THANK YOU FOR JOINING

we will start in a few minutes...

IBM Startup & Developer Program Lead

IBM **Developer**

IBM Alpha Zone accelerator

IBM Alpha Zone Accelerator
https://www.ibmalphazone.com/registration/

IBM Alpha Zone accelerator

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Digital Health. London

UK Israel Tech HUB

DANGOOR EDUCATION

Join the IBM startup accelerator!

***** Application for IBM Alpha Zone is designated for Israeli startups only. *****

Click here for more details about the program

Asterisks (*) indicate required fields. Please use English only.

Who are the founders?

Founder:

First Name *

Last Name *

Email *

LinkedIn*

Role *

Cell Phone*

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Hadassah Accelerator
https://www.ibmalphazone.com/hadassahaccelerator/

Startup & Developer – IBM Israel

Kubernetes 102 Kubectl

Jaffa Sztejnbok
Developer Advocate, IBM

jaffas@il.ibm.com

IBM **Developer**

IBM

Presentation and Lab

https://github.com/jaffaszt/jaffa-kubernetes102

Cloud-native development is an approach to building and running applications that exploits the advantages of the cloud computing delivery model. The Cloud Native Computing Foundation (CNFC) talks about using "… an open source software stack to deploy applications as microservices, packaging each part into its own container, and dynamically orchestrating those containers to optimize resource utilization. Cloud native technologies enable software developers to build great products faster." (CNCF, 2019)

CLOUD NATIVE
COMPUTING FOUNDATION

Cloud Native Development

CNCF Cloud Native Landscape
2020-05-05T22:49:53Z 8a2f76a

Overwhelmed? Please see the CNCF Trail Map. That and the interactive landscape are at l.cncf.io

Greyed logos are not open source

kubernetes

Database

Streaming & Messaging

Application Definition & Image Build

Continuous Integration & Delivery

Platform

Observability and Analysis

Monitoring

Logging

Tracing

Chaos Engineering

App Definition and Development

Scheduling & Orchestration

Coordination & Service Discovery

Remote Procedure Call

Orchestration & Management

Cloud Native Storage

Runtime

Automation & Configuration

Container Registry

Security & Compliance

Key Management

Provisioning

PaaS/Container Service

Kubernetes Certified Service Provider

Kubernetes Training Partner

Special

CLOUD NATIVE Landscape

CLOUD NATIVE COMPUTING FOUNDATION

Redpoint Amplify

l.cncf.io

This landscape is intended as a map through the previously uncharted terrain of cloud native technologies. There are many routes to deploying a cloud native application, with CNCF Projects representing a particularly well-traveled path.

Cloud — Open

Containers

docker

MRSU 008 059 5
22G1
MAX. GROSS
TARE WT.
PAYLOAD
CUBE
MAERSK

What is a container?

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.

Deb
The Developer

- Package apps with all dependencies
- Deploy to any environment in seconds
- Easily accessed and shared

Worries about what's « **inside** » the container

Mike
The Ops Guy

- Application processes on a shared kernel
- Simpler, lighter, and denser than VMs
- Portable across different environments

Worries about what's « **outside** » the container

VMs vs Containers

- VMs are a better choice for running apps that require all of the operating system's resources and functionality when you need to run multiple applications on servers or have a wide variety of operating systems to manage.
- Containers are a better choice when your biggest priority is maximizing the number of applications running on a minimal number of servers.

VMs	Containers
Heavyweight	Lightweight
Limited performance	Native performance
Each VM runs in its own OS	All containers share the host OS
Hardware-level virtualization	OS virtualization
Startup time in minutes	Startup time in milliseconds
Allocates required memory	Requires less memory space
Fully isolated and hence more secure	Process-level isolation, possibly less secure

Advantages of containers

- Consistency
- Agility
- Portability
- Efficiency
- DevOps
- Microservices
- Ecosystem

Basic deployment process

Orchestration

A few containers are manageable but…

> docker run myApp

But when we scale...

