DevOps

Software Architecture

March 21, 2022

Richard Thomas

1 Brief

DevOps is a portmanteau[1] of development and operations. It is intentionally a portmanteau to emphasise that the approach requires a close integration of development and operations behaviours in one team. In a proper DevOps environment the development team is responsible for the infrastructure on which their software runs, not just for the software itself. This can include considering infrastructure costs in their development budget and estimates.
This week we will

1. provide an overview of DevOps,
2. consider what are necessary DevOps practices, and
3. let you explore how you might implement a DevOps pipeline.

2 Introduction to DevOps

You should be familiar with the concepts of automated testing and continuous integration. We will now extend that to include continuous testing and deployment, and then expand on these to provide a full DevOps process.

For an introduction to DevOps read Amazon's description of "What is DevOps?"[2] [1]. Do not worry about the discussion about microservices. That is an architectural style that will be covered later in the course. DevOps does not require a microservices architecture, though there are some benefits of using it.

Skim through the description of implementing DevOps at Wotif[3] in "DevOps: Making it Easy to Do the Right Thing"[4] [2]. Focus on the section titled "Making it Easy." This is where they discuss how they provided the environment to support DevOps.

3 DevOps Practices and Tools

You should be familiar with some of the practices and tools used in a DevOps process. Amazon's description of "What is DevOps?"[5] [1] listed what they consider to be required practices. For any practices (aside from microservices) that you are not familiar with, you should follow the links to read a summary of those practices. Amazon naturally describes their tools for implementing a DevOps pipeline. You should skim the description of Amazon's tools at "DevOps and AWS"[6] [3]. You do not need to be familiar with these tools, but should have a general idea of what services the tools provide from their summaries.

[1] https://www.britannica.com/topic/portmanteau-word
[2] https://aws.amazon.com/devops/what-is-devops/
[3] Now Expedia.
[4] https://search.library.uq.edu.au/permalink/f/tbms52/TN_cdi_webofscience_primary_000383092600012CitationCount
[5] https://aws.amazon.com/devops/what-is-devops/
[6] https://aws.amazon.com/devops/

Another view of necessary DevOps practices is that it requires continuous

- development,
- integration,
- testing,
- operations,
- deployment,
- monitoring, and
- feedback.

These can only be achieved through automation.

3.1 Pre-Tutorial Task

Before the tutorial, identify a tool that can be used for each of the seven practices listed above. Come to the tutorial with a list of tools and be prepared to give a ten second summary of each tool.

3.2 Discussion Question

In the tutorial you will describe the tools you identified. Briefly explain how they can be integrated to deliver a complete DevOps pipeline.

4 DevOps in Practice

At least skim read "DevOps Capabilities, Practices, and Challenges: Insights from a Case Study"[7] ***before*** the tutorial [4].

4.1 Discussion Question

At least skim read the article ***before*** the tutorial. In the tutorial you will discuss the differences between the capabilities and technological enablers mentioned in the article, and the seven DevOps practices listed in section 3.

- Do the seven necessary DevOps practices map perfectly to the enablers in the article by Senapathi et al [4]?
- If there are some mismatches, discuss whether they are important enough that they should be a required practice.

5 DevOps Pipeline

For the service-based architecture approach of the Sahara eCommerce case study [5], describe a DevOps pipeline that could be employed for the project.

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?

You will work in small groups to identify a set of tools that can be used to create a DevOps pipeline.

[7] https://search.library.uq.edu.au/permalink/f/tbms52/TN_cdi_arxiv_primary_1907_10201

References

[1] AWS, "What is DevOps?." https://aws.amazon.com/devops/what-is-devops/.

[2] M. Callanan and A. Spillane, "DevOps: Making it easy to do the right thing," *IEEE software*, vol. 33, no. 3, pp. 53–59, 2016.

[3] AWS, "DevOps and AWS: Tooling and infrastructure resources for DevOps practitioners." https://aws.amazon.com/devops/.

[4] M. Senapathi, J. Buchan, and H. 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*, vol. 137700 of *EASE'18*, pp. 57–67, ACM, 2018.

[5] R. Thomas, "Service-based architecture slides," March 2022. https://csse6400.uqcloud.net/slides/service-based.pdf.