SIGCONNECT
Higher Education Conference

Contain Your ERP

Leveraging Container Technologies to Optimize IT Operations

Gabriel Tocci

Housekeeping

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@SIGCorpLive

Gabriel Tocci
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> whoami

Gabriel Tocci

Senior DBA/Certified Cloud Architect

Focused on application of Cloud and Container Technologies

- Cloud Migration
- Cloud Optimization
- Containerization

Certified Cloud Solutions Architect

- Amazon Web Services (AWS)
- Oracle Cloud Infrastructure (OCI)

Senior Banner Admin and DBA

- Banner ERP Implementations
- Banner Product Implementations and Upgrades
- Oracle Upgrades

Diverse IT Background

- Senior Software Engineer
- Systems Administrator (windows and Linux)
- Networking / Information Security
- BS and MS in Computer Science

Presentation Summary

Containerization Overview

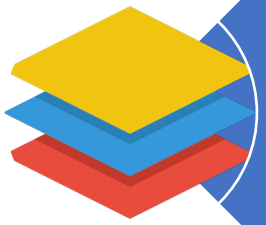
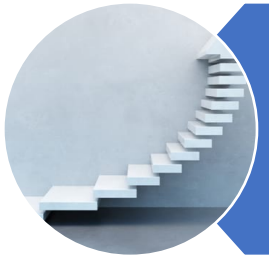
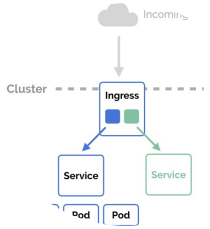