Intelligent Scheduling

Self-healing

Horizontal scaling

Service discovery & load balancing

Automated rollouts and rollbacks

Secret and configuration management

https://www.theregister.com/2020/03/09/monzo_microservices/

Welcome to Kubernetes

Intelligent Deployment

Auto repair (*Self-healing*)

Horizontal scaling

Service discovery and load balancing

Automation deployments and rollback

Key Management (Secret) and configuration

Other Orchestrators

What is Kubernetes?

At its core, Kubernetes is a database (etcd).
With "watchers" & "controllers" that react to changes in the DB.
The controllers are what make it Kubernetes.
This pluggability and extensibility is part of its "secret sauce".

DB represents the user's desired state
Watchers attempt to make reality match the desired state

"API Server" is the HTTP/REST front-end to the DB

More on controllers later...

Kubernetes architecture

Workers Nodes. They are machines (virtual, physical, etc.) that run your applications and workflows. The Kubernetes master controls each node.

Master Node. Responsible for maintaining the desired state of your cluster. Collection of processes that manage the state of the cluster. Typically these processes all run on a single node although it may be replicated for reasons of availability and redundancy.

https://kubernetes.io/es/docs/concepts/

An application in Kubernetes

https://kubernetes.io/docs/tutorials/kubernetes-basics/explore/explore-intro/

Kubernetes resource model

- A resource for every purpose

Config Maps
Daemon Sets
Deployments
Events
Endpoints
Ingress
Jobs
Nodes
Namespaces
Pods
Persistent Volumes
Replica Sets
Secrets
Service Accounts
Services
Stateful Sets, and more...

Kubernetes aims to have the building blocks on which you build a cloud native platform.

Therefore, the internal resource model **is** the same as the end user resource model.

<u>Key Resources</u>

Pod: set of co-located containers

- Smallest unit of deployment
- Several types of resources to help manage them
- **Replica Sets, Deployments**, Stateful Sets, ...

Services

- Define how to expose your app as a DNS entry
- Query based selector to choose which pods apply

Components of Kubernetes

https://medium.com/containermind/a-beginners-guide-to-kubernetes-7e8ca56420b6

Kubernetes Architecture: How apps are accessed

Pod

- Smallest deployment unit – runs containers
- Each pod has its own IP
- Shares a PID namespace, network, and hostname

Service

- Collection of pods exposed as an endpoint
  - state and networking info propagated to all worker nodes
- Types of service exposure
  - ClusterIP – Exposes cluster-internal IP
  - NodePort – Exposes the service on each Node's IP at a static port
  - LoadBalancer – Exposes externally using a cloud provider's load balancer
  - ExternalName – Maps to an external name (such as foo.bar.example.com)

Kubernetes in Action – Deployment

guestbook-deployment.yaml

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: guestbook-v1
  labels:
    app: guestbook
    version: "1.0"
spec:
  replicas: 3
  selector:
    matchLabels:
      app: guestbook
  template:
    metadata:
      labels:
        app: guestbook
        version: "1.0"
    spec:
      containers:
      - name: guestbook
        image: ibmcom/guestbook:v1
        ports:
        - name: http-server
          containerPort: 3000
```

Replica set
Number of Pod

Container
image

Listening to
port

Kubernetes in Action – Deployment

```
~/o/guestbook/v1  master  kubectl create -f guestbook-deployment.yaml
deployment.apps/guestbook-v1 created

~/o/guestbook/v1  master  kubectl get pods -l app=guestbook
NAME                              READY   STATUS    RESTARTS   AGE
guestbook-v1-98dd9c654-27jdm      1/1     Running   0          16s
guestbook-v1-98dd9c654-tlw6x      1/1     Running   0          16s
guestbook-v1-98dd9c654-xn46l      1/1     Running   0          16s
```

Kubernetes in Action – Service

guestbook-service.yaml

