A Gentle Introduction to DevOps

Learning Objectives

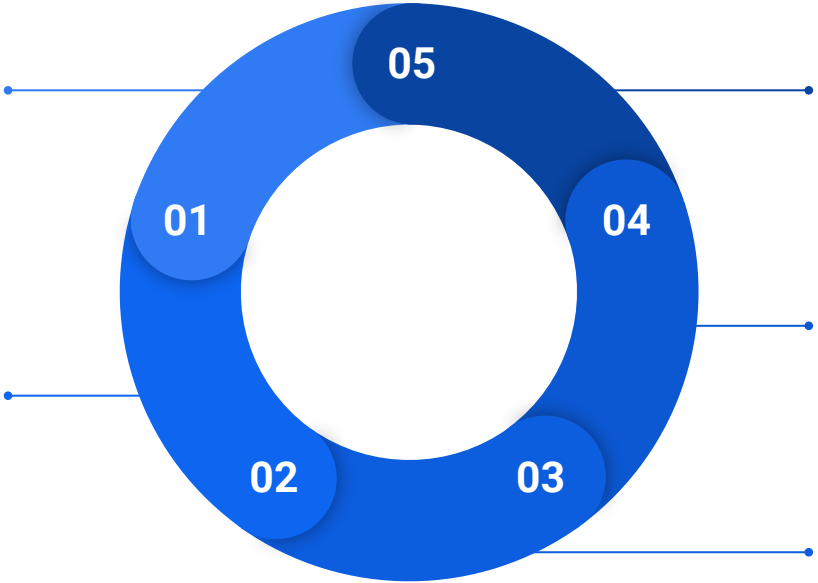
The learning objectives are to

- To explain DevOps through 5 P's framework
- To briefly review DevOps adoption in industry
- To briefly review DevOps Educational activities
- To explore DevOps research opportunities

Why you should know DevOps?

Industry Relevance.

Career Opportunities.



Preparing next generation students

Cross Disciplinary Skills

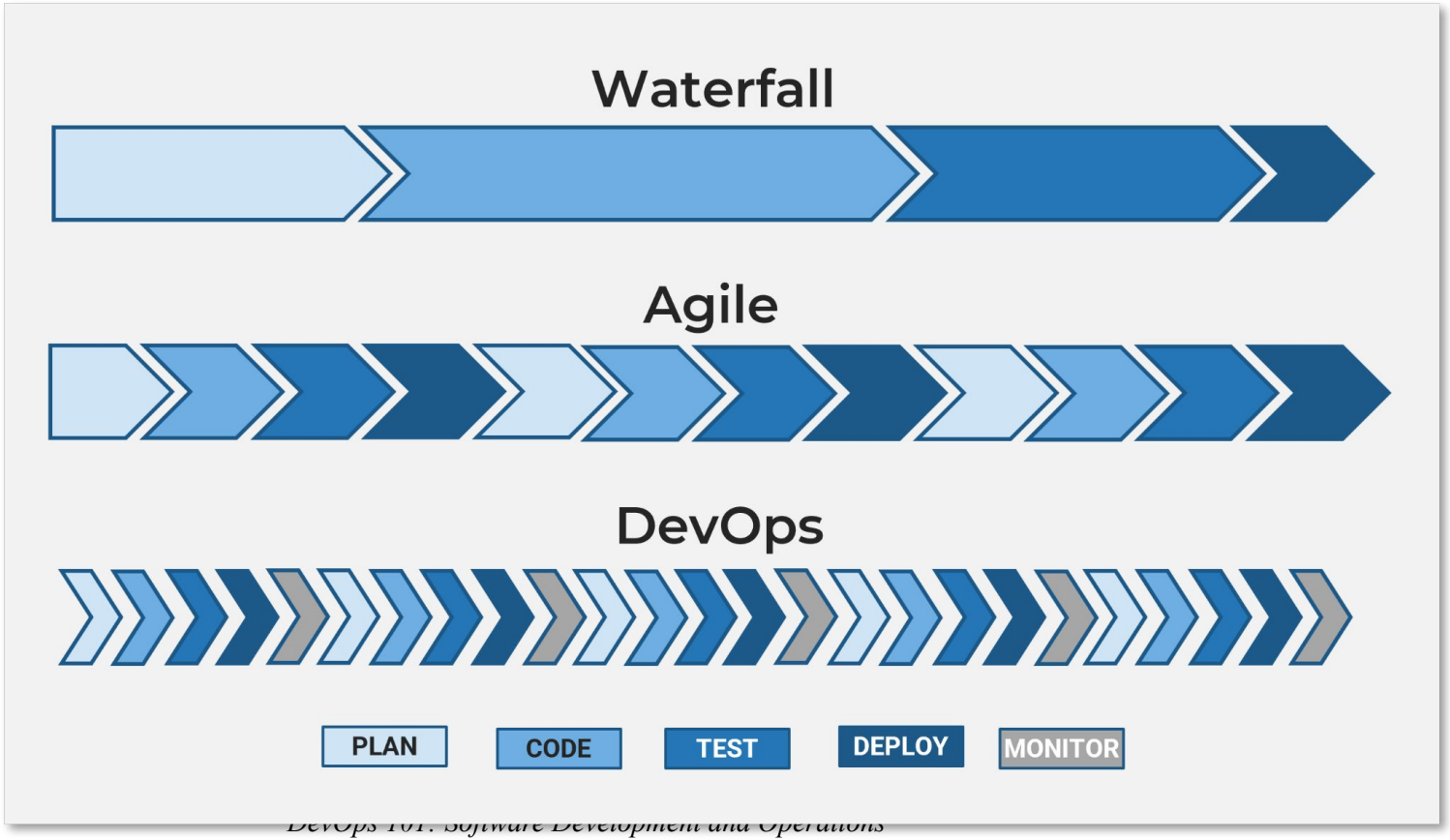
Enhanced Problem Solving Skills

Is DevOps a Component of Industry 4.0 in the Software Industry?

