Microservices, Websphere Liberty and Kubernetes - a fully buzzword-compliant devOps pipeline

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InterConnect
2017

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Agenda

Introducing Microservice Builder (Beta)

On-Prem DevOps Pipeline

Demo

Introducing Microservice Builder (Beta)

Better software delivery through devOps

- As an IT business I want to
  - Make money: reduce time to market
  - Save money: reduce faults, outages, manual steps, unused capacity
- Buzzwords to the rescue!
  - devOps
  - Cloud computing
  - Automation, continuous delivery, pipelines
  - Microservices
  - Kubernetes
  - Docker

The Microservices Revolution

Connecting people and digital apps better than ever before

A microservices architecture is gaining traction for developing and delivering cloud-native workloads across public, private, and hybrid application environments

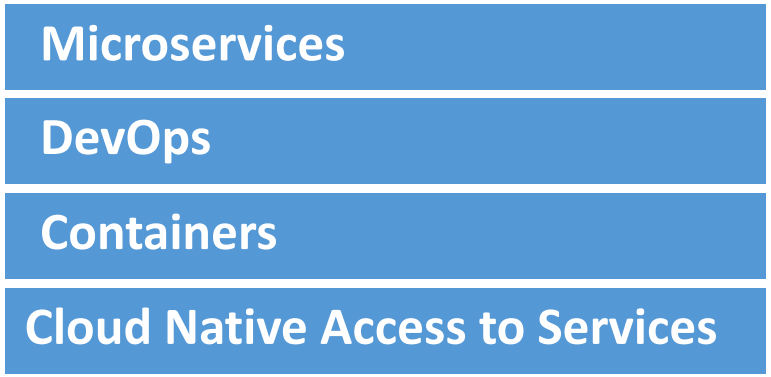
***60% of new apps will use cloud-enabled continuous delivery and cloud-native application architectures to enable faster innovation and business agility** (Bluemine)*

Why?

- ✓ Decomposed into small pieces
- ✓ Loosely coupled
- ✓ Easier to scale development
- ✓ Improved fault isolation
- ✓ Each service can be developed and deployed independently
- ✓ Eliminates any long-term commitment to a technology stack

Cloud-Native

An **application architecture** designed to leverage the **strengths** and accommodate the **challenges** of a **standardized** cloud environment, including concepts such as **elastic** scaling, **immutable** deployment, **disposable** instances, and **less predictable infrastructure**.



Cloud Native and Microservices: The journey

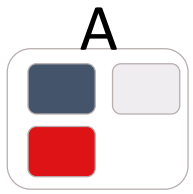
Stages of Maturity

Single Developer (experimentation)

Single Container

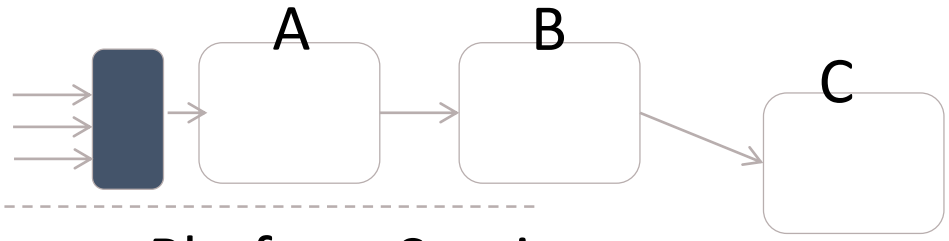
A Single Team

Single Service



Multiple Teams Collaborating

Microservices App



Technology /Ecosystem

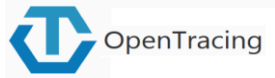
Docker Containers

Pods , Clusters

k8

swarm

Platform Services



Problem Solved

Portability

Orchestration
Clustering

Integration
Collaboration
Innovation

The Java programming model for microservices

Define a Java programming model in order to:

- Provide guidance on developing microservices
- Consistent qualities of service (scaling, health, analytics) across all envs
- Make Java microservices portable and interoperable
- Ensure applications have overall control over the environment provided similar checks

Java programming model:

Collaborate in MicroProfile.io: evolution of Java EE focused on microservices. Open collaboration led by IBM & Red Hat

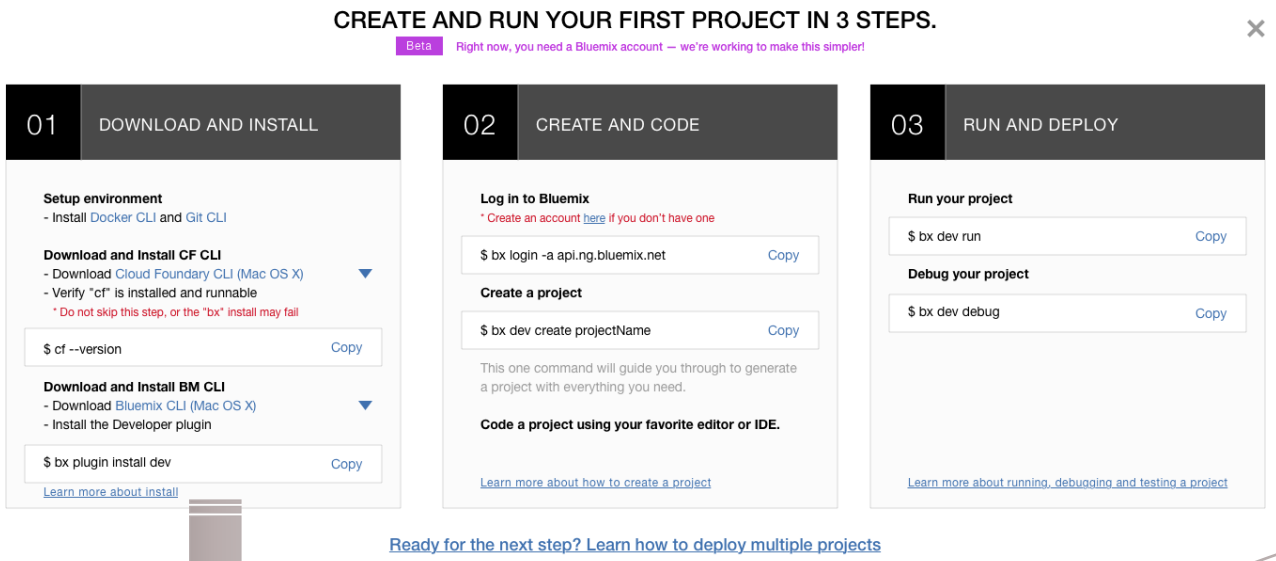
CDI:	A loose-coupling model for developing microservices
Config:	A model of isolating config source from microsvcs code
Fault Tolerance:	A model to build a robust microservices
Monitoring:	A model to provide vendor and application specific data
Health Check:	A model to provide health check data
Trace Correlation:	A model to correlate trace
Security:	A model to secure microservices

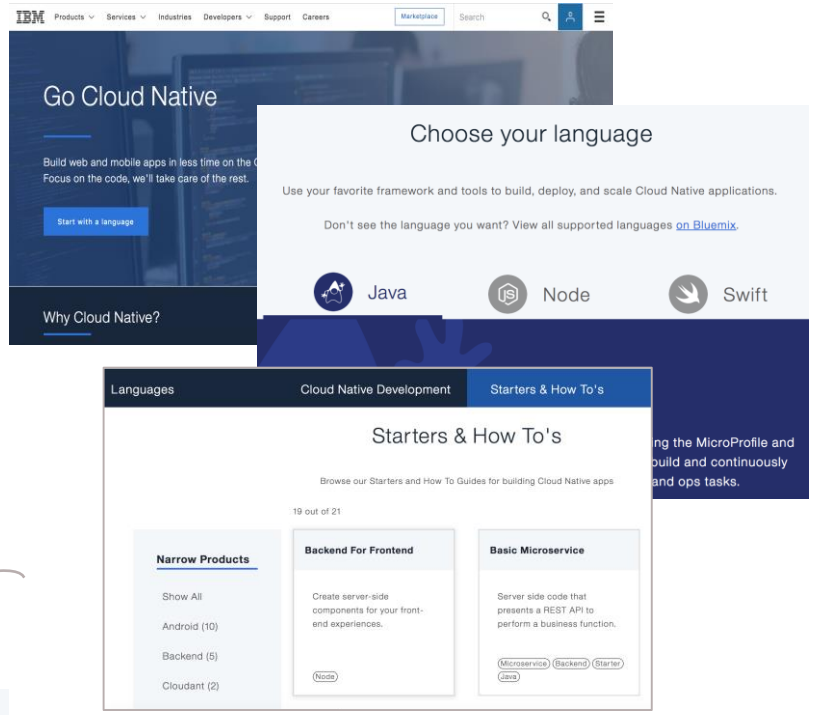
Adding resilience to the Java microservices programming model

As a developer, ….