Image Strategies

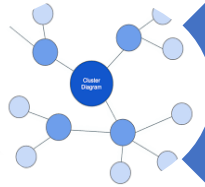
DevSecOps



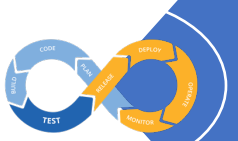
Autoscaling



Ingress Design



Cluster Design

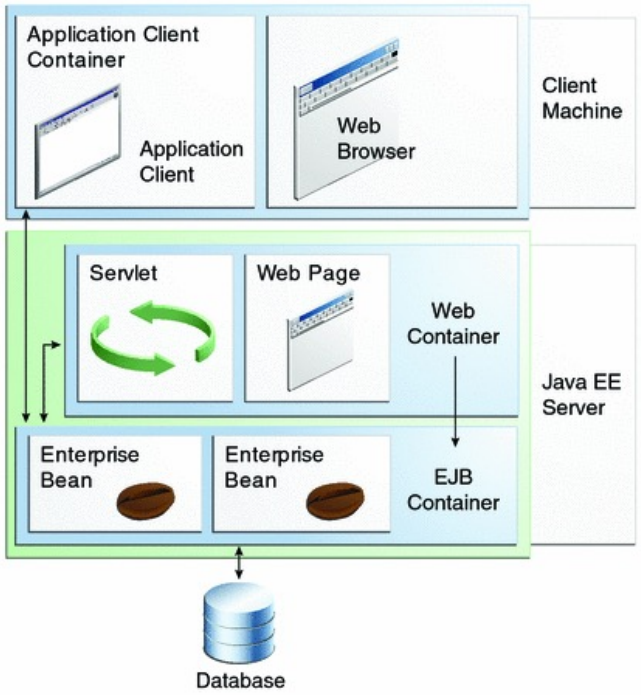


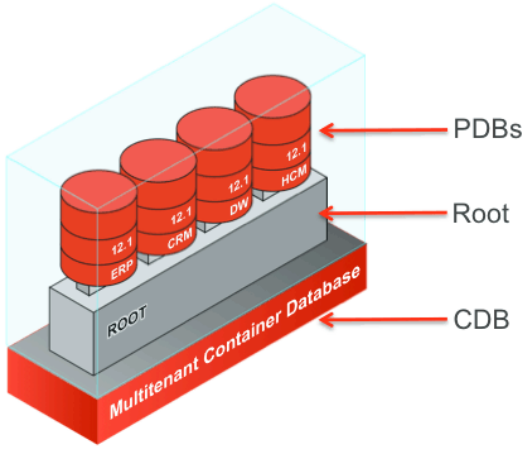
Continuous Deployment

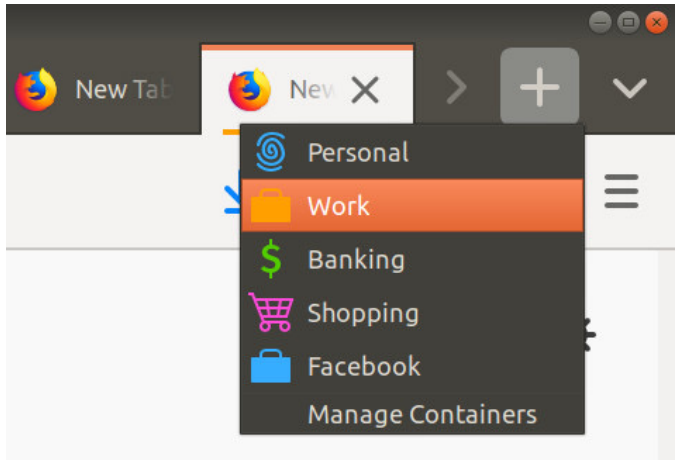
ERP Environment Duplication

Observability

“Containerization” Buzz

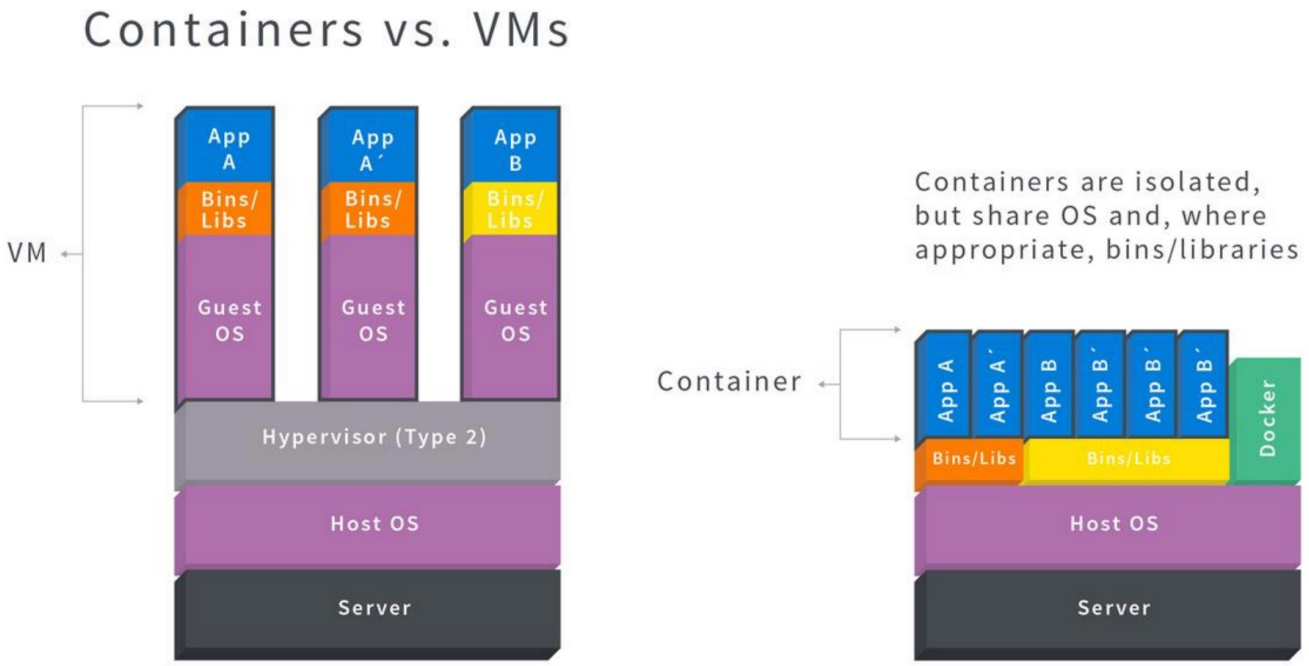






Containerization

- Containerization
  - Docker
  - Other Options; Containerd
- Increased Efficiency
  - Compute Resources
  - IT Operations (devops)
    - Automation
    - Codification (gitops)
- Deployment Options
- Portability



Container Orchestration

Needs:

