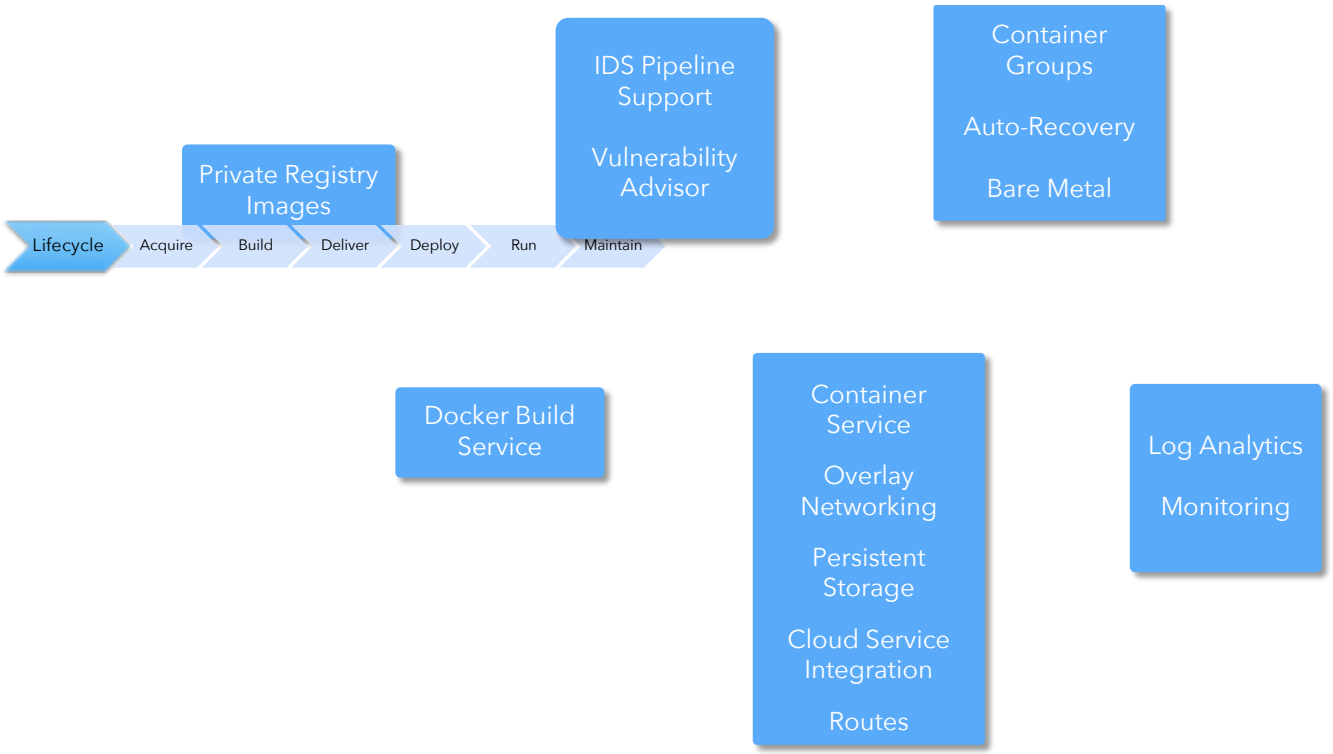
IBM Managed

Understanding the IBM Container Service



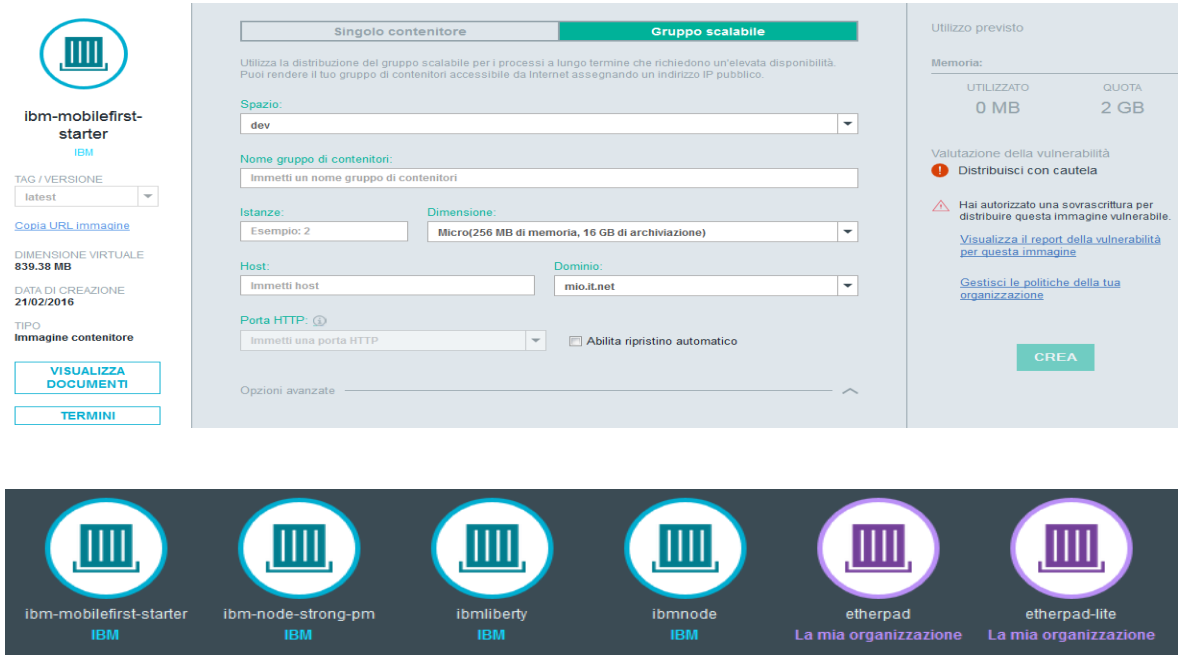
Understanding the IBM Container Service

Different things still need to be considered to support Full Container Lifecycle



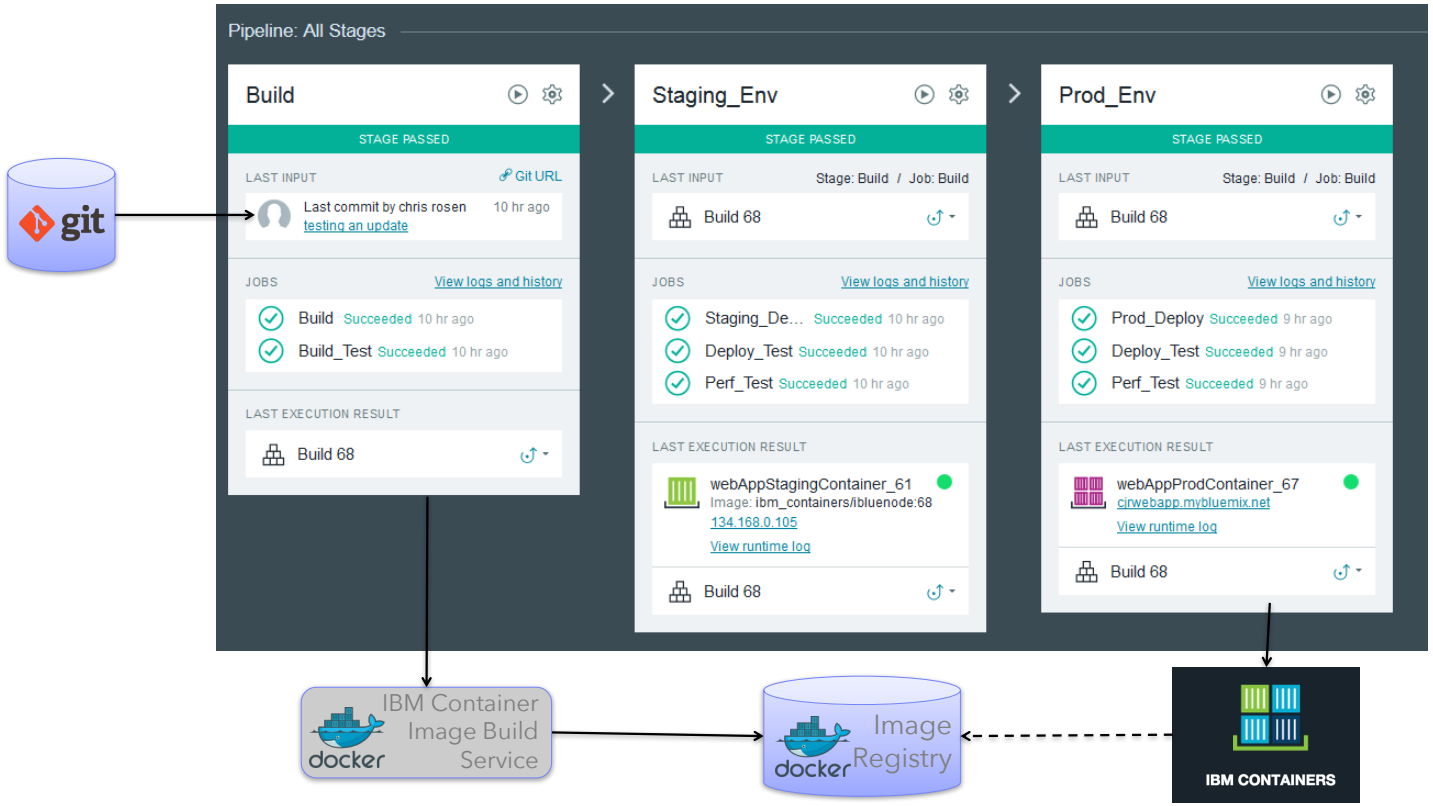
Docker & IBM Containers

IBM Containers Service are designed to be production-ready, hosted containers. Developers can quickly create production-ready containers for their applications and then deploy them into different



- Automating the build of Docker images
- Managing and distributing Docker images in private image registries
- Easily hosting and managing containers in the cloud
- Integrating with readily available PaaS application services
- Scale and auto-recovery built-in
- Logging and Monitoring built-in
- Easily assign IP subnets and external IP addresses