- **Retry** – execute the same operation multiple times on failures
  - ….I would like to retry the same operation on some failure
- **Fallback** – provide an alternative result for a failed execution. Can be used to suppress exceptions and provide a default result.
  - …..I would like to fall back to a secondary service if the primary service is down.
- **Timeout** – When making a service invocation, the request must have a timeout in order to prevent from indefinite wait.
  - ….I would like to get timeout on request instead of waiting indefinitely.
- **CircuitBreaker** – provide a way to avoid repeating timeouts.
  - ….I would like to fail fast after a repeating failure instead of waiting for timeout to occur.
- **Bulkhead** – failure in one part doesn't take down the whole app.
  - ….I would like to make sure one service failure does not cause the whole application to fail.

Cloud Native Developer Experience





IBM Developer Hub

IBM Project Generators

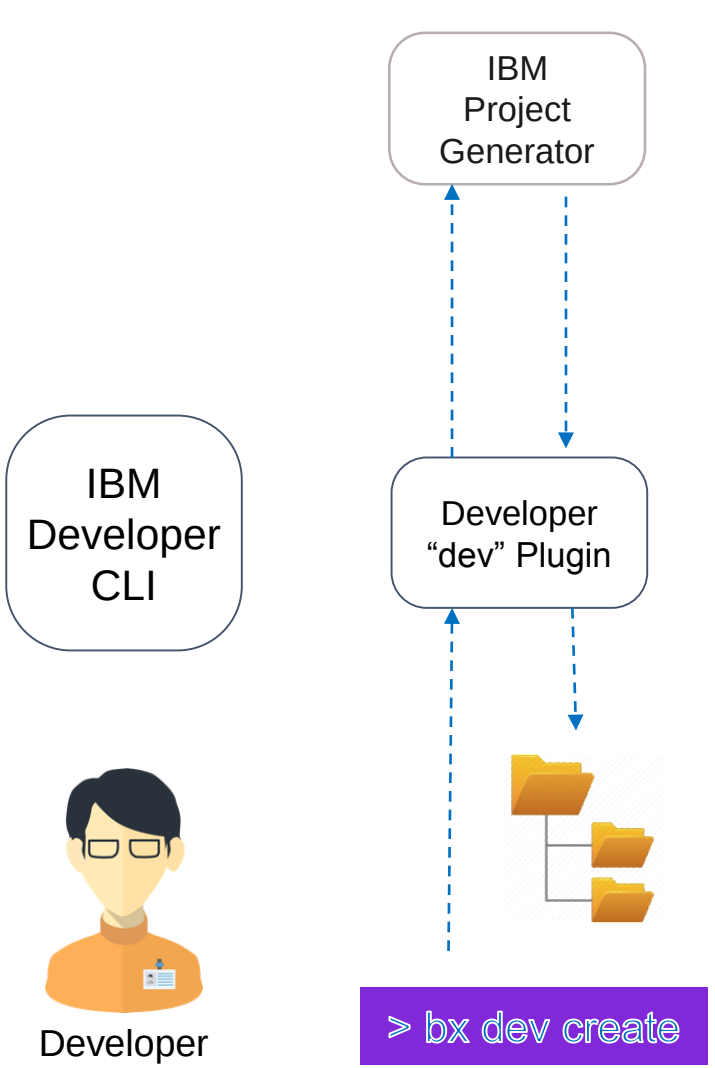
IBM Developer CLI:
create, run, test, deploy

Downloaded Projects

Application Patterns:

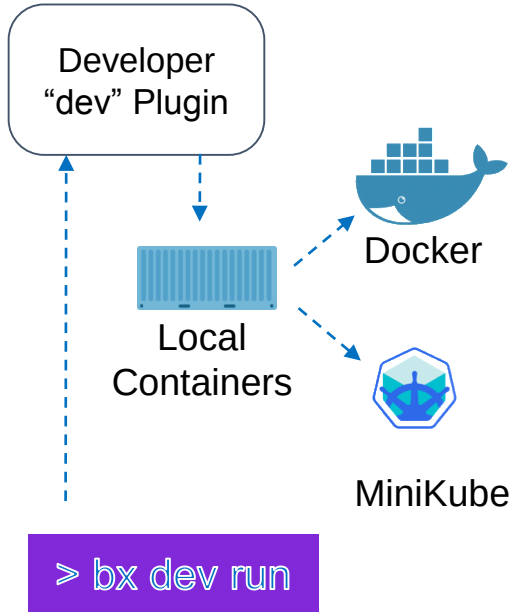
1) Web
2) Mobile
3) Backend-4-Frontend
4) Microservice

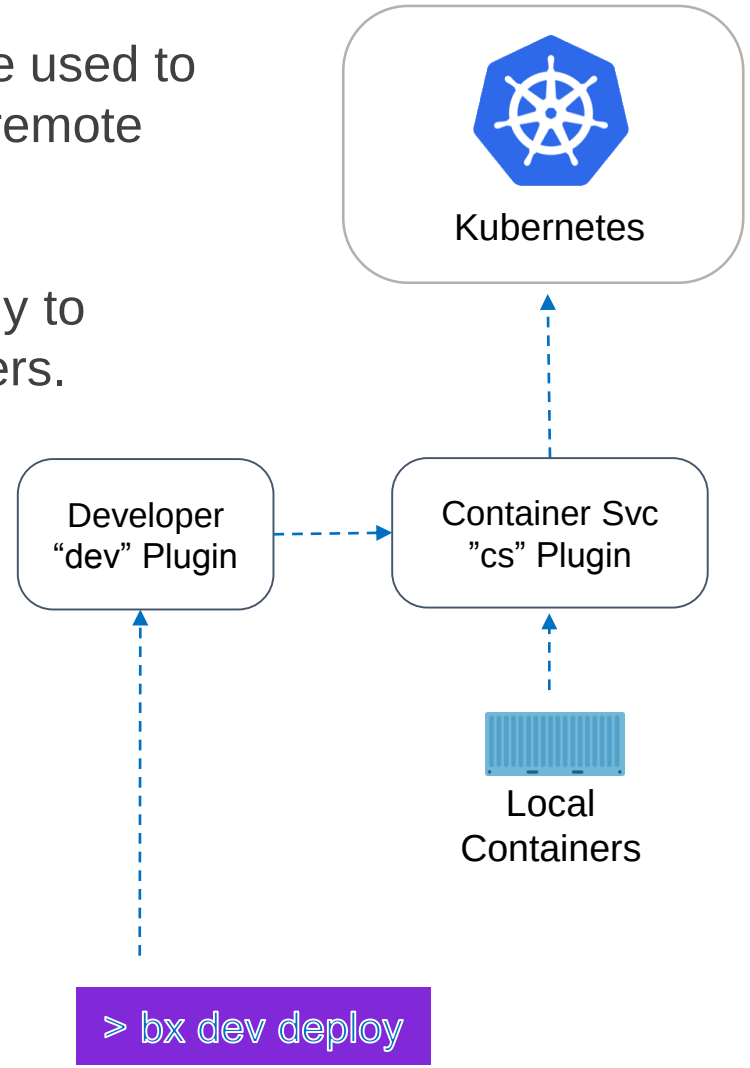
Developer CLI Workflow



In a basic environment Docker can be used to manage a single container, using all remote services.

