DevOps

Software Architecture

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Who has heard of *DevOps*?

Who has used *DevOps*?
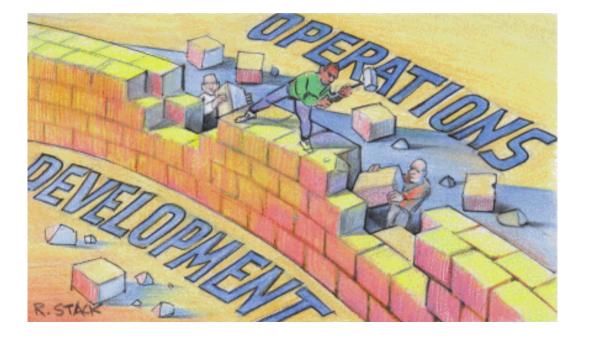
The larger story

Server Config	Config Management
Application Config	Config Files
Provisioning	Infrastructure Code
Building	Continuous Integration
Deployment	Continuous Deployment
Testing	Automated Tests
Database Administration	Schema Migration
Specifications	Behaviour Driven Development

What is *DevOps*?

What is DevOps? [Senapathi et al., 2018]

- A combination of *software development* and *IT operations* skills

What is DevOps? [Senapathi et al., 2018]

- A combination of *software development* and *IT operations* skills

- A *cultural movement* that enables rapid development with four defining characteristics: open communication, incentive and responsibility alignment, respect, and trust

Continuous *

If it hurts, do it more often

1. Continuous *development*
2. Continuous *integration*
3. Continuous *testing*
4. Continuous *deployment*
5. Continuous *operations*
6. Continuous *monitoring*
7. Continuous *feedback*

Describe the tools you have identified for the Continuous * practices.

Summarise the tools identified by each group and the practices they support.

Design a DevOps pipeline for *Sahara*

Order Personnel
[Person]
Manages inventory and ordering products.

Payment Provider
[Software System]
External service providing payment facilities.

Customer
[Person]
Someone who shops at the Sahara on-line store.

On-line Store
[Software System]
Allows customers to browse and search for items and to order them.

Data Mining Service
[Software System]
Collects customer visit data and provides product recommendations.

Search, browse and purchase products.

Monitor inventory and order new stock.

Process payment.
[REST API JSON/HTTPS]

Get Product Suggestions

Customer Browsing History
[REST API JSON/HTTPS]

Sahara eCommerce
[Enterprise]

[System Context] On-line Store
Friday, 18 March 2022, 23:38 Australian Eastern Standard Time

[Component] On-line Store - Product Browsing
Sunday, 20 March 2022, 21:51 Australian Eastern Standard Time

Mobile Application
From the back stack
[Container, Web3 Device]
Mobile app on iPhone and Android providing shopping experience

Customer's Mobile Device
[Deployment Node: Apple iPhone or Android]

Interactive Web Pages
From the back stack
[Container, JavaScript]
Provides the environment in which customers can view products

Web UI render
[Deployment Node: Chrome, Firefox, Safari or Edge]

Customer's Computer
[Deployment Node: MS Windows, Apple macOS or Linux]

Network connect
to the customer's browser
[Container]
HTTPS

Web Application
From the back stack
[Container, JSF/Java]
Delivers the web front-end to the online store

Apache Tomcat
[Deployment Node: Apache Tomcat 9.x]

Sells Server
[Deployment Node: Ubuntu 20.04 LTS]

View & Retrieve
Product Details
[JMS]

Notification/Order
Request
[JMS]

CRUD Customer
Account
[JMS]

Query Order
Status
[JMS]

Product Browsing
From the back stack
[Container, Java]
Provides backend logic for browsing or searching for products

Product Browsing Server
[Deployment Node: JBoss EAP 7.9.x Java 11 CB]

Product Purchasing
From the back stack
[Container, Java]
Provides backend logic for purchasing products

Product Purchasing Server
[Deployment Node: JBoss EAP 7.9.x Java 11 PS]

Customer Account Management
From the back stack
[Container, Java]
Provides backend logic for managing customer accounts

Customer Account Server
[Deployment Node: Ubuntu 20.04 CM Java 11 CB]

Product Fulfillment
From the back stack
[Container, Java]
Provides backend logic for fulfilling orders

Product Fulfillment Server
[Deployment Node: Ubuntu 20.04 LTS Java 11 FB]

Create, Purchase
[JMS]

Queries &
Updates
[JMS]

Queries &
Updates
[JMS]

Queries
[JMS]

Application Database
From Online Store
[Container, Oracle]
Stores customer credentials, products and orders

MySQL Primary
[Deployment Node: MySQL 8.0]

Application Database Server
[Deployment Node: Ubuntu 20.04 LTS]

Read & Write
Product Details
[JDBC]

Customer
Browsing History
[JDBC encrypted HTTPS]

Customer
Purchase History
[JDBC encrypted HTTPS]

Read & Write
Updates
[JMS]

Inventory Management
From the back stack
[Container, Java]
Provides backend logic for managing inventory

Inventory Management Server
[Deployment Node: JBoss EAP 7.9.x Java 11 IS]

Retrieve Stock
Levels and Order
Stock
[JDBC encrypted SSL]

Inventory Application
From the back stack
[Container, C#]
Interface to manage inventory

Web Browser
[Deployment Node: Chrome, Firefox, Safari or Edge]

Order Personnel Computer
[Deployment Node: MS Windows, Apple macOS or Linux]

Sahara
[Deployment Node: Amazon eCommerce Kubernetes]

Data Mining Interface
From Data Mining Service
[Container, Java]
Provides interface to user data to to create and retrieve mining results

Data Mining API
[Deployment Node]

Store Customer
Browsing History
[JDBC]

Data Warehouse
From Data Mining Service
[Container, Oracle]
Stores customer browsing and transaction history.

Data Warehouse
[Deployment Node]

Get Product Price
Inconsistencies

Perform Data
Mining
[JMS]

Data Mining Process
From Data Mining Service
[Container, Java]
Performs data mining on collected data

Machine Learning Process
[Deployment Node]

Data Mining Service
[Deployment Node: Amazon Open eCommerce]

[Deployment] - Live
Friday, 19 March 2021, 15:08 Australian Eastern Standard Time

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Sahara Pipeline

1. What *types of tools* would be required?
2. Which *specific tools* would you choose?
3. On which type of *computing infrastructure* would you deliver the system?
4. What parts of the deployment and operations processes could be *automated*?

Present the DevOps pipelines that you have developed to the rest of the class.

Do the seven necessary *DevOps practices* map perfectly to the *enablers* in the article by Senapathi *et al* [Senapathi et al., 2018]?

- *Build* automation
- *Test* automation
- *Deployment* automation
- *Monitoring* automation
- *Recovery* automation
- *Infrastructure* automation
- *Configuration* management for code and infrastructure
- *Metrics* automation

References

[Senapathi et al., 2018] Senapathi, M., Buchan, J., and Osman, H. (2018). DevOps capabilities, practices, and challenges: Insights from a case study. In *Proceedings of the 22nd International Conference on evaluation and assessment in software engineering 2018*, volume 137700 of *EASE'18*, pages 57–67. ACM.