- Node Management
  - Add / Remove Nodes
- Application Deployment
  - Pulls images from repository and run them
- Ingress / Cluster Networking
- Security
  - Role Based Access Control
  - Secrets Management
- Container Access
  - Bash, logs

Kubernetes Features

- Package Management: Helm
- Scripts on demand: KNative
- Log file Management: Fluentd
- Resource Monitoring: Prometheus
- Storage Management: Rook
- Service Mesh: Istio, Linkerd

Autoscaling

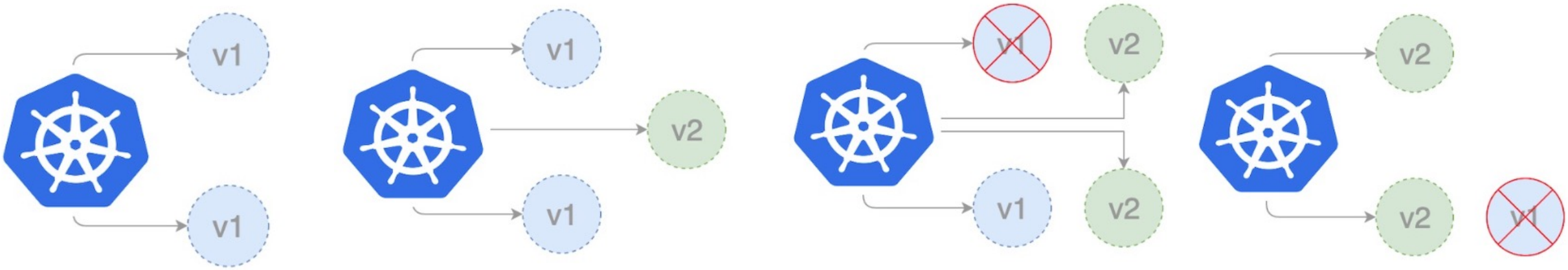
Non-Required Feature

- **Types of Scaling**:
  - Horizontal: In/Out
  - Vertical: Up/Down
- **Cluster Scaling**
  - Scaling Metric: Memory Utilization
  - ECS: Autoscaling Group
  - K8s: Cluster Autscaler, Karpenter, Distribution Specific Feature
  - Serverless Options
- **Container Scaling**
  - Scaling Metric: HTTP Requests
  - ECS: ALBRequestCountPerTarget
  - K8s: Horizontal Pod Autoscaler: requests_per_second
- **Distribution Strategies**
  - HA: Multi-Zone, Multi-Host
    - ECS: Spread Strategy
    - K8s: topologySpreadConstraints, Anti-Affinity
  - Efficient:
    - ECS: Binpack
    - K8s: NodeResourcesFit, RequestedToCapacityRatio
  - Both:
    - Requires 3+ container instances per application

Near-Zero Downtime Deployments

Highly Available Distribution Required

- Rolling Restart
  - Containers can be stopped one at a time
  - Users will incur minimal downtime
  - Browser session may need to be reestablished
- ECS: minimumHealthyPercent and maximumPercent
- K8s: Readiness Probe



Continuous Deployment

Non-Required Feature

Deployment Steps

1. Stage Artifacts
   - `cp $SRC_WAR docker-stage/$APP_NAME/`
2. Rebuild Image
   - `docker build`
   - `docker push`
3. Redeploy Container
   - `restart deployment $APP_NAME`

Banner ESM Integration

Deployment job deploy step - custom scripts

You can create custom pre- and post-deploy step scripts that apply to all deployments of an application or specific to the deployment of the application to a particular App Server.

The deployment job deploy step initially looks for pre- and post-deployment customization scripts in an App Server specific sub-directory of the deployment custom scripts directory.

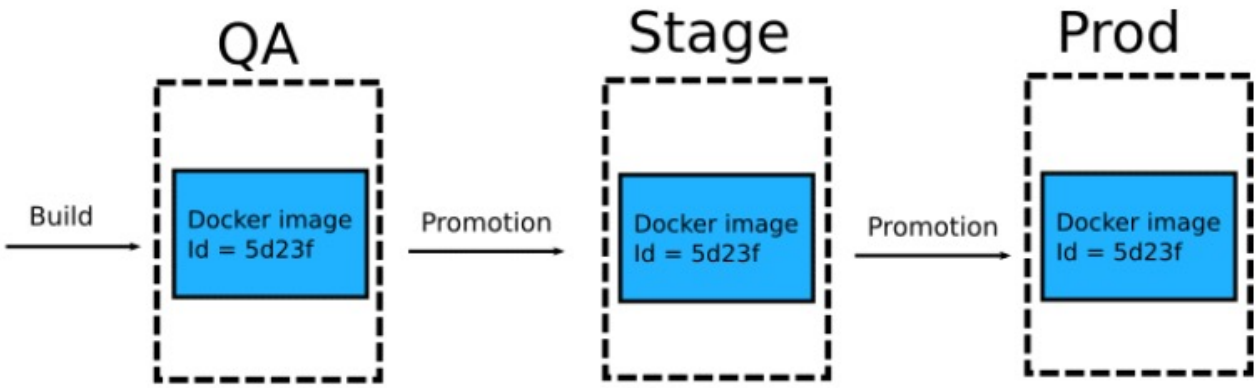
Ban9WarFileStagingPath/deployScripts/*AppName*/*AppServer*

Ref: Ellucian_Solution_Manager_1.x_User_Guide_x.pdf

Image Strategies

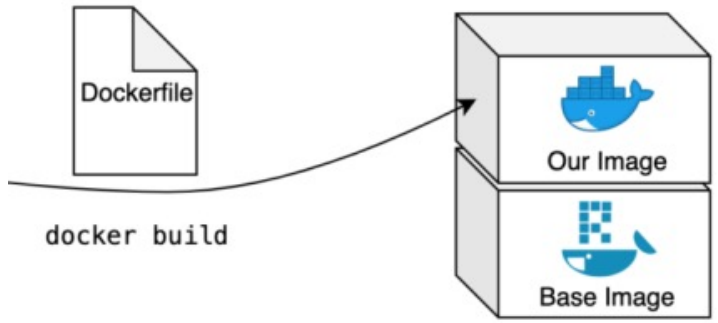
Environment Agnostic Images

- Same Image in PROD/TEST
- Runtime Configuration from ENV
  - Secrets
  - Database Connection Strings
  - URLs

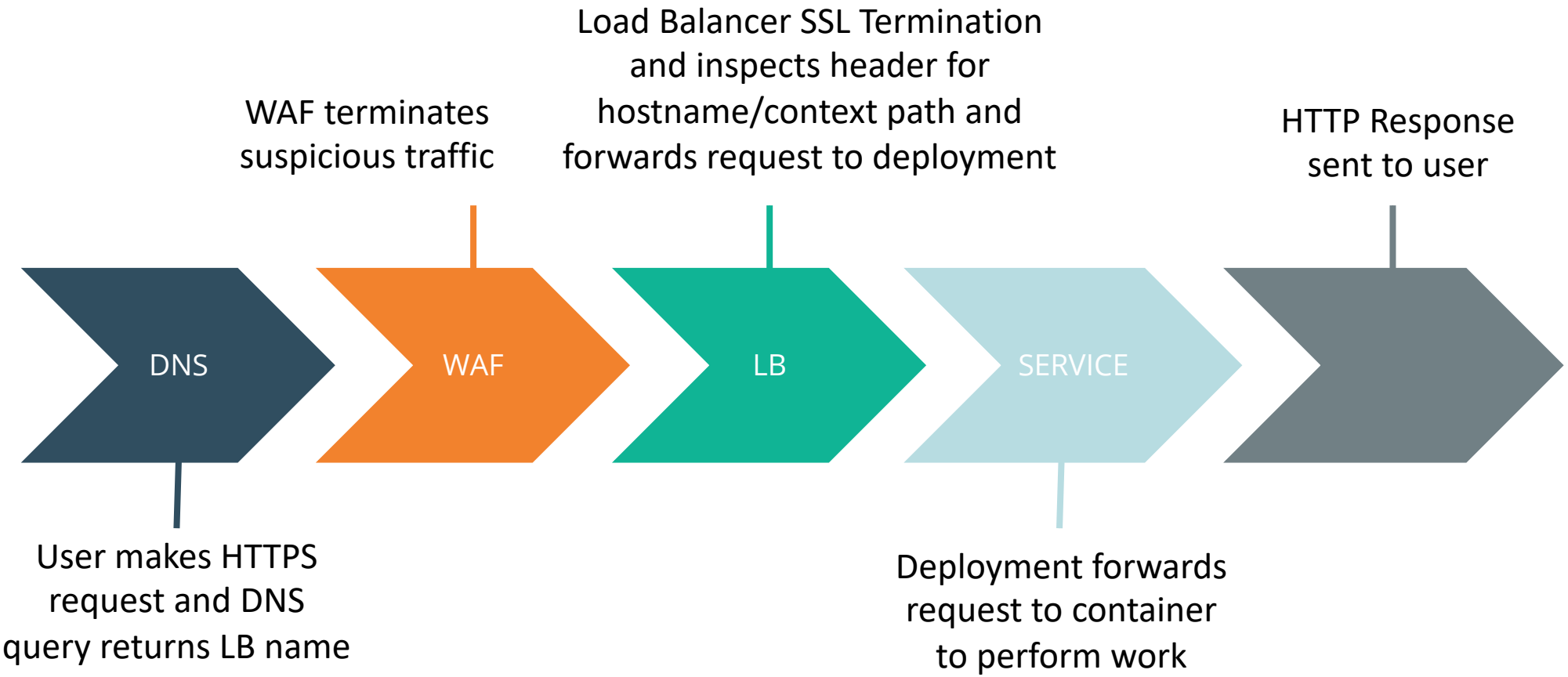


Base Images

- Created from Official Vendor Image
- Add Common Dependencies
  - Oracle Libraries
  - CLI Utilities
  - Common Configurations
- Improve speed of upgrades
- Improve security
  - Package updates
  - Security workarounds
  - Non-Root User Setup



Cluster Ingress Recommendations



- Review naming conventions for banner environments.
- DNS names should be provisioned to match environment name.

- Banner Requires Session Affinity
  - ECS: ALB
  - K8s: HAProxy Ingress Controller

ERP Environment Duplication

- **Container Cluster**
  - Infrastructure as Code
    - Copy and Paste
  - Environment Specific Secrets
- **VM's**
  - Database Clone
  - Batch Job Servers
  - Configuration Management
    - Ansible, puppet, chef
- **Networking**
  - Ingress
    - DNS, Loadbalancers, WAF, SSL

DevSecOps

- Application Isolation
- Continuous Image Repo Scanning
- Execute with Least Privilege
  - Tomcat user not root
  - Cluster Roles and Privileges
- Official Images
- Private Repos
  - No DockerHub, or other public repo
- Secrets Management
- Base Images
  - Fleetwide Updates
  - Runtime configuration
- Common Network Security
  - Private Subnets
  - K8s: Private Control Plane API
  - Threat / Intrusion Detection
  - Firewalls
- Proper Logging Infrastructure
  - Auditing and alerting
- Infrastructure as Code
  - Provisioning Automation
- K8s: Admission Controllers
  - API Security Policies

Cluster Design

- **Optimal**
  - Environment Separation Per Cluster
  - Drawback
    - Potentially lots of clusters to manage
- **Minimal**
  - Production / NonProduction Separation
  - Additional Cluster
    - A third cluster for development work is often helpful

Observability

- Monitoring and Alerting
- Log File Management
  - Centralized Logging
  - Log Analysis
  - Anomaly Detection
- Common Solutions
  - ECS: Cloudwatch
  - K8s: Prometheus, ELK

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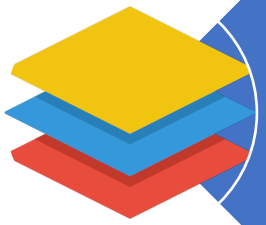

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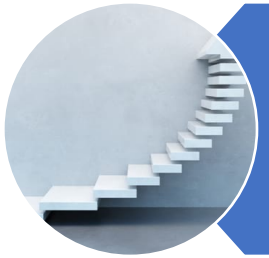

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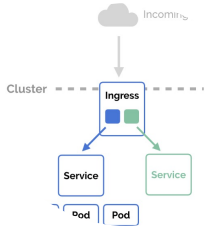

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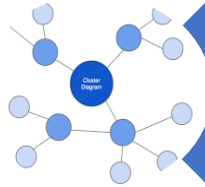

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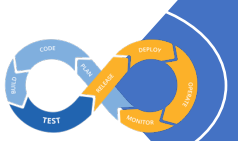

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QUESTIONS
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