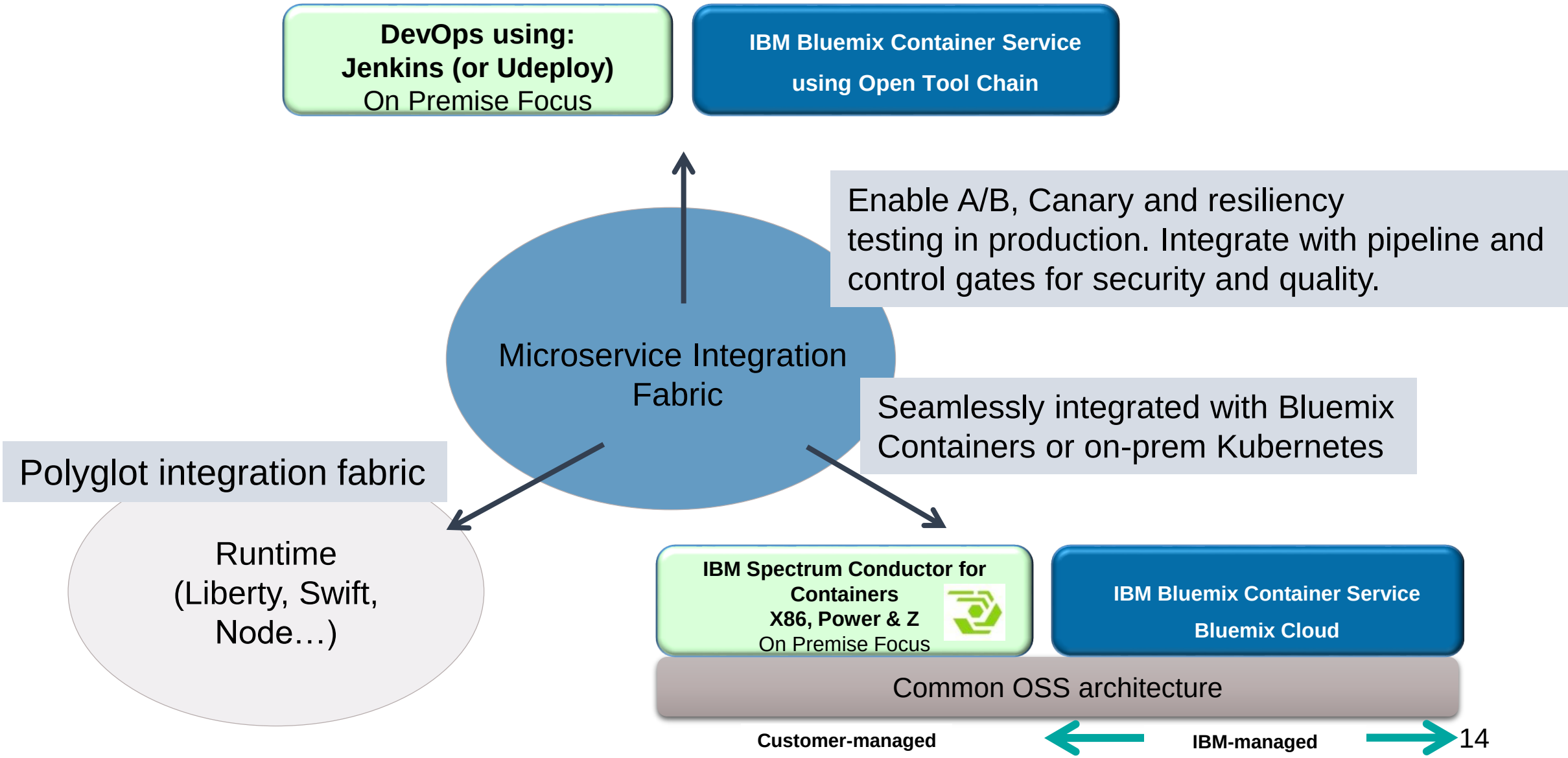
More realistically, use MiniKube locally to manage multiple interrelated containers.





Note: DevOps flow not shown

Cloud-native and Microservices Run Environments



IBM's approach: Providing a A Turnkey Solution to Build Microservices

Application

MicroProfile

Swift

node

Standardization of programming model for microservices

Dev Env

Dev Tools

Innovate through ease of connecting w/Watson & Connect Services

Fabric

elastic +

logstash +

kibana

Monitoring services for real-time visibility

Pipeline

urban{code} Deploy

Automation through IBM DevOps

On-Off premise

docker

kubernetes

collectives

IBM Spectrum Conductor

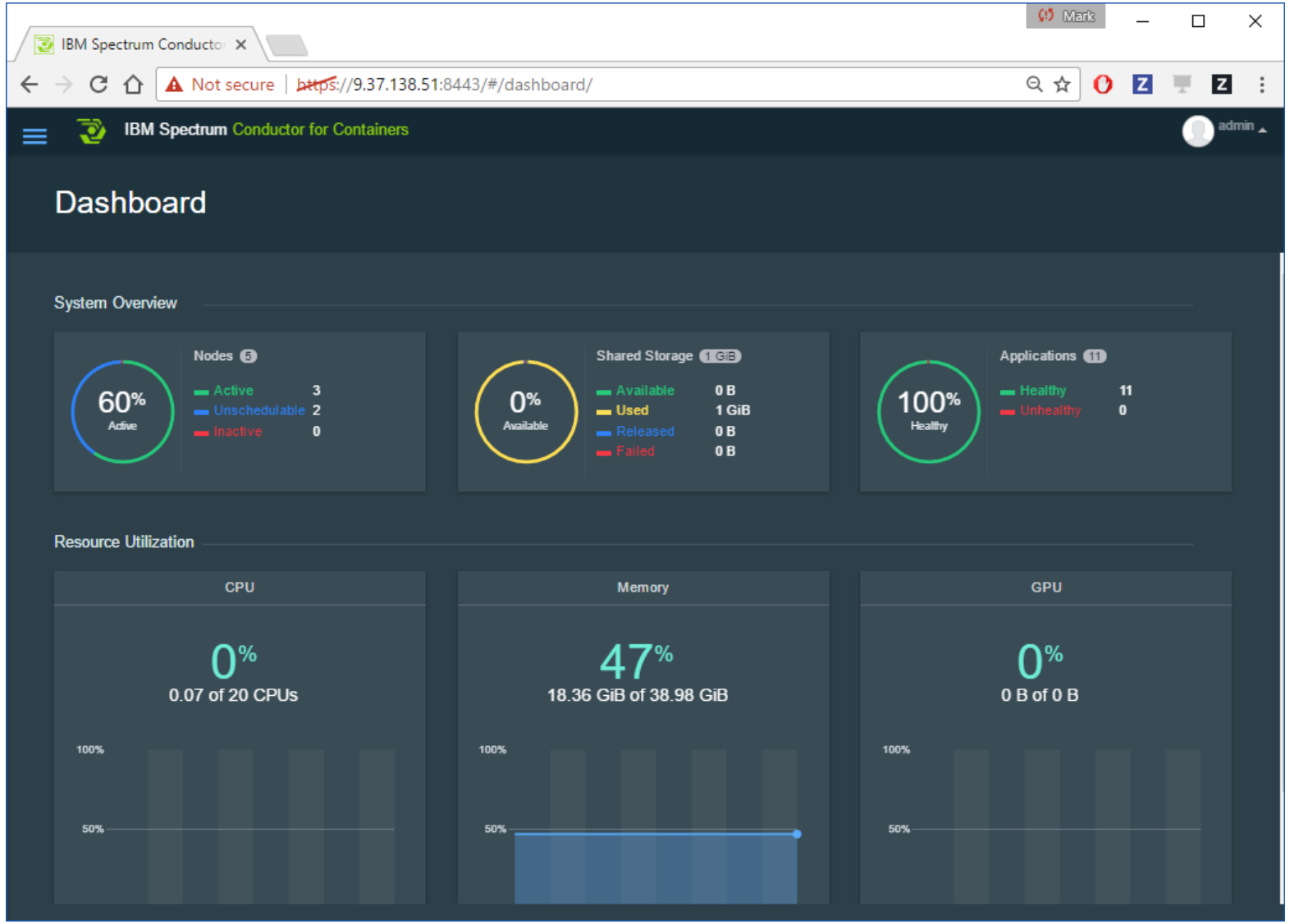
Virtualization through abstraction of service discovery & scaling across infra. service offerings

Business benefits:

1. **Frictionless application lifecycle** and user experience from **laptop through production**
2. **Accelerate software delivery** leveraging Continuous Delivery Pipeline
3. **Easily** connect existing assets with **Watson Cognitive services** to discover actionable insights
4. **Real-time diagnosis and resolution** of app infrastructure: minimizing downtime and maintaining SLAs
5. **Achieve cost optimization** in any cloud with **"seamless"** portability across popular cloud providers, public, dedicated, private, and hybrid

End-to-end user experience for development and deployment of Microservice and hybrid apps!