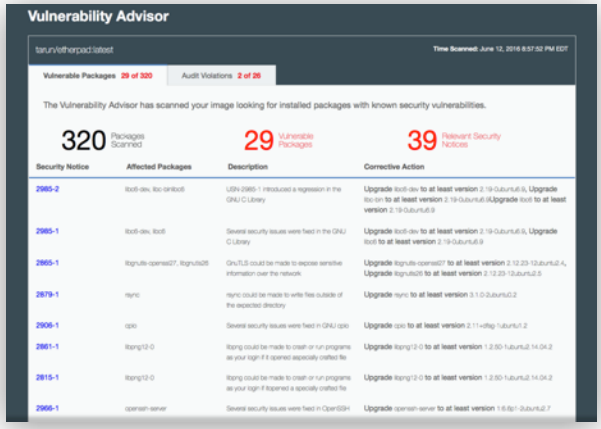
Docker DevOps Pipeline in Bluemix

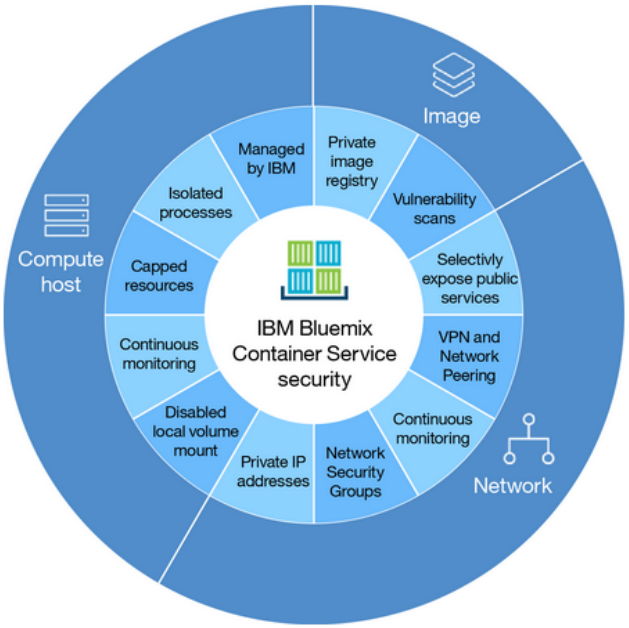


Securing Containers

- Secure compute hosts
- Private image registry and network overlays
- Vulnerability scanning

https://new-console.ng.bluemix.net/docs/containers/container_security.html



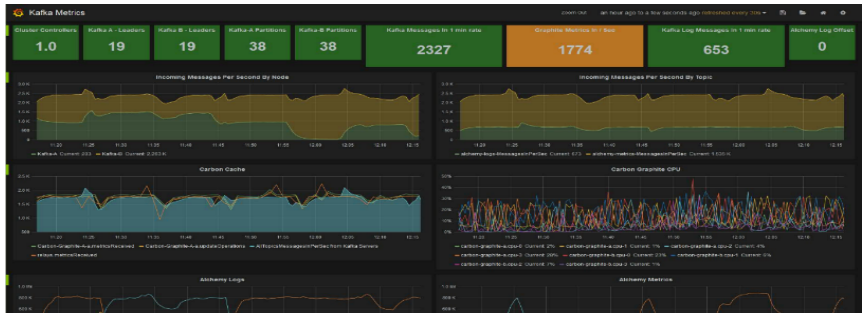


Integrated monitoring of containers

Track and maintain the health of your application and environment.

Easy launch to preconfigured metrics

- June: Go-live support for Containers
- Beta support for VMs



Visualize your data

- Mixed styling: lines, bars, points, stacking, multi Y-axis
- Dashboards: templates, scripted, playlists, sharable within account
- Query UI: 70+ calculation functions on metrics
- Add/remove metrics through simple query formulas

Interact with your data

- Microchart for at-a-glance views
- Drag/drop zoom and flyover values within the Monitoring UI