```yaml
apiVersion: v1
kind: Service
metadata:
  name: guestbook
  labels:
    app: guestbook
spec:
  ports:
  - port: 3000
    targetPort: http-server
  selector:
    app: guestbook
  type: LoadBalancer
```

Trafic in

Kubernetes in Action – Service

```
~/o/guestbook/v1  master  kubectl create -f guestbook-service.yaml
service/guestbook created

~/o/guestbook/v1  master  kubectl get svc
NAME        TYPE           CLUSTER-IP       EXTERNAL-IP    PORT(S)          AGE
guestbook   LoadBalancer   172.21.149.120   5.10.123.234   3000:32159/TCP   66s
```

Kubernetes in Action – Service

Kubernetes in Action – Deployment

Red Hat OpenShift

What is Red Hat OpenShift?

Red Hat OpenShift is Kubernetes for business, in Hybrid Cloud mode.

How Do We Deliver OpenShift?

- OKD (Origin Community Distribution)
- github.com/openshift/origin
- 30,872 commits, 364 contributors

okd → RED HAT® OPENSHIFT Container Platform

- Community Distribution of Kubernetes
- 100+ Integrations
- Align time with OSS trunk
- Integrate OSS projects
- Partner integration platform
- No-cost validations for innovation

IBM Cloud Registration and OpenShift Openlabs

OPENSHIFT

Presentation and Lab

https://github.com/jaffaszt/jaffa-kubernetes102

… and access a wide catalog of services

Service Type

IBM Service

Third Party Service

Status

New Service (2019)

Service Refresh (2019) *(Plan Add)*

AI

Watson Assistant
Watson Studio
Compare and Comply
Discovery
Knowledge Catalog
Knowledge Studio
Language Translator
Machine Learning
Natural Language Classifier
Natural Language Understanding
Personality Insights
Speech to Text
Text to Speech
Tone Analyzer
Visual Recognition
Voice Agent with Watson
Watson OpenScale
PowerAI

Analytics

Analytics Engine
DB2 Warehouse on Cloud
IBM Cognos Dashboard
Master Data Management
SQL Query
Streaming Analytics
Weather Company Data
AccountScore

Security & Identity

App ID
Certificate Manager
Cloud HSM
FortiGate Security Appliance
Hardware Firewall
Hardware Firewall (Dedicated)
Hyper Protect Crypto Services
Hyper Protect Virtual Servers
Internet Services
Key Protect
Security Advisor
SSL Certificates
Contrast Security
FusionAuth
Twilio Authy
Twilio Verify

Dev Tools

Availability Monitoring
Continuous Delivery
DevOps Insights
Cloud Event Management
Globalization Pipeline
Monitoring
Schematics
Toolchain
IBM Cloud Activity Tracker with LogDNA
IBM Cloud Monitoring with Sysdlg
IBM Log Analysis with LogDNA
Pager Duty

VPC

Block Storage for VPC
Load Balancer for VPC
Virtual Private Cloud
Virtual Server for VPC
VPN for VPC

Web & Mobile

Mobile Foundation
Push Notifications
Email Delivery, powered by Sendgrid
Bitbar Testing Cloud
Esri ArcGIS for Developers
Nexmo
Phunware Location Based Services
Phunware Mobile Marketing Automation
SPLICE Pre-CAT Insurance Notifications
Telstra Messaging API
Twilio Programmable SMS
Twilio Programmable Video
Twilio Programmable Voice

Web & App

Apache Spark
Consult with IBM Garage
Information Server
Managed Financial Data API
Simulated Instruments Analytics API
Accern-API
Network ACL for VPC
Subnet for VPC
Alloy
Bondevalue-API
CloudAMQP
Difitek
Dwolla
ElephantSQL
Envestnet | Yodlee
FundingShield – Wire Accounts
Verification Service (WAVS)
HazardHub Property Risk Data API
Health Score
Hydrogen
Morningstar
Natural Language Generation APIs