IBM Spectrum Conductor for Containers



App Center – currently Helm charts

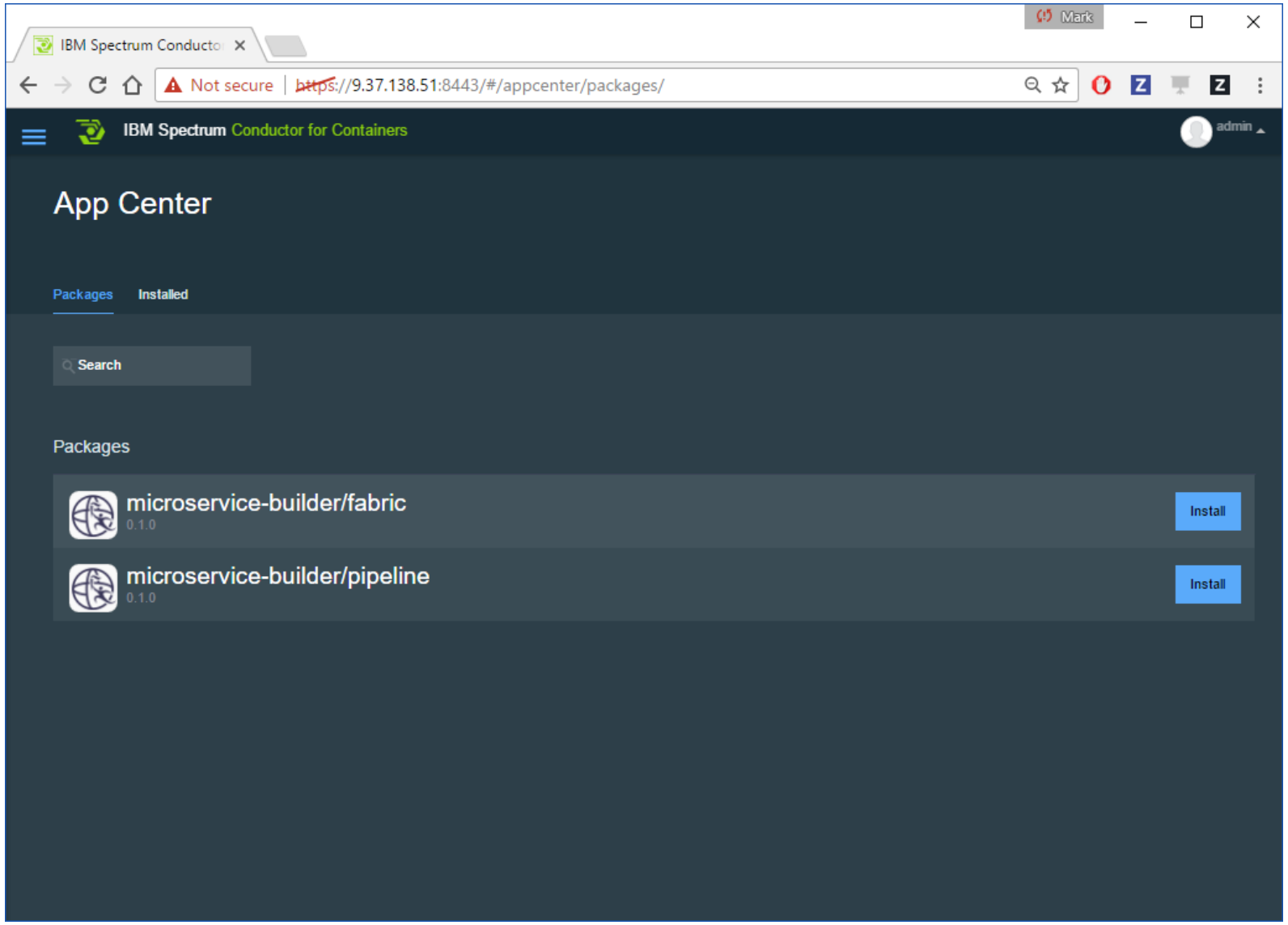
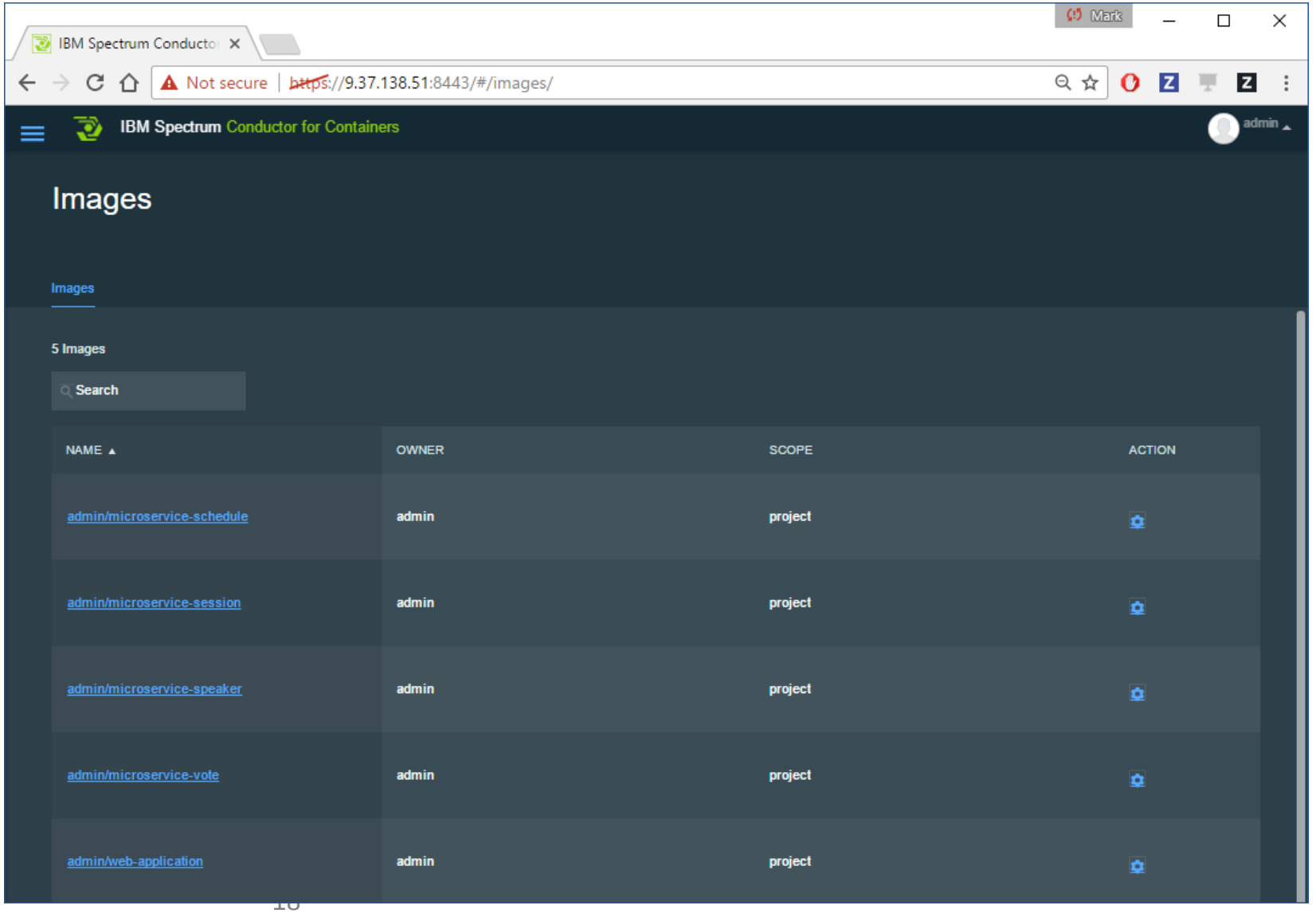
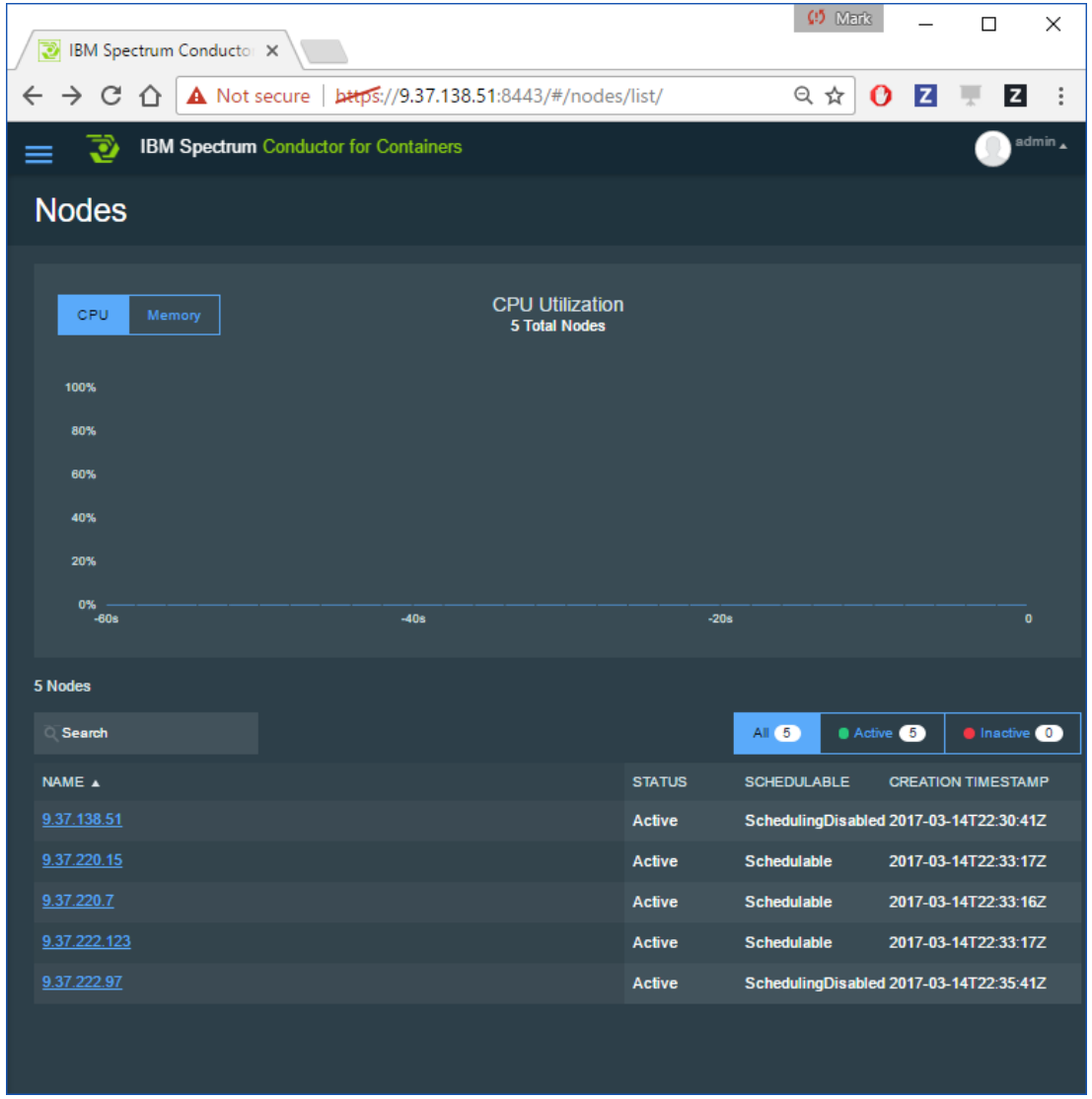