IBM Containers value

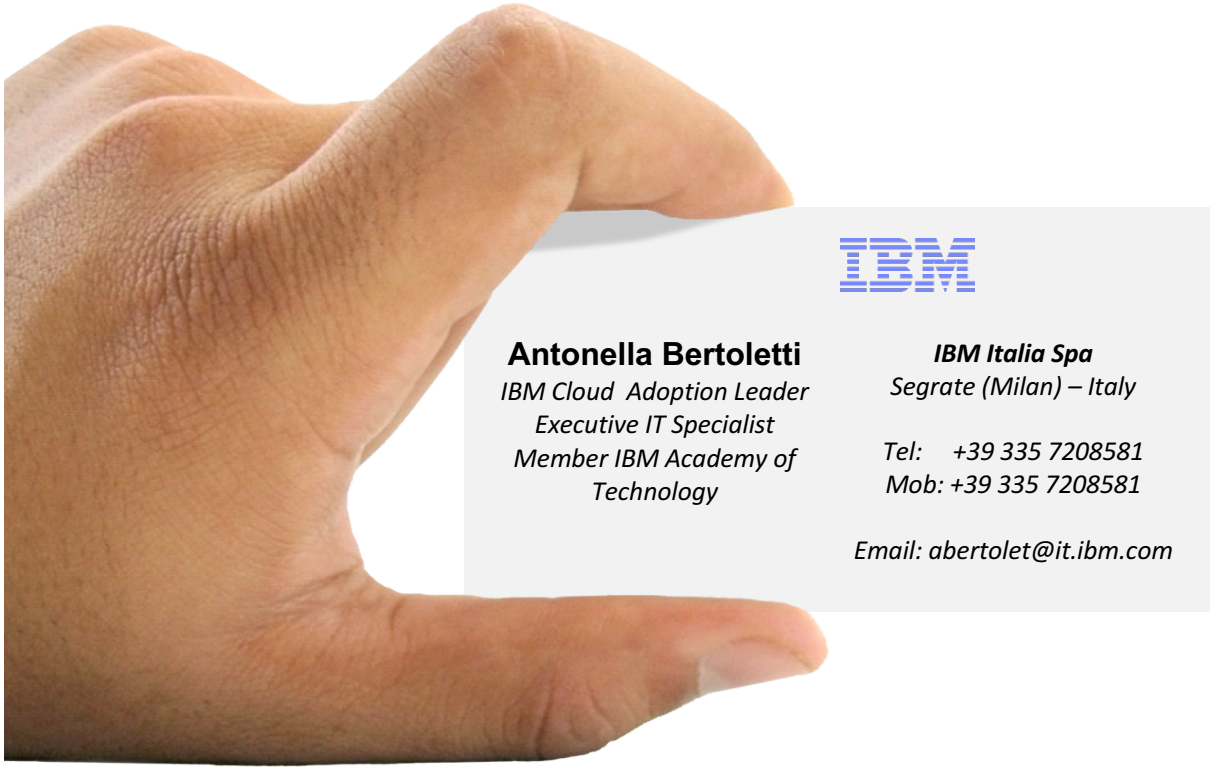
Bluemix provides a **fully managed, high performance, multi-tenant Docker offering**, with integrated monitoring, logging, elasticity, enterprise images, and VM abstraction as standard features.

Docker Value	IBM Value-add	Customer Value
• Docker Hub Registry holds a repository of 75000+ Docker images	• IBM hosted **private registry** containing IBM images - linked to Docker Hub • Client unique registry available **on and off premises** • Enterprise-ready images • **Security** readiness guidance via the Vulnerability Advisor	• Access to the images you require to deploy containers that meet your business needs and strategy
• Open-source, standardized, lightweight, self sufficient container technology	• Enhanced performance with **bare metal deployment** • Run images to **local datacenter or cloud** • Deployment choice with Intel, pSeries, and zSeries	• Flexibility to choose the right hybrid cloud mix for your business
• Build, ship, and run standardized containers	• Integrated **monitoring & logging** • **Elasticity** to grow storage & container needs • **Life-cycle management** of containers and data volumes • No VMs to manage • **Scalable container groups** with integrated load balancer, domain names, and auto-recovery	• Docker ease of use combined with enterprise-level integrity and confidence
• Container connections using links and service discovery	• **Private network** communication • **External IP** address management • **Subnet** Range	• Extends and connects Docker containers to production-ready enterprise environments

Vendors Containers Analysis

						
Engine	AWS ECS: Container as-a-service based on Docker	Azure Container as-a-service based on Docker	Google Container Service based on Docker	Has its own containers based on Garden (previously Warden)	Based on Linux Containers (LXC), although Docker is distributed with RHEL separately	Native support for LXC but also supports Docker as image type in Magnum
Orchestration	Built their own orchestration layer in ECS (open source project Blox), but AWS also supports DDC, Mesos, Kubs	Provides Mesos as preferred orchestration option and also provides Docker Swarm	Provides it's own Kubernetes as orchestration option	Orchestration based on Cloud Foundry	Standardized on Kubernetes	Provides Magnum, an API service which makes Kubernetes and Docker Swarm as resources in OpenStack

Thank You



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