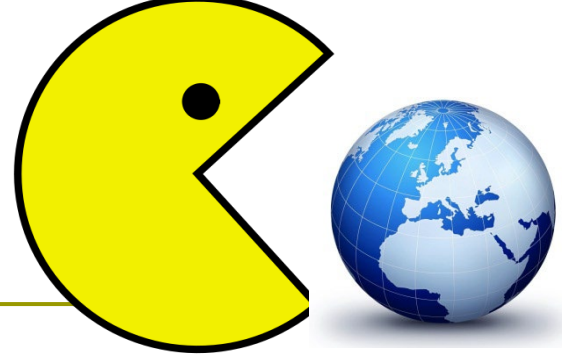


CSIT314 Software Development Methodologies



DevOps

“Software eats the World”



- *“We are in the middle of a dramatic and broad technological and economic shift in which software companies are poised to take over large swathes of the economy”*
(Marc Andreessen, “Why Software is Eating the World”)
- Some examples:
 - Modern cars contain **hundred millions** of lines of code.
 - Dominos Pizza has increased its IT workforce by 240%.
 - Nike is turning footwear into a fully connected platform by integrating shoes with lifestyle and fitness applications.

Every business is a software business.

Traditional development models



Development team (DEV)

- ▣ Design
- ▣ Code
- ▣ Test



IT Operations Team (OPS)

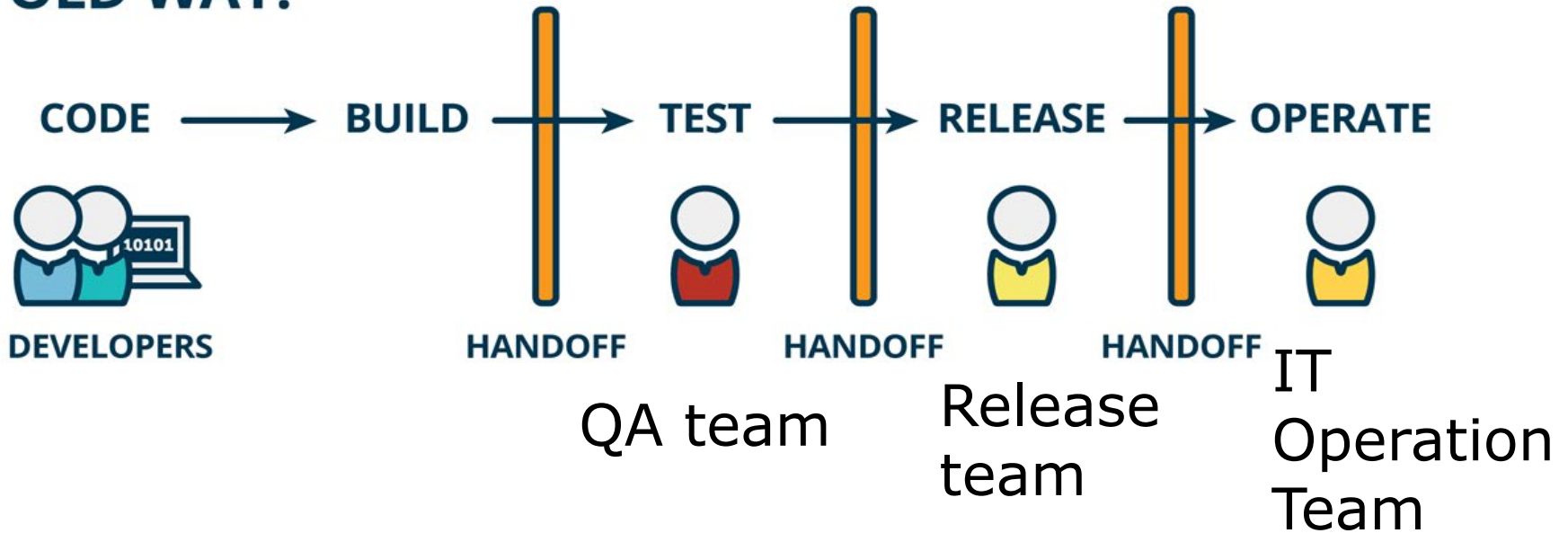
- ▣ Deploy
- ▣ Support, Sys Admin
- ▣ Maintenance

▣ Wall of confusion:

- Different mindsets
- Different tools & environments

Traditional development models (cont.)

OLD WAY:



Traditional development models (cont.)

- ❑ Traditionally, development and operations are separate entities within an organization.
 - They are two different departments
 - They have different objectives:
 - ❑ Operations: work in a cost-efficient way.
 - ❑ Development: efficiently deliver features

Traditional development models (cont.)

□ Problem 1: different objectives

- IT Operations team like the software to be as much stable as possible.
 - They might see each change and every new release as a potential danger to stability.
- The Development team is paid for changing and adding new features the software application.

=> Might lead to conflicts between Dev and Ops departments.

Traditional development models (cont.)

- ❑ Problem 2: different perspectives
 - Operations team views the application as a black box. They can monitor it with suitable tools (e.g. CPU utilization, I/O load, kernel behaviour).
 - Development team has access to source code and knows the internal working of the application.