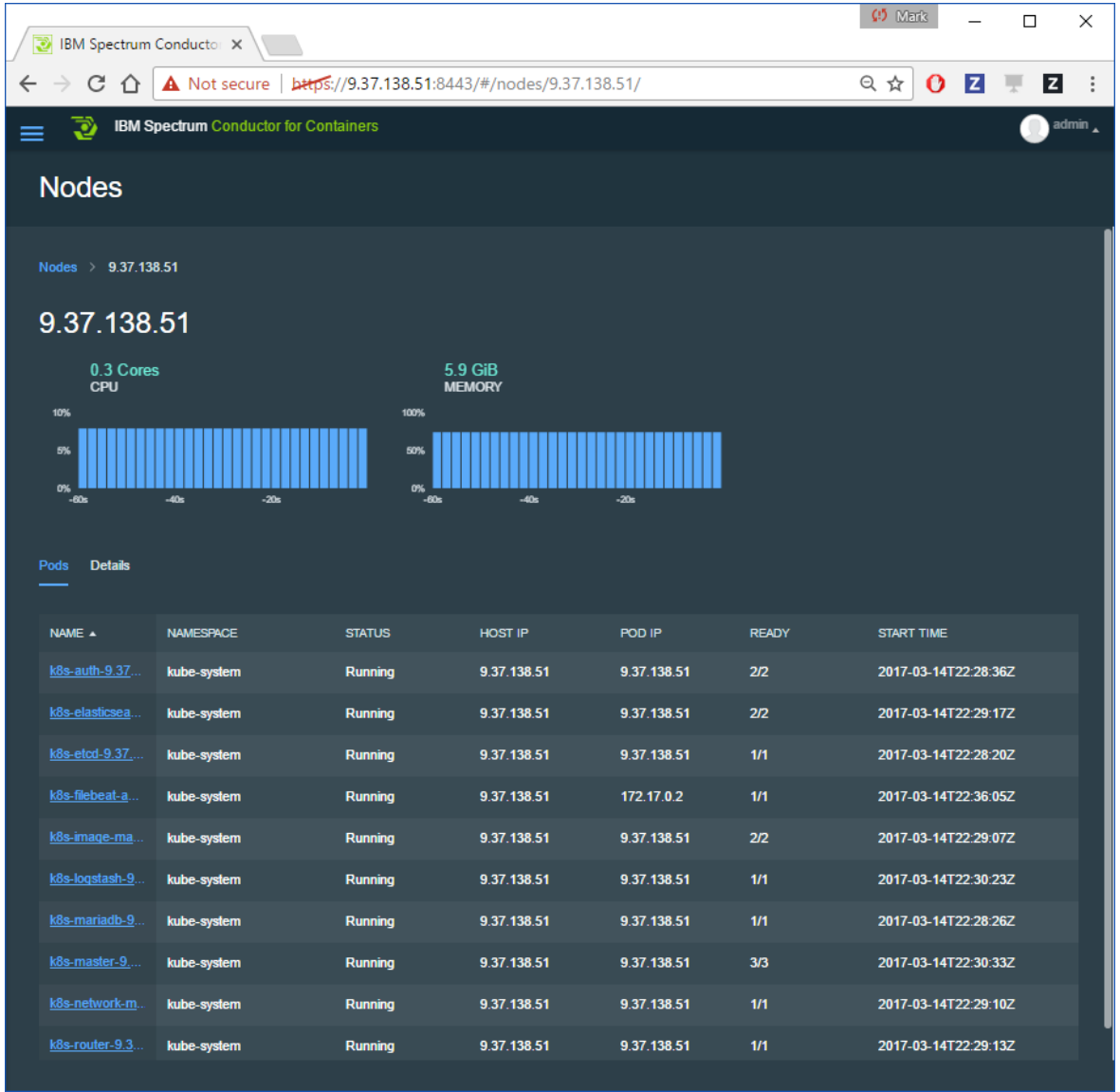
Image management



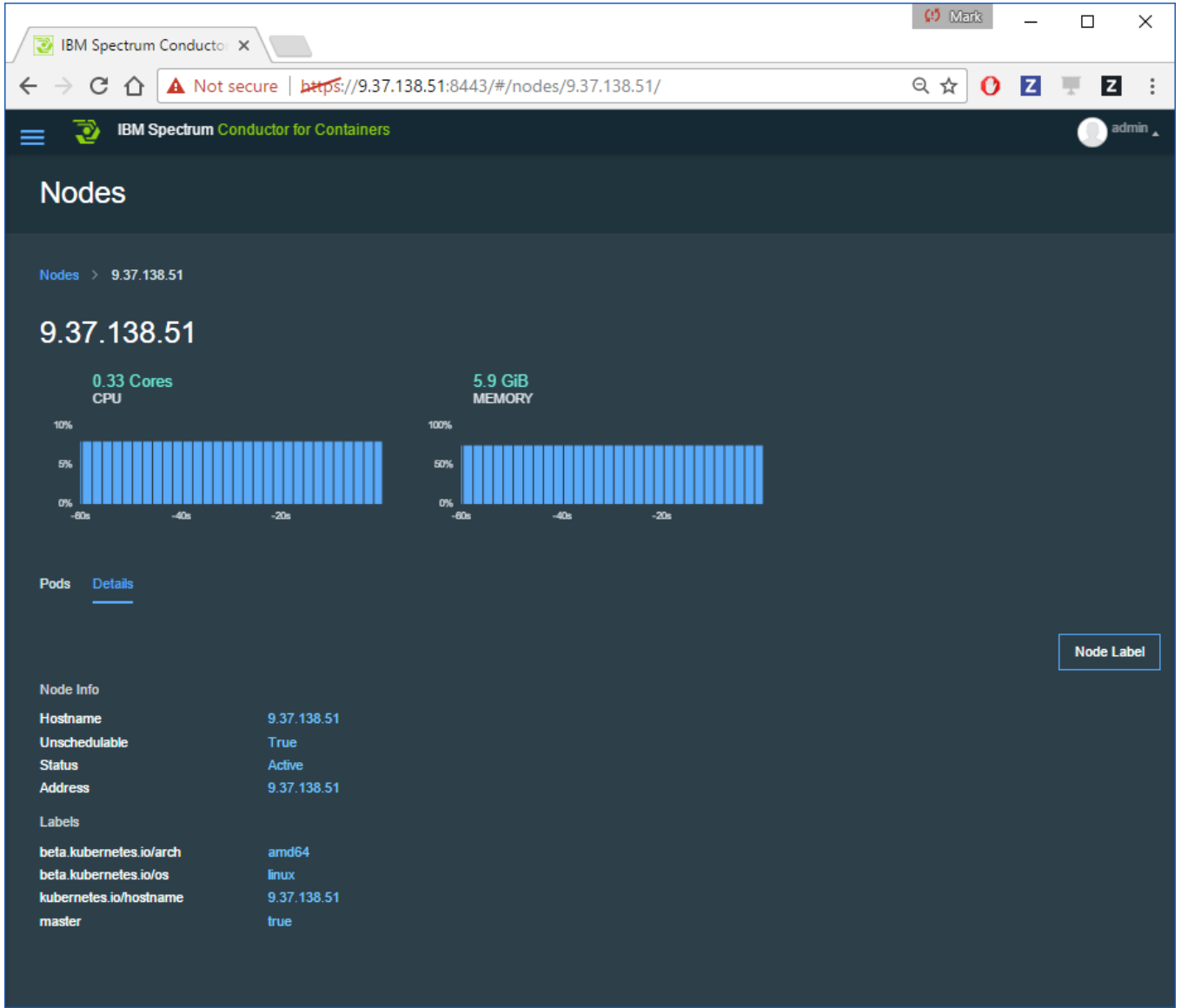
Node management



Pods on a node



Node details



On-Prem DevOps Pipeline

Deployed as Helm Chart

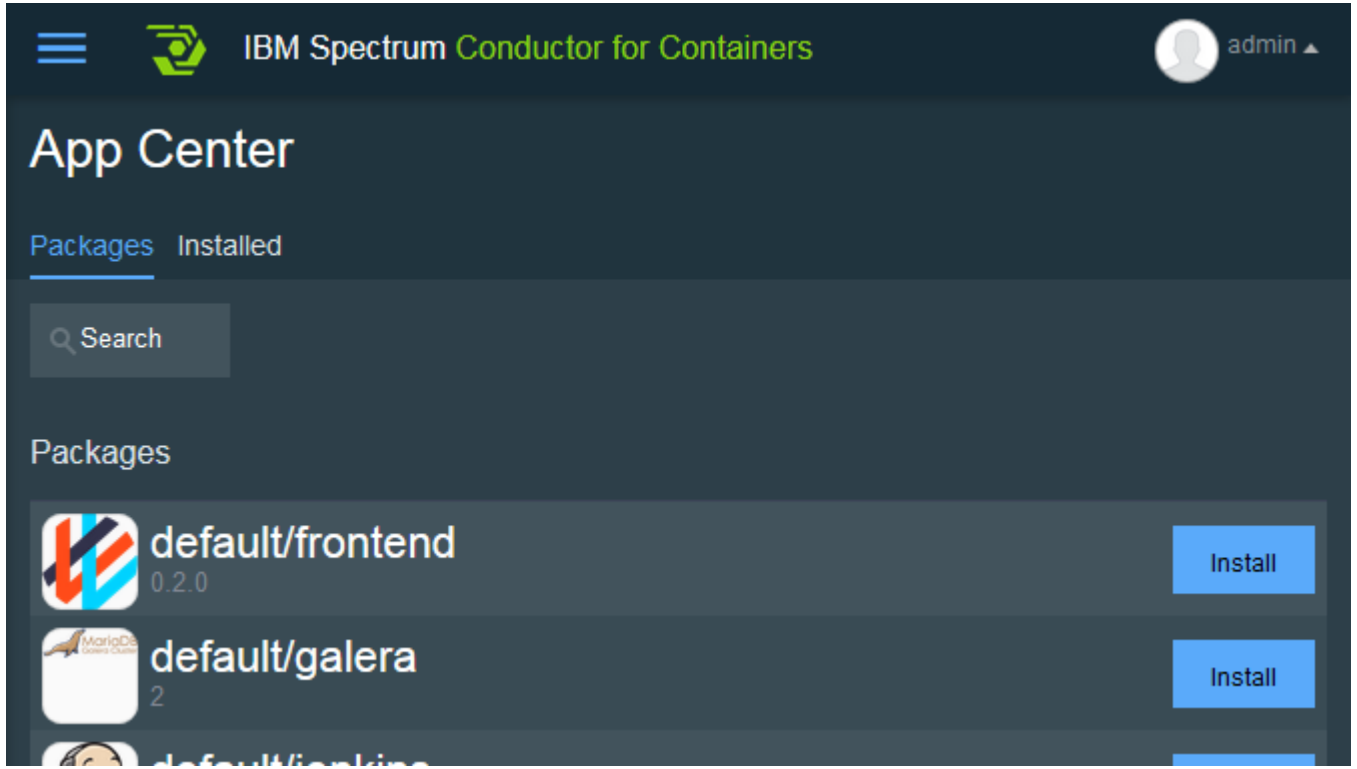
Deploy via Helm CLI or Conductor for Containers App Center

Required values:

- GitHub organization(s)
- GitHub OAuth User/Token
- GitHub App ID and Secret
- GitHub IDs for admin users
- Jenkins email address

Optionally:

- Regex for repositories



Pipeline – Deploy on Green

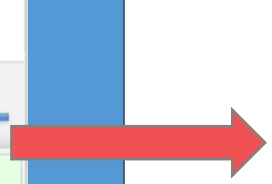
GitHub/GitHub Enterprise

- my-org
  - ▸ service-a
  - ▾ service-b
    - ▸ src
    - Dockerfile
    - Jenkinsfile
    - ▾ manifests
      - deploy.yaml
    - pom.xml

Jenkins

▸ my-org ▸ service-b ▸ master

Extract	Build	Test	Deploy
6s	1min 18s	27ms	902ms
6s	1min 18s	27ms	902ms