Payeezy
Plaid
Powerlytics Behavior/Propensity Model API
Powerlytics Consumer Income API
Powerlytics Investable Assets & Wealth API
Quovo
Rainbow
RelSci
Risk Engine
SizeUp Small Business Intelligence
Strands Business Financial Management
Totum Risk
TradeIt
uCloud Multitenant Core Platform for VMWare
WealthEngine API
Xignite Market Data APIs
Ylabs

IoT

IoT Platform
Weather Company Data
AT&T Flow Designer
AT&T IoT Data Plans
Bosch IoT Rollouts
Car Diagnostic API
Precision Location
Unification Engine

Starter Kits

Custom Vision Model for Core ML with Watson
Internet of Things Platform Starter
Java Microservice with MicroProfile and Java EE
Java Microservice with Spring
Java Web App with Spring
Mobile Basic
Node.js Microservice with Express.js
Node.js Web App with Express.js
Python Microservice Flask
Python Web App with Django
Python Web App with Flask
Watson Assistant Basic
Watson Natural Language Understanding Basic
Watson Visual Recognition Basic
Node-RED Starter

Databases

Blockchain Platform
Cloudant
Databases for PostgreSQL
Databases for Redis
Databases for Elasticsearch
Databases for MongoDB
Messages for RabbitMQ
Databases for etcd
Compose Enterprise
Compose for RethinkDB
Db2
Db2 Hosted
Db2 Warehouse
Hyper Protect DBaaS for Mongo DB
Hyper Protect DBaaS for PostgreSQL
Informix
SQL Query
GEO Web Services
InfluxCloud

Storage

Block Storage
Block Storage for VPC
File Storage
IBM Cloud Backup
Object Storage
OSNEXUS Software Defined Storage for Bare Metal
Actifio GO
box

Network

Load Balancers
Content Delivery Network
Direct Link Connect
Direct Link Dedicated
Direct Link Dedicated Hosting
Direct Link Exchange
Domain Name Service
FortiGate Security Appliance
Gateway Appliance
Internet Services
IPSec VPN
Load Balancer for VPC
Subnets/IPs
Virtual Private Cloud
VLAN
VPN for VPC

Integration

API Connect
APP Connect
Lift CLI
MQ
Secure Gateway
Rocket Mainframe Data
SPLICE PRE-Cat Insurance
Notifications

Compute

Bare Metal Server
Cloud Foundry Enterprise Environment
HPCaaS from Rescale
Power System Virtual Server
Virtual Server
Virtual Server for VPC
WebSphere Application Sever
VMware vCenter Server on IBM Cloud
VMware vSphere on IBM Cloud
NetApp ONTAP Select
Single-node Trial for Migration and App Modernization
Single-node Trial for Data Protection & Disaster Recovery
Caveon RiskForesight on IBM Cloud
F5 on IBM Cloud
FortiGate Security Appliance on IBM Cloud
FortiGate Virtual Appliance on IBM Cloud
HCX on IBM Cloud
HyTrust CloudControl on IBM Cloud
HyTrust CloudControl on IBM Cloud
HyTrust DataControl on IBM Cloud
HyTrust KeyControl on IBM Cloud
IBM Cloud Private Hosted
IBM Cloud Secure Virtualization
IBM SPECTRUM Protect Plus on IBM Cloud
KMIP for VMware on IBM Cloud
Veeam Availability Suite for Virtual Server
Veeam on IBM Cloud
VMware vRealize Operations and vRealize Log Insight on IBM Cloud
Mission Critical VMWare on IBM Cloud
Managed Services from IMI
Managed Services for Veeam on IBM Cloud
Managed Services for Zerto on IBM Cloud
IBM Cloud Backup
OSNEXUS Software Defined Storage for Bare Metal
Plesk Onyx Linux
Unlimited for Virtual Server
Red Hat Enterprise Linux OS for Virtual Server
Liberty for Java
SDK for Node.js
ASP.NET Core
Runtime for Swift
Go
PHP
Python
Ruby
Tomcat
Red Hat OpenShift Cluster
Kubernetes Service
Container Registry