Traditional development models (cont.)

- ❑ Problem 3: different environments
 - Operations team run the application in the production environment
 - Developers run and test their application in their own computer.
 - The two environments may be vastly different in terms of hardware, software, libraries, etc.

Traditional development models (cont.)

- ❑ Problem 4: driven by different requirements
 - Operations is driven by non-functional requirements (availability, reliability, system speed ...)
 - Development is driven by functional requirements (features).

Traditional development models (cont.)

□ Problem 5: client perspective

- When there is an error or a problem, the client can find it difficult to determine who is really responsible.

Traditional development models (cont.)

- Problem 6: combining know-how
 - **Operations** and **development** have only a part of the necessary knowledge and the required tools to build, test and run the application.
 - A smooth operation of applications is only possible with the combined know-how of **operations** and **development**.

What is DevOps?

- ❑ DevOps is a software engineering methodology which aims to **unify** software development (Dev) and IT operation (Ops)
- ❑ Development and operations teams are no longer separated (i.e. no confusion wall)
 - Sometimes, these two teams are merged into a single team where the DevOps engineers work across the entire application lifecycle, from development and test to deployment to operations.

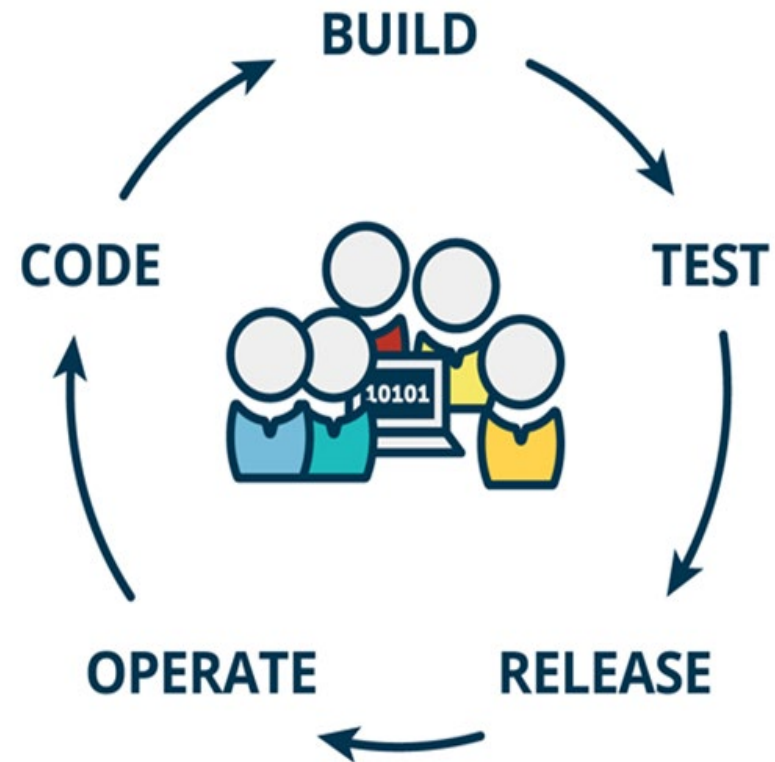
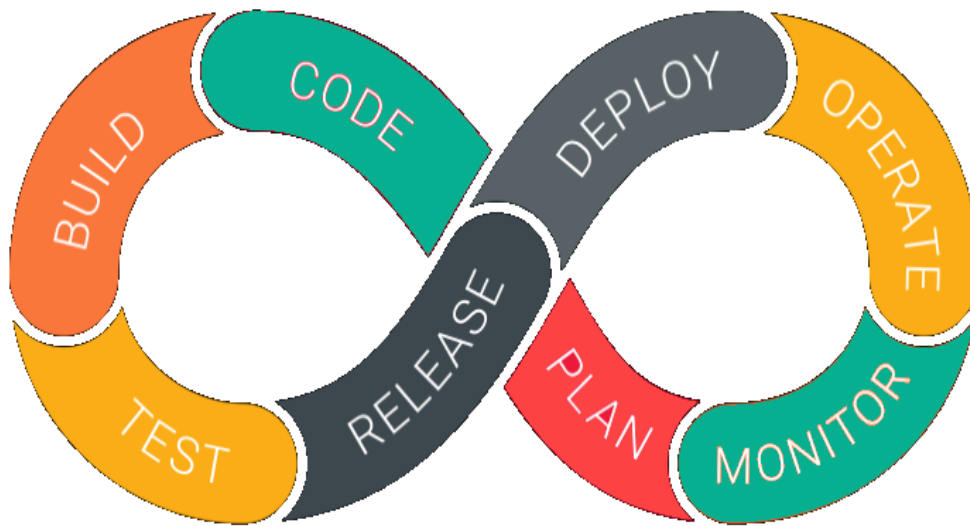
Watch this intro video: <https://youtu.be/I94-tJlovvg>

DevOps: cultural shift

- ❑ **increased collaboration** between the roles of development and operations
- ❑ **shared responsibility**
- ❑ support **autonomous teams**
- ❑ value **feedback**
- ❑ **Automation**



DevOps lifecycle



DevOps lifecycle (cont.)