kubernetes

Pipeline – Gated Deployment

GitHub/GitHub Enterprise

- my-org
  - service-a
  - service-a-deploy
  - service-b
    - src
    - Dockerfile
    - Jenkinsfile
    - pom.xml
  - service-b-deploy
    - manifests
      - deploy.yaml
    - Jenkinsfile

Jenkins

▸ my-org ▸ service-b ▸ master

Extract	Build	Test	PushToRepo
6s	1min 18s	27ms	1s
6s	1min 18s	27ms	1s

▸ my-org ▸ service-b-deploy ▸ master

Extract	deployFromRepo
4s	902ms
4s	902ms

docker REGISTRY

kubernetes

Build Jenkinsfile

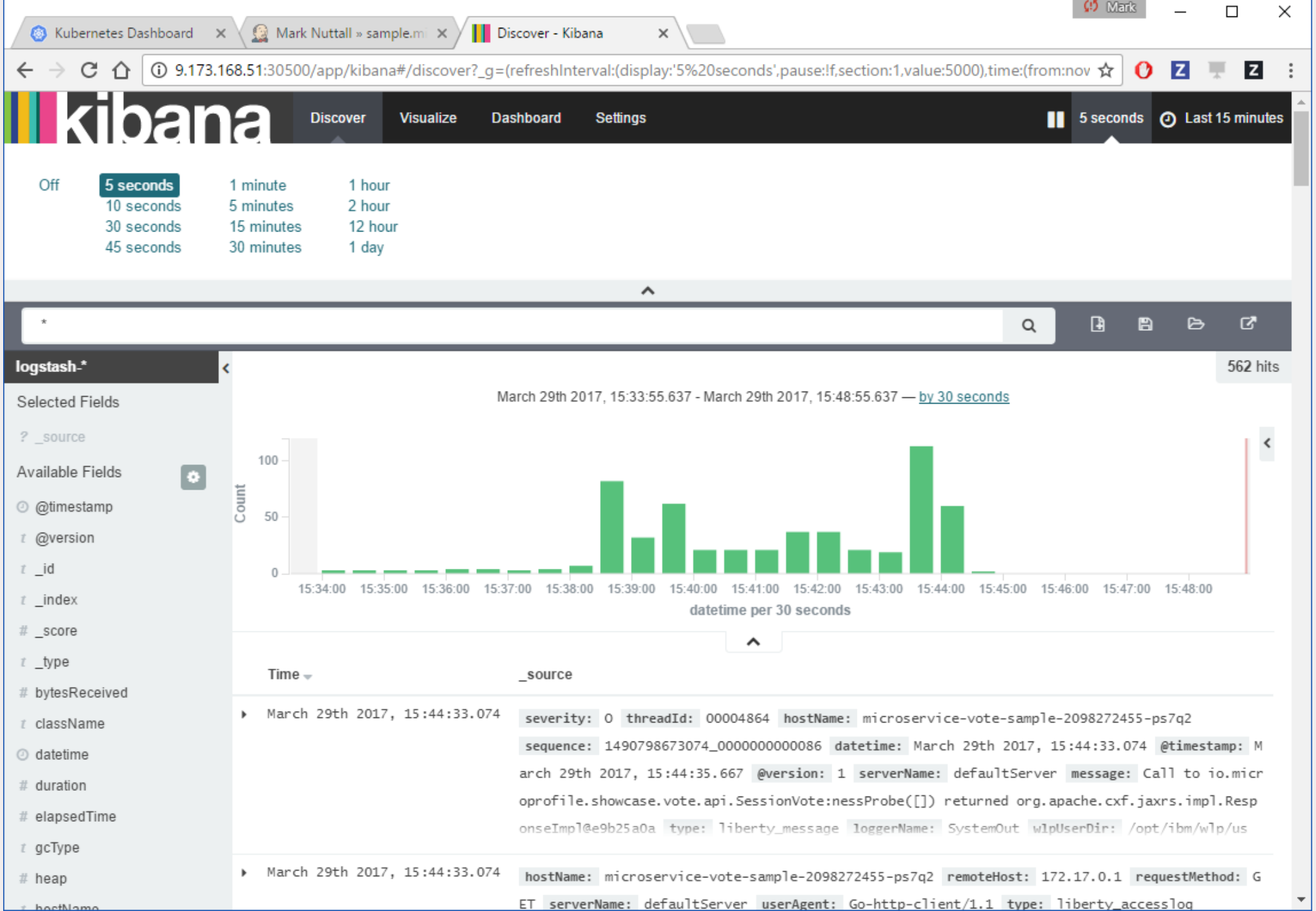
```
node('master') {
  def utils = load "/scripts/buildUtils.groovy"
  stage ('Extract') {
    checkout scm
  }
  stage ('Build') {
    utils.mavenBuild ('clean', 'package‘)
    utils.dockerBuild (‘back-end’)
  }
  stage ('PushToRepo') {
     utils.pushToRepo ('back-end')
   }
}
```