END OF THE 18TH CENTURY	START OF THE 20TH CENTURY	START OF THE 1970S	PRESENT
			
INDUSTRY 1.0 **Mechanization** Introduced mechanization of production by using water and steam to increase production capacity and productivity, versus manual craft work **1784** First mechanical loom	**INDUSTRY 2.0** **Electrification** Introduced labor-based mass production (assembly lines) powered by electrical energy **1870** First production line, Cincinnati slaughterhouses	**INDUSTRY 3.0** **Automatization** Introduced electronics and computers to replace manual work by stand-alone robotic systems **1969** First programmable logic controller (PLC), Modicon 084	**INDUSTRY 4.0** **Cyber-Physical Systems** The convergence of physical, digital, and virtual environments through **Cyber-Physical Systems (CPS)** and the **Internet of Things (IoT)**

	Industry 4.0	DevOps
Scope and Focus	Holistic industrial transformation	**Software development and delivery**
Industries	Manufacturing, logistics, healthcare, etc.	**Primarily software industry, but adaptable**
Technologies	IoT, AI, big data, automation, robotics	**CI/CD, automation, version control, etc.**
Goals	Operational efficiency, waste reduction, predictive maintenance	**Faster, reliable software releases**
Cross-Functional Collaboration	Collaborative teams in industrial settings	**Collaboration between dev and ops teams**
Applicability	Impacts various business operations	**Focused on software development and deployment**


DEV
OPS


Waterfall
Agile
DevOps
PLAN
CODE
TEST
DEPLOY
MONITOR

DevOps Timeline

DevOps Timeline

2008

DevOps is Introduced 01

Patrick Debois and Andrew Clay come with "DevOps" at "Birds of a Feather" Session

Agile Conference, Toronto

2009

02 1st DevOps Days

Short Description

Ghent, Belgium

2012

03 State of DevOps report

1st Report was drawn up and launched by Alanna Brown

Puppet

2013

04 The Phoenix Project Published

Fictional Novel about IT, DevOps and helping Organization adopt DevOps by **Nicole Forsgren, Gene Kim, Jez Humble** and others

IT Revolutions

2014

05 DevOps Impact "Enterprise"

Many organization adopt the DevOps culture. DevOps adoption increasing worldwide.

N..

06 Next Gen of DevOps

More organization using DevOps and SRE part of DevOps. DevSecOps approach introduced. More event like DevOps Days held Worldwide.

DevOps is?	DevOps is not
Concept	Open-source software
Mindset	A programming language
A culture that must be nurtured and iteratively improved	Easily achieved nor implemented
An excellent way to confidently develop and deliver software	A cloud infrastructure solution
A collaborative approach	A product or toolchain
A continuous activity	A marketing campaign

Defining DevOps

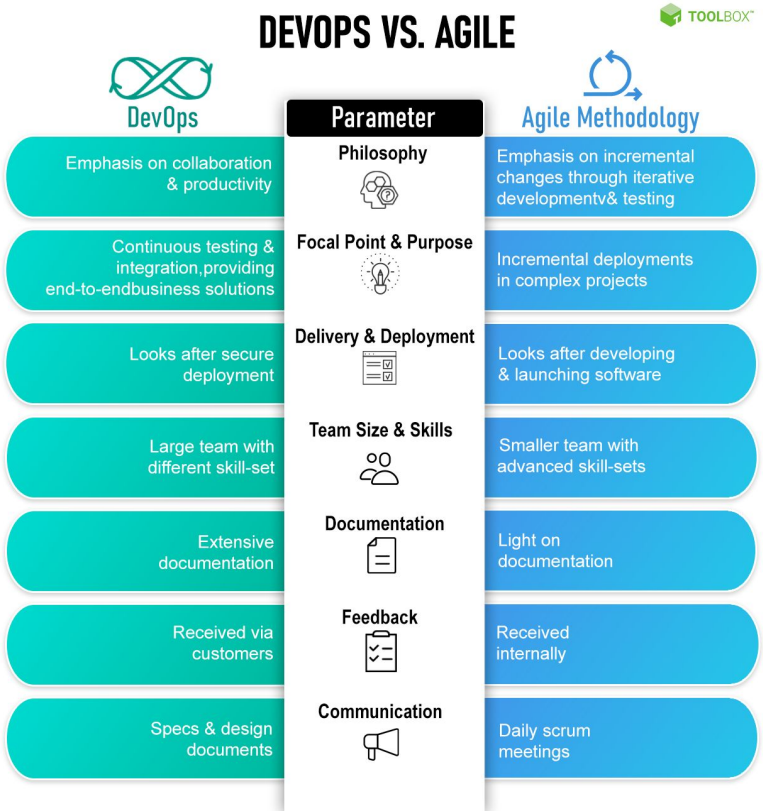
It is a set of practices combining software development (Dev) and IT operations (Ops). It aims to shorten the systems development life cycle and provide continuous delivery with high software quality.

