DevOps

CSSE6400

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Who has heard of *DevOps*?

Question
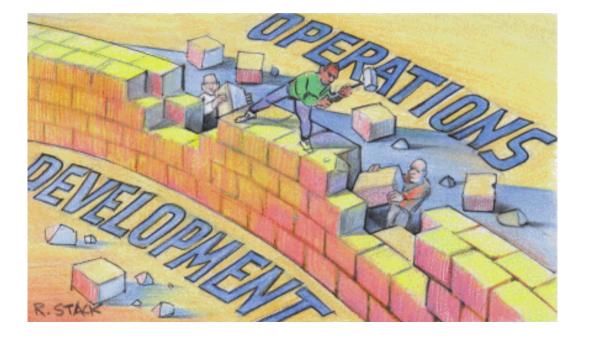
Who has used *DevOps*?

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

Question

What is *DevOps*?

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

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

Important

Continuous *

Also Important

If it hurts, do it more often

DevOps lifecycle: Dev — CODE, PLAN, BUILD, TEST; RELEASE; Ops — DEPLOY, OPERATE, MONITOR

Tooling

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

The DevOps infinity loop showing the phases CODE, BUILD, TEST, PLAN, RELEASE, DEPLOY, OPERATE, and MONITOR, with associated tools:

- CODE: Confluence, JIRA, git
- BUILD: sbt, maven
- TEST: Selenium (Se), JUnit
- PLAN / RELEASE: Jenkins, Codeship
- DEPLOY: DC/OS, docker, aws
- OPERATE: CHEF, ANSIBLE, kubernetes
- MONITOR: Nagios, splunk>, DATADOG

Do the seven necessary *DevOps practices* map perfectly to the *enablers* in the article by Senapathi *et al* [1]?

Technological Enablers

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

Today

Design a DevOps pipeline for *Sahara*

Order Personnel
[Person]

Manages inventory and ordering products.

Payment Provider
[Software System]

External service providing payment facilities.

Monitor inventory and order new stock.

Process payment.
[REST API JSON/HTTPS]

Customer
[Person]

Someone who shops at the Sahara on-line store.

Search, browse and purchase products.

On-line Store
[Software System]

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

Get Product Suggestions

Data Mining Service
[Software System]

Collects customer visit data and provides product recommendations.

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

Web Application
[Container: J2EE Server]

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

Suggest Products
[Component: Java]

Suggest products user may be interested in.

Search for Product
[Component: Java]

Finds products based on search criteria.

Product Browsing Façade
[Component: JSF]

Provides interface to retrieve product information 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]

Get Product
Suggestions
[REST API JSON/HTTPS]

Customer
Browsing History
[REST API JSON/HTTPS]

Uses

Uses

Uses

Uses

Uses

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

Mobile Application
iPhone device
[Container::Web Client]
Mobile app on iPhone and Android providing shopping experience.

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

Interactive Web Pages
React JS Web Client
[Container::Web Client]
Provides the environment in which customers can view products.

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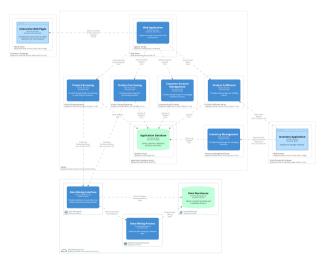
Customer's Computer
[Deployment Node::MS Windows, Apple macOS or Linux]

Web Application
Java Spring Boot
[Container::Web Server]
Delivers the web front end to the via the store.

Apache Tomcat
[Deployment Node::Apache/Tomcat for M.8.5.]

Sales Server
[Deployment Node::Ubuntu 20.04 LTS]

Network context
In this customer's browser
HTTPS

Visit & Retrieve
Product details
JSON

NOTIFICATION
Request
JSON

Query Order
Status
JSON

CRUD Customer
Account
JSON

Product Browsing
React JS Web Client
[Container::Java]
Provides backend logic for browsing or searching for products.

Product Browsing Server
[Deployment Node::Ubuntu 20.04 LTS/Java 11 LTS]

Product Purchasing
React JS Web Client
[Container::Java]
Provides backend logic for purchasing products.

Product Purchasing Server
[Deployment Node::Ubuntu 20.04 LTS/Java 11 LTS]

Customer Account Management
React JS Web Client
[Container::Java]
Provides backend logic for managing customer accounts.

Customer Account Server
[Deployment Node::Ubuntu 20.04 LTS/Java 11 LTS]

Product Fulfillment
React JS Web Client
[Container::Java]
Provides backend logic for fulfilling orders.

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

Check Products
JDBC

Query for &
Updates
JDBC

Queries &
Updates
JDBC

Queries
JDBC

Query for &
Updates
JPA

Application Database
Open Online Store
[Container::SQL]
Stores customer credentials, products and orders.

MySQL Primary
[Container::MySQL 8.0]

Application Database Server
[Deployment Node::Ubuntu 20.04 LTS]

Customer
Browsing History
JSON via pool entry

Customer
Purchase History
JSON via pool entry

Inventory Management
React JS Web Client
[Container::Java]
Provides backend logic for managing shipments.

Inventory Management Server
[Deployment Node::Ubuntu 20.04 LTS/Java 11 LTS]

View Order
Details
JSON via pool entry

Retrieve Stock
Levels and Order
New Stock
JSON via pool entry

Inventory Application
React JS Web Client
[Container::Web Client]
Interface to manage inventory.

Web Browser
[Deployment Node::MS Windows, Apple macOS or Linux]

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

Subnet
[Deployment Node::Generic Aurora Watertown]

Data Mining Interface
Machine Learning Server
[Container::Java]
Provides interface to user data to to create and retrieve mining results.

Data Mining API
[Container::Java]

Data Warehouse
Data Warehousing Server
[Container::SQL]
Stores customer browsing and transaction history.

Data Warehouse
[Container::Java]

Data Mining Process
Machine Learning Server
[Container::Java]
Performs data mining on collected data.

Machine Learning Process
[Container::Java]

Store Customer
Browsing History
JDBC

Get Product Mass
Recommendation

Perform Data
Mining
JDBC

Data Mining Service
[Deployment Node::Azure Cloud Watertown]

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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*?

References

[1] Mali Senapathi, Jim Buchan, and Hady Osman.
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, 2018.