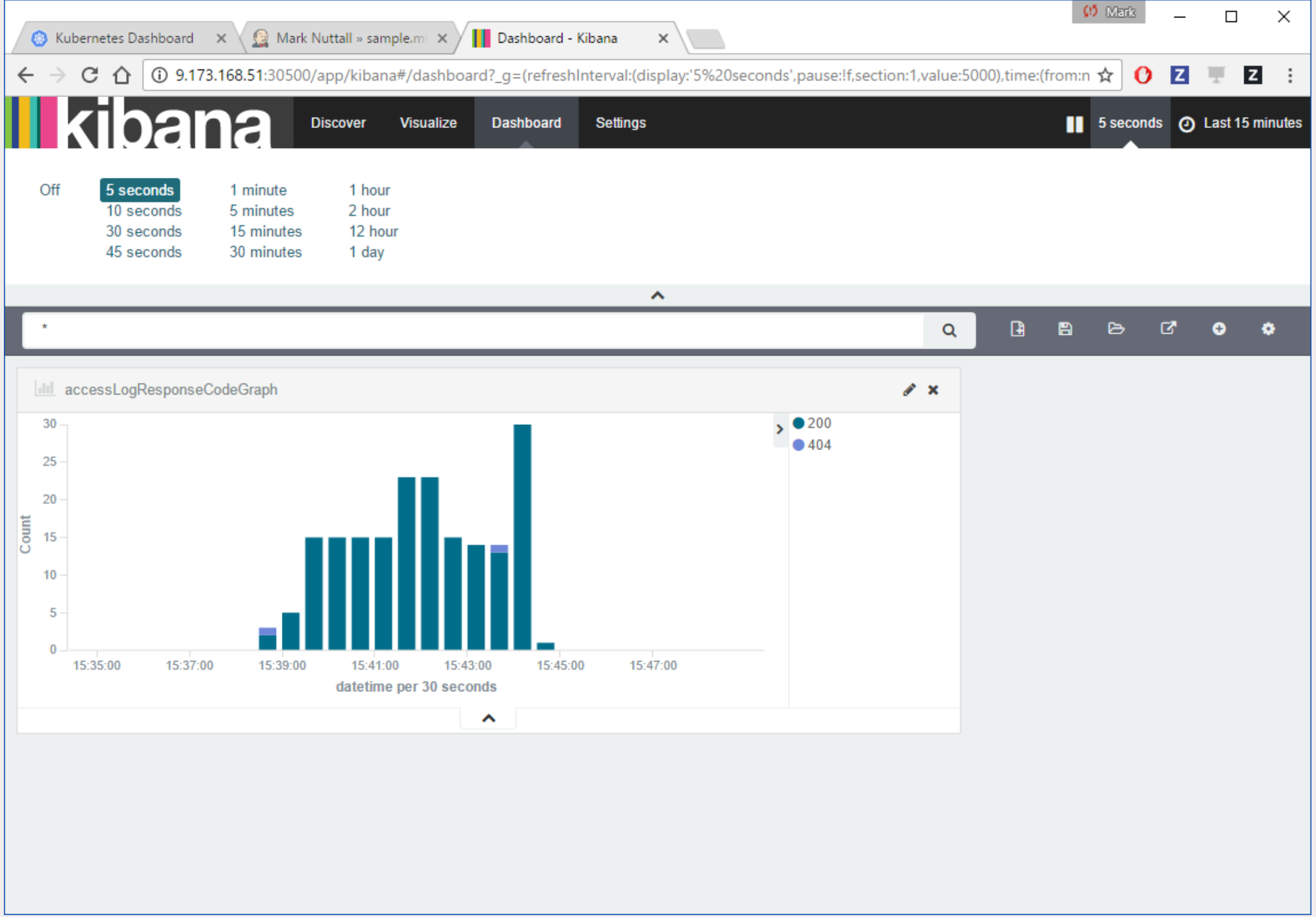
Deploy Jenkinsfile/YAML

```
node('master') {
def utils = load "/scripts/buildUtils.groovy"
  stage ('Extract') {
    checkout scm
  }
  stage ('deployFromRepo') {
    utils.deploy()
  }
}
```

```
spec:
    containers:
    - name: back-end
      image: registry/service:5e3e666
      ports:
        …
```

Demo


Kubernetes Dashboard
Mark Nuttall » sample.m
Discover - Kibana
9.173.168.51:30500/app/kibana#/discover?_g=(refreshInterval:(display:'5%20seconds',pause:!f,section:1,value:5000),time:(from:nov
kibana
Discover
Visualize
Dashboard
Settings
5 seconds
Last 15 minutes
Off
5 seconds
10 seconds
30 seconds
45 seconds
1 minute
5 minutes
15 minutes
30 minutes
1 hour
2 hour
12 hour
1 day
*
logstash-*
562 hits
Selected Fields
? _source
Available Fields
@timestamp
@version
_id
_index
_score
_type
bytesReceived
className
datetime
duration
elapsedTime
gcType
heap
March 29th 2017, 15:33:55.637 - March 29th 2017, 15:48:55.637 — by 30 seconds
Count
100
50
0
15:34:00
15:35:00
15:36:00
15:37:00
15:38:00
15:39:00
15:40:00
15:41:00
15:42:00
15:43:00
15:44:00
15:45:00
15:46:00
15:47:00
15:48:00
datetime per 30 seconds
Time
_source
March 29th 2017, 15:44:33.074
severity: 0 threadId: 00004864 hostName: microservice-vote-sample-2098272455-ps7q2
sequence: 1490798673074_0000000000086 datetime: March 29th 2017, 15:44:33.074 @timestamp: M
arch 29th 2017, 15:44:35.667 @version: 1 serverName: defaultServer message: Call to io.micr
oprofile.showcase.vote.api.SessionVote:nessProbe([]) returned org.apache.cxf.jaxrs.impl.Resp
onseImpl@e9b25a0a type: liberty_message loggerName: SystemOut wlpUserDir: /opt/ibm/wlp/us
March 29th 2017, 15:44:33.074
hostName: microservice-vote-sample-2098272455-ps7q2 remoteHost: 172.17.0.1 requestMethod: G
ET serverName: defaultServer userAgent: Go-http-client/1.1 type: liberty_accesslog


Kubernetes Dashboard
Mark Nuttall » sample.m
Dashboard - Kibana
Mark
9.173.168.51:30500/app/kibana#/dashboard?_g=(refreshInterval:(display:'5%20seconds',pause:!f,section:1,value:5000),time:(from:n
kibana
Discover
Visualize
Dashboard
Settings
5 seconds
Last 15 minutes
Off
5 seconds
10 seconds
30 seconds
45 seconds
1 minute
5 minutes
15 minutes
30 minutes
1 hour
2 hour
12 hour
1 day
*
accessLogResponseCodeGraph
200
404
Count
30
25
20
15
10
5
0
15:35:00
15:37:00
15:39:00
15:41:00
15:43:00
15:45:00
15:47:00
datetime per 30 seconds

kibana

Discover | Visualize | Dashboard | Settings

5 seconds | Last 15 minutes

Liberty-K4-20160216

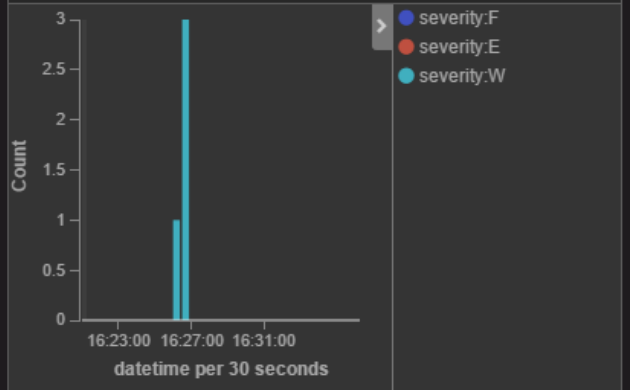
*

serversTable

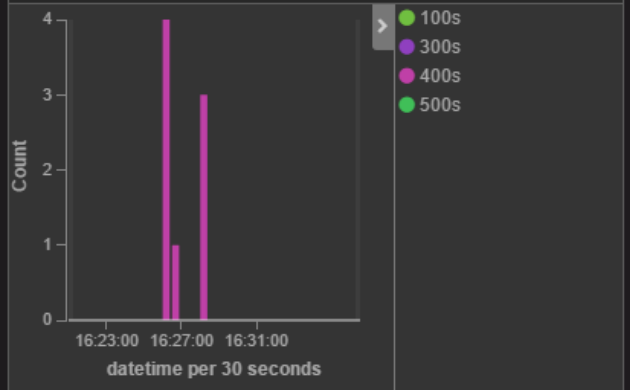
hostName: Descending	wlpUserDir: Descending	serverName: Descending	Count
microservice-test-deployment-2554010453-m6vfh	/opt/ibm/wlp/usr/	defaultServer	216
microservice-vote-sample-2098272455-r2jbd	/opt/ibm/wlp/usr/	defaultServer	193
microservice-schedule-sample-283123513-9wjkv	/opt/ibm/wlp/usr/	defaultServer	160
microservice-speaker-sample-3539148118-swpt6	/opt/ibm/wlp/usr/	defaultServer	127