- ❑ Development
 - Agile, incremental and iterative development
- ❑ Testing
 - Test-driven development, acceptance testing
- ❑ Integration
 - New functionality is integrated with existing code, and testing takes place.
- ❑ Deployment
 - Deployment process takes place continuously.
- ❑ Monitoring
 - Bugs and performance reporting in real time.

Continuous Delivery and DevOps

- ❑ DevOps facilitates the implementation of CI/CD:
 - Development knows:
 - ❑ the internal structure of the application
 - ❑ how the application has to be configured
 - ❑ metrics for monitoring
 - Operations knows:
 - ❑ Production environments and conditions
 - ❑ Tools for monitoring or log analysis.
 - Feedback from operation can be used directly to optimize further development of the application (since all necessary roles are united in one team)

Tools used in DevOps

- ❑ Source Code Repository: developers check-in and change code => a major component of continuous integration
 - E.g. Git, Subversion, Cloudforce, Bitbucket and TFS
- ❑ Build Server: automatically compiles the code in the source code repository into executable code base
 - E.g. Jenkins, SonarQube and Artifactory
- ❑ Configuration Management: defines the configuration of a server or an environment.
 - E.g. Puppet and Chef.
- ❑ Virtual Infrastructure: programmatically create new virtual machines – provided by cloud vendors
 - E.g. Amazon Web Services and Microsoft Azure
- ❑ Test Automation: automatically perform all tests
 - E.g. Selenium and Water

DevOps benefits

- ❑ **Rapid delivery:** innovate and improve your product faster (e.g. release new features and bug fixes quickly) => respond to your customers' needs and build competitive advantage.
- ❑ **Reliability:** ensure the quality of application updates and infrastructure changes.
- ❑ **Scale:** Operate and manage your infrastructure and development processes at scale.

Let's discuss the Netflix case study

- ▣ <https://netflixtechblog.com/full-cycle-developers-at-netflix-a08c31f83249>

DevOps in practice

Some extra demos of how DevOps is used in major companies:

DevOps at Atlassian:

https://youtu.be/neySeor_vAk

DevOps at Netflix:

<https://youtu.be/UTKIT6STSVM>

DevOps at Google: <https://youtu.be/0SU8-HJtYYc>

Exit quiz

DevOps means...

- A) Developers taking over all Operations tasks.
- B) Automating the process of software delivery and infrastructure changes.
- ☒ C) The collaboration and communication of both software developers and other information-technology (IT) professional while automating the process of software delivery and infrastructure changes.
- D) The collaboration and communication of just software developers and operations staff while automating the process software delivery and infrastructure changes.

Which of these statements are correct about DevOps?

- A) DevOps and ITIL® don't mix
- B) DevOps won't work in regulated industries
- C) DevOps won't work with Outsourced Development
- D) You must use cloud technologies

Which benefits of adopting a DevOps approach could be included in a business case to adopt a DevOps approach?

- A) Improved deployment frequency, which can lead to faster time to market
- B) Lower failure rate of new releases
- C) Shortened lead time between fixes
- D) Faster mean time to recovery in the event of a new release crashing or otherwise disabling the current system

Which statement best describes the goal of DevOps?

A) One goal of DevOps is to establish an environment where Change Management does not control application releases.

☒ B) One goal of DevOps is to establish an environment where releasing more reliable applications faster and more frequently can occur.

C) One goal of DevOps is to establish an environment where application development perform all operations tasks.

D) One goal of DevOps is to establish an environment where releasing applications is valued over the quality of the released application.

Is this statement correct? “DevOps is more than just a tool or a process change, it inherently requires an organisational culture shift”

- ☒ A) Yes, there needs to be cultural shift within the organisation across all stakeholders to ensure a successful adoption of a DevOps approach.
- ☐ B) Yes, but the most up to date tools and LEAN processes need to be in place to drive an organisational culture shift.
- ☐ C) No, DevOps is all about the tools.
- ☐ D) No, cultural shift will occur when staff are using the most up to date tools and LEAN processes.

The adoption of DevOps is being driven by factors such as:

- A) Use of Agile and other development processes and methodologies
- B) Demand for an increased rate of production releases from application and business unit stakeholders
- C) Wide availability of virtualised and cloud infrastructure from internal and external providers
- D) Increased usage of data centre automation and configuration management tools

Which factors are correct?

The development teams that support the Agile approach to DevOps must include staff from the operations teams to ensure:

- A) That stability is prioritised over creativity
- B) Operational considerations are prioritised over stability
- ☒ C) Operational considerations are taken into account
- D) The resultant designs of the systems will fit nicely into the business as usual environment

References and acknowledgement

Materials used in the lecture slides were adapted from

E. Wolff, A Practical Guide to Continuous Delivery,
Addison-Wesley

<https://www.guru99.com/devops-tutorial.html#5>

<https://martinfowler.com/bliki/DevOpsCulture.html>

<https://purplegriffon.com/quizzes/devops-mini>