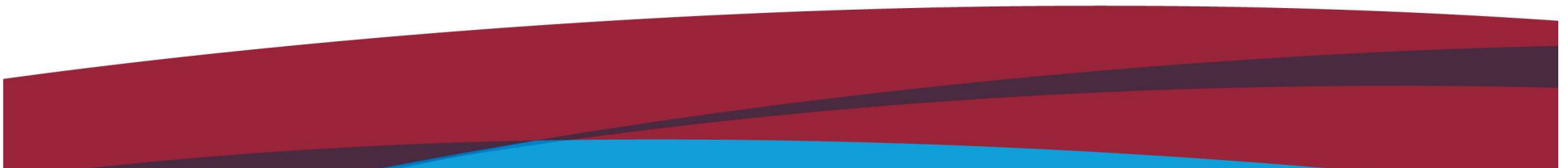


CSER 2021 Spring

DevOps Undergraduate Course Proposal

2021-05-14

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MacEwan University



DevOps Popularity

- DevOps Engineers are highly demanded in industry.
- Graduated students asked why they have not learned DevOps in their Computer Science degrees.

DevOps Education

- Candy Pang, **Grounded Theory for DevOps Education**, Ph.D. dissertation, Dept. of Computing Science, University of Alberta, Edmonton, AB, 2019.
<https://doi.org/10.7939/r3-b09b-vd20>.
- C. Pang, A. Hindle and D. Barbosa, **Understanding DevOps Education with Grounded Theory**, ICSE-SEET'20, pp. 107-118, ISBN 978-1-4503-7124-7,
<https://doi.org/10.1145/3377814.3381711>.
- 15 years of Technical Architect experience.

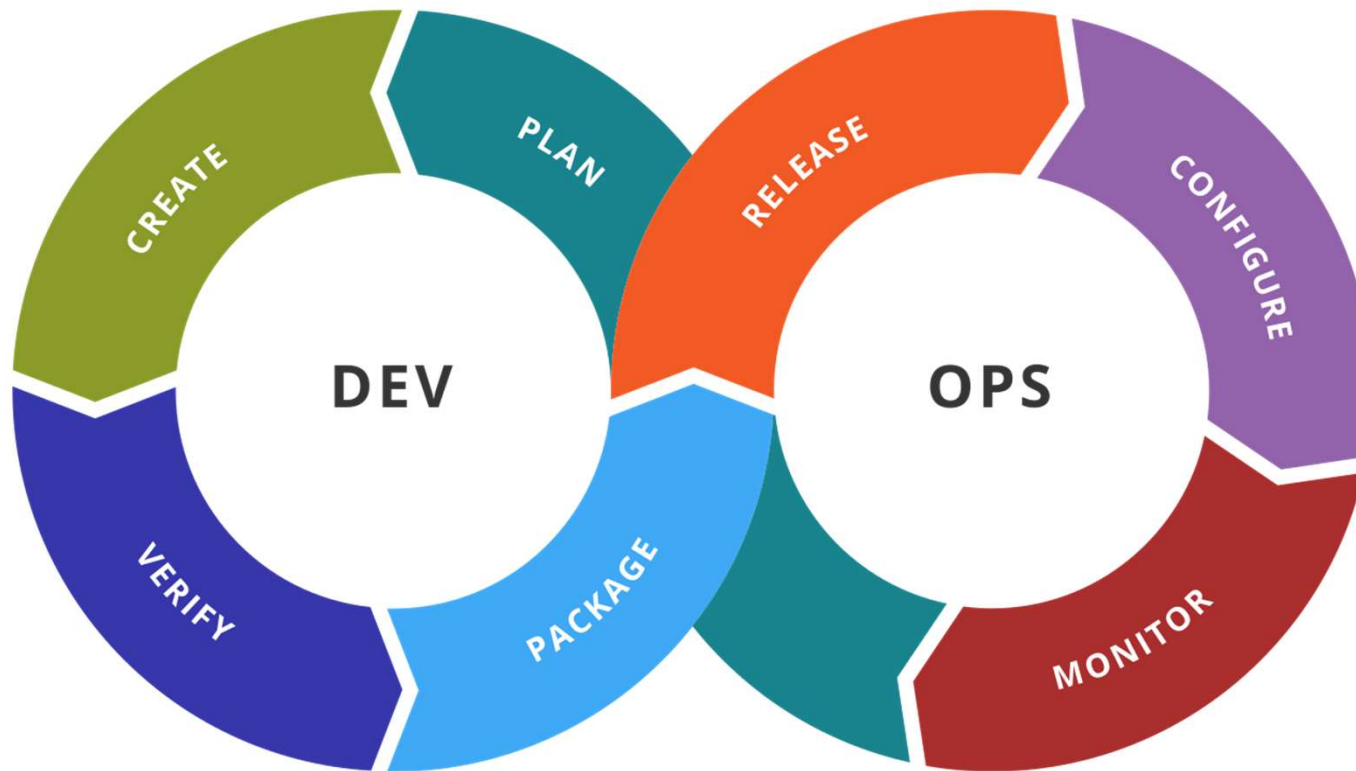
What is DevOps?

- Students said ...

DevOps is one of the Agile practices

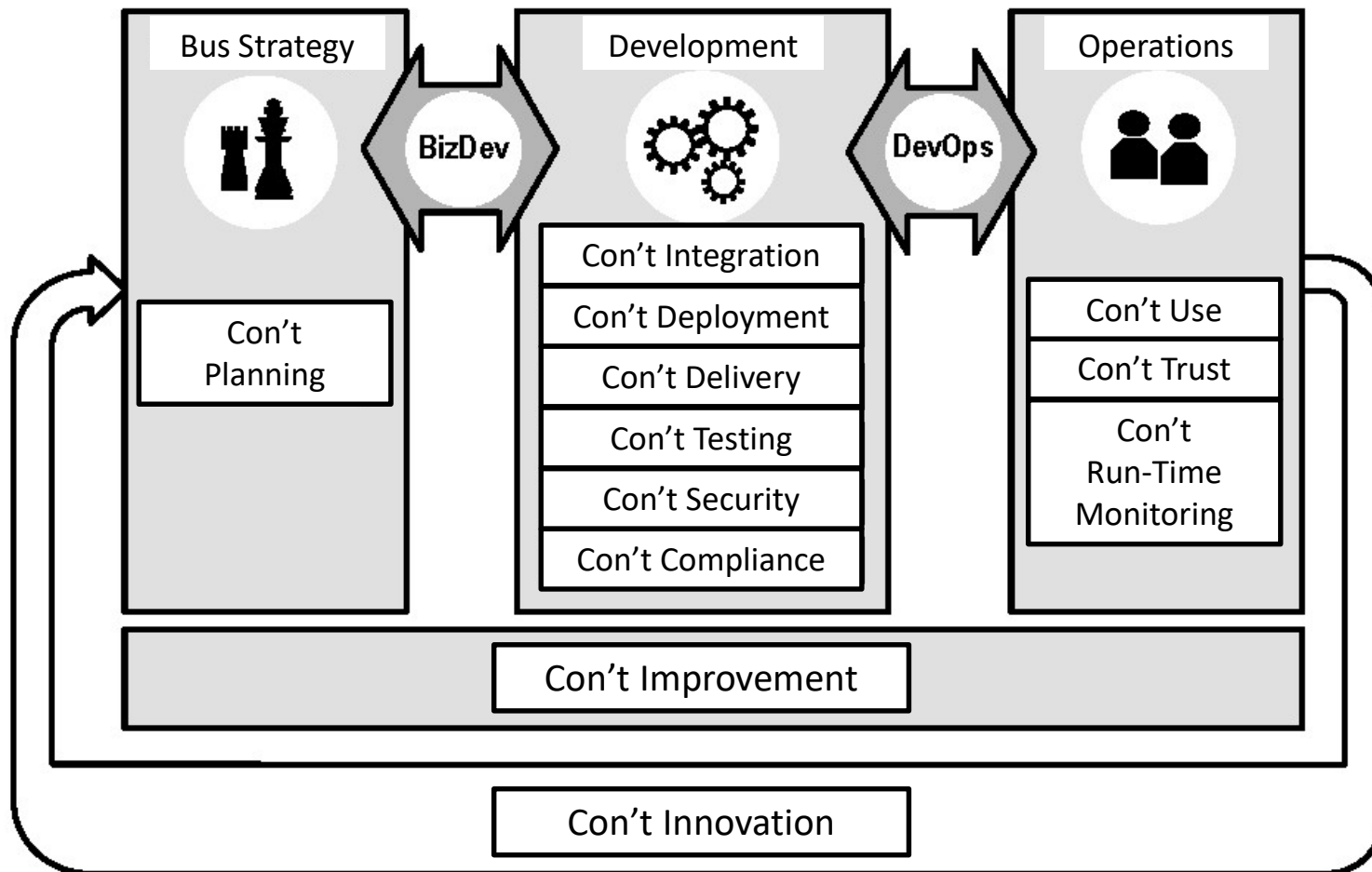
DevOps == Automated Testing

What is DevOps?



<https://en.wikipedia.org/wiki/File:Devops-toolchain.svg>

DevOps is too broad!



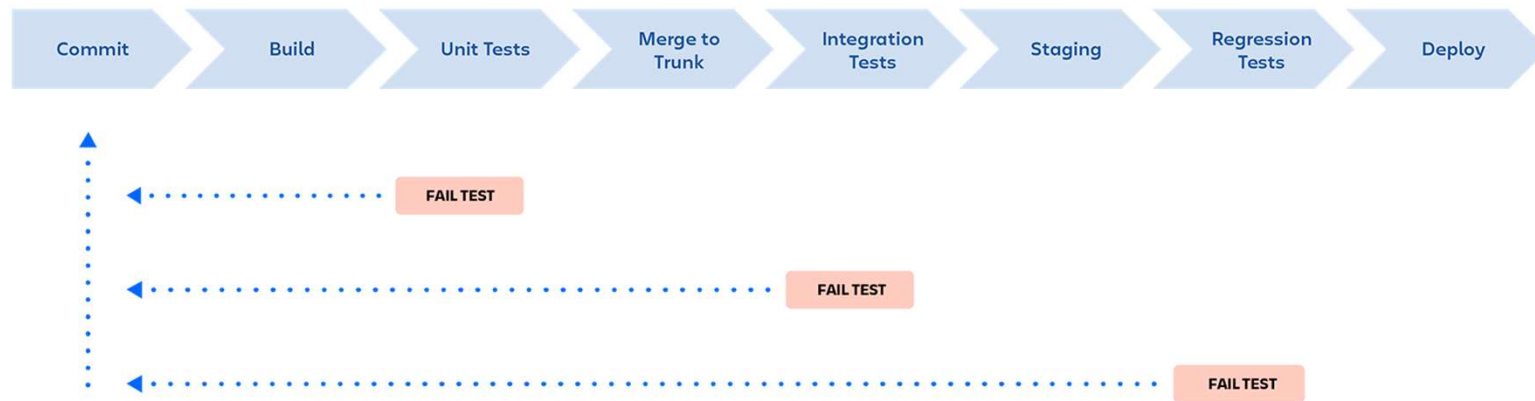
[Fitzgerald et al. 2014]

DevOps is too broad!

- Continuous Integration [Duvall et al. 2007]
 - Continuous Code Integration
 - Continuous Database Integration
 - Continuous Testing
 - Continuous Inspection
 - Continuous Delivery
 - Continuous Feedback

DevOps is too broad!

- Continuous Delivery [Humble et al. 2010]
 - Deployment pipeline



<https://www.atlassian.com/devops/devops-tools/devops-pipeline>

DevOps changes too fast!

The Periodic Table of DevOps Tools (V4)

AI/ops/Analytics		Artifact/Package Management		Cloud		Collaboration		Configuration Automation		Containers		Continuous Integration		Database Management		Deployment		Enterprise Agile Planning		Issue Tracking/ITSM		Release Management		Security		Serverless/PaaS		Source Control Management		Testing		Value Stream Management																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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digital.ai
CollabNet/VersionOne, Xebialabs, Annon, Numerify & Expertest
are now Digital.ai

<https://digital.ai/periodic-table-of-devops-tools>

DevOps changes too fast!

Expanding DevOps Topics

- AIOps
- BizDevOps
- CloudOps
- DataOps
- DevSecOps
- GitOps
- ModelOps
- NoOps
- Microservices
- Serverless
- Observability
- Performance Testing
- Resilience Testing
- Infrastructure as Code
- Site Reliability Engineering (SRE)

[Belagatti 2021 and others]

DevOps Institute

<https://devopsinstitute.com/>



DevOps Institute

- Researched about DevOps skills needed by industry.



https://info.devopsinstitute.com/2021-upskilling-report-download?utm_campaign=Upskilling%202021&utm_source=SKILupDay-Download-Upskilling-2021

DevOps Institute

- 16-hour online certificate courses
 - DevOps Foundation
 - DevOps Leader
 - DevSecOps Foundation
 - Continuous Testing Foundation
 - Continuous Delivery Ecosystem Foundation
 - Site Reliability Engineering Foundation

ICAgile – DevOps Track

<https://www.icagile.com/Agile-Delivery/DevOps>

- DevOps Track Certifications
 - Foundations of DevOps Professional (ICP-FDO)
 - Implementing DevOps Professional (ICP-IDO)
 - DevOps Expert (ICE-DO)

ICAgile – DevOps Track

- ICAgile Learning Roadmap – DevOps Track
 - ICAgile depends on experienced DevOps practitioners for guidance. Hence, the primary source of DevOps knowledge is from experience.
 - The roadmap was created collaboratively by pioneers, experts, and trusted advisors.
 - ICAgile does not offer DevOps training directly.
 - Training providers develop courses according to the roadmap, and verify by ICAgile.

ICAgile – DevOps Track



cprime (<https://www.cprime.com/>)

- DevOps Implementation Boot Camp (ICP-FDO)
 - 3 days / 24 hours of instruction
 - In-Person / Live Online

Lectures

- ICAgile Learning Roadmap DevOps Track [ICAgile 2018]
 - Creative Commons Attribution 4.0 International License (<https://creativecommons.org/licenses/by/4.0/>)
 - Possibility for the course to offer the Foundations of DevOps Professional (ICP-FDO) certification

Lectures – 1.0

1. The Case of DevOps

1.1. History of DevOps

1.2. Mindset and Principles

1.3. Cultural Challenges

Lectures – 2.0

2. Configuration Management

2.1. Version Control

2.2. Managing Configuration

Lectures – 3.0

3. Continuous Integration

3.1. Principles of Continuous Integration

3.2. Practices of Continuous Integration

3.3. Quality Assurance

Lectures – 4.0

4. Continuous Delivery

4.1. Definition of Continuous Delivery

4.2. Principles of Continuous Delivery

4.3. Practices of Continuous Delivery

4.4 Deployment Pipeline

Lectures – 5.0

5. Operations

5.1. Managing Infrastructure

5.2. Managing Database

Labs

- Continuous Integration [Duvall et al. 2007]
 - Base on a simple **Java application**
 - 1.0 Continuous Code Integration
 - 2.0 Continuous Database Integration
 - 3.0 Continuous Testing
 - 4.0 Continuous Inspection
 - 5.0 Continuous Delivery
 - 6.0 Continuous Feedback

Lab – 1.0

- 1.0 Continuous Code Integration
 - Configuration Management
 - Create git repository for multi-user development
 - Maven Configuring

Lab – 2.0

- 2.0 Continuous Database Integration
 - Database scripting
 - Extract Translate Load (ETL)
 - Database backup
 - Schema update

Lab – 3.0

- 3.0 Continuous Testing
 - JUnit configuration
 - Test cases management
 - Test data management
 - *Authentication & authorization testing?*

Lab – 4.0

- 4.0 Continuous Inspection
 - Inspector configuration in the build process
 - Inspection results handling

Lab – 5.0

- 5.0 Continuous Delivery
 - Deployment configuration
 - Software library management
 - Rollback
 - *Container or virtual machine?*
 - *Infrastructure as code?*

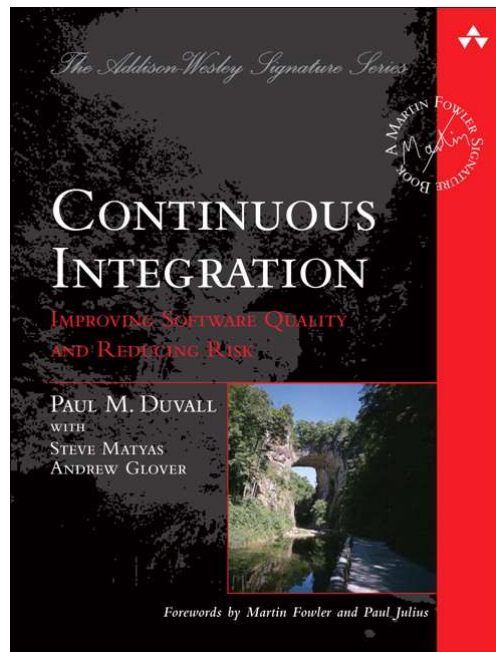
Lab – 6.0

- 6.0 Continuous Feedback
 - Log records create, backup, and archive
 - Log monitoring

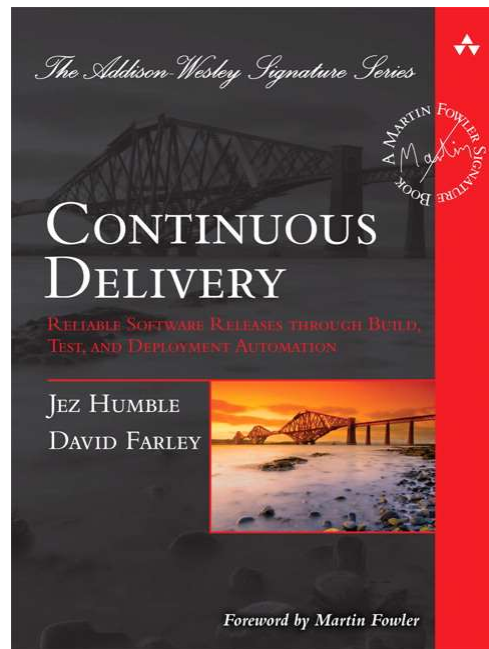
Student Evaluation

- Labs 50%
- Assignments 30%
- Final Exam 20%

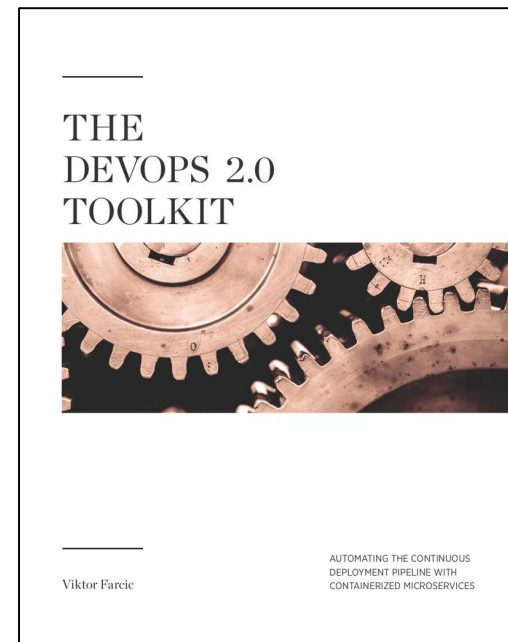
Text Books & References



[Duvall et al. 2007]



[Humble et al. 2010]



[Farcic 2016]

What's next?

- Prepare lecture material
- Prepare labs
 - Hire students to help planning and creating lab exercises
 - Apply for funding
- Look for opportunity to deploy the course

References

- [Fitzgerald et al. 2014]
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C. Garlick, D. DeGrandis, G. Gotimer and T. Guay, "ICAgile Learning Roadmap DevOps Track," International Consortium for Agile (ICAgile), 04 2018. [Online]. Available: <https://icagile.com/Portals/0/LO%20PDFs/DevOps%20Learning%20Outcomes.pdf>. [Accessed 27 07 2018].

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Thank you very much 🧐