DevOps

Software Architecture

Brae Webb

March 20, 2023

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

Important

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*

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

Technological Enablers

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

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.

Search, browse and purchase products.

Monitor inventory and order new stock.

Process payment.
[REST API JSON/HTTPS]

On-line Store
[Software System]

Allows customers to browse and search for items and to order them.

Get Product Suggestions

Customer Browsing History
[REST API JSON/HTTPS]

Data Mining Service
[Software System]

Collects customer visit data and provides product recommendations.

Sahara eCommerce
[Enterprise]

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

Web Application
[Container: J2EE Server]

Delivers the web front-end for the on-line store.

Product Browsing Façade
[Component: JSP]

Provides interface to retrieve product information based on search criteria

Suggest Products
[Component: Java]

Suggest products user may be interested in.

Search for Product
[Component: Java]

Finds products based on search criteria.

Browse for Product
[Component: Java]

Finds products based on user navigation.

Shopping Cart Management
[Component: Java]

Add and remove items from user's shopping cart.

Data Mining Service
[Software System]

Collects customer visit data and provides product recommendations.

Application Database
[Container: MySQL]

Stores customer credentials, products and orders.

Find & Retrieve
Product Details
[RMI]

Uses

Uses

Uses

Uses

Get Product
Suggestions
[REST API JSON/HTTPS]

Customer
Browsing History
[REST API JSON/HTTPS]

Finds Product
[JPA]

Finds Product
[JPA]

Updates Cart
[JPA]

Customer
Browsing History
[REST API JSON/HTTPS]

Record Cart
Updates
[REST API JSON/HTTPS]

Product Browsing
[Container]

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

Mobile Application
[Container: JavaScript]
[Customer Touchpoint]

Mobile app on iPhone and Android providing shopping experience

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

Interactive Web Pages
[Execution Environment: JavaScript, HTML and CSS]
[Container]

Provides the environment in which customers can view products

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

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

Web Application
[Container: JSP, Servlet]
[Customer Touchpoint]

Delivers the web front end for the purchase store

Apache Tomcat
[Deployment Node: Apache Tomcat 9.0]

Web Server
[Deployment Node: DVM OS]

Product Browsing
[Container: Java]
[Customer Facing]

Provides backend logic for browsing or searching for products

Product Browsing Server
[Deployment Node: Acme JEE-2 6 base 11/19]

Product Purchasing
[Container: Java]
[Customer Facing]

Provides backend logic for purchasing products

Product Purchasing Server
[Deployment Node: Acme JEE6/19 base 11/19]

Customer Account Management
[Container: Java]
[Customer Facing]

Provides backend logic for managing customer accounts

Customer Account Server
[Deployment Node: DVM 19 base 11/19]

Product Fulfilment
[Container: Java]
[Customer Facing]

Provides backend logic for fulfilling orders

Product Fulfilment Server
[Deployment Node: Acme JEE6 base 11/19]

Inventory Management
[Container: Java]
[Customer Facing]

Provides backend logic for managing inventory

Inventory Management Server
[Deployment Node: DVM 19 base 11/19]

Application Database
[Container: MySQL]
[Customer Facing]

Stores customer credentials, products and orders

MySQL Primary
[Deployment Node: DVM OS]

Application Database Server
[Deployment Node: Acme JEE-10]

Inventory Application
[Container: Java]
[Customer Facing]

Interface to manage inventory

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

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

AWSws
[Deployment Node: Safana eCommerce Electrocity]

Data Mining Interface
[Container: Java, Python]
[Customer Facing]

Provides interface to operators to access and retrieve mining results

Data Mining API
[Deployment Node]

Data Warehouse
[Container: MongoDB]
[Customer Facing]

Stores customer browsing and transaction history

Data Warehouse
[Deployment Node]

Data Mining Process
[Container: Python]
[Customer Facing]

Performs data mining on collected data

Machine Learning Process
[Deployment Node]

Data Mining Service
[Deployment Node: Oracle Cloud Infrastructure]

[Deployment] - Live

1. What *types of tools* would be required?

1. What *types of tools* would be required?
2. Which *specific tools* would you choose?

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?

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*?

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.