accessLogServersPie

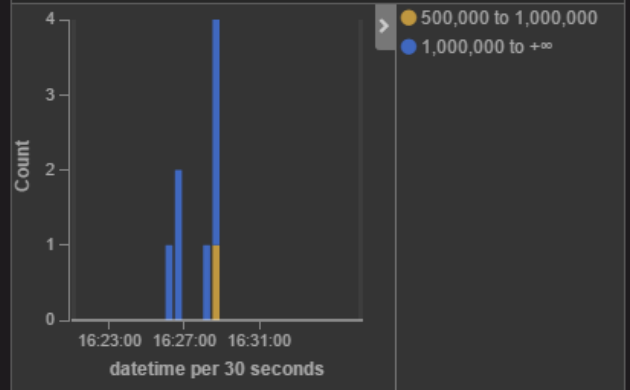
hotMessages



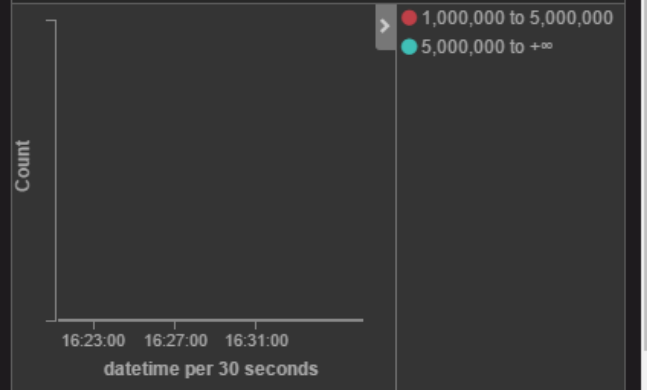
hotResponseCodes



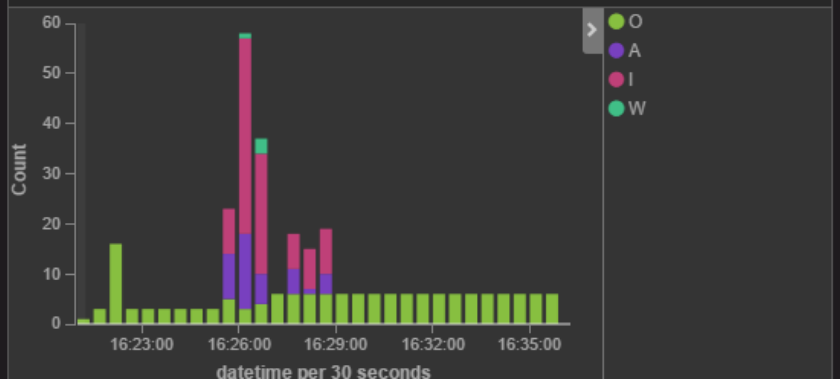
slowHits



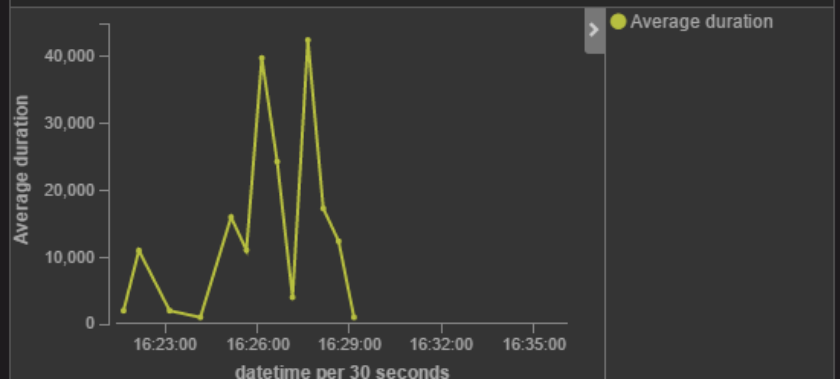
slowGC



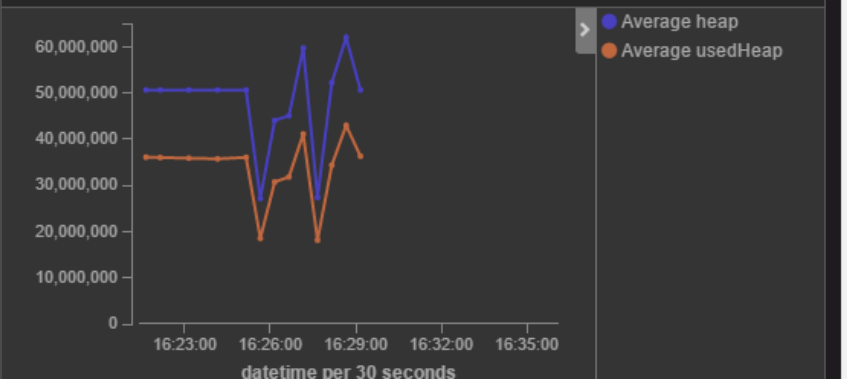
messageGraph



gcDuration

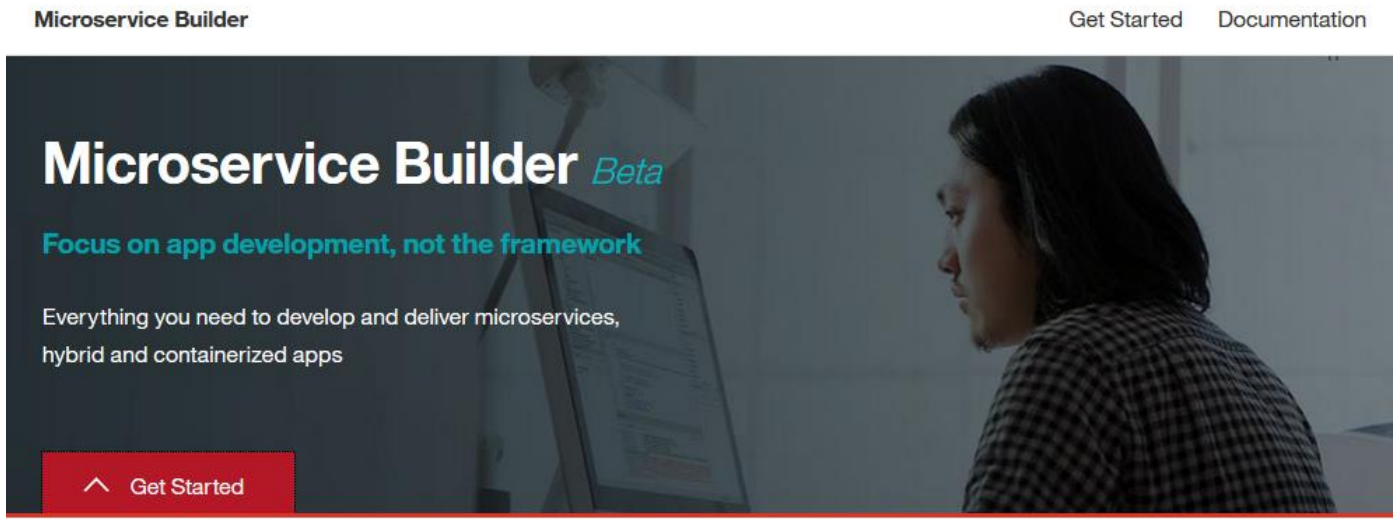


gcHeap



Microservice Builder (Beta)

End-to-End user experience to develop and deliver microservices, hybrid and containerized apps



Innovate with

SPEED

In 3 steps

Create and Run your microservices, hybrid and containerized apps

1. Download and Install
2. Create and Code
3. Run and Deploy

Set up your environment, fabric and DevOps pipeline in

Minutes

https://developer.ibm.com/microservice-builder

Questions?

Summary

Introducing Microservice Builder (Beta)

On-Prem DevOps Pipeline

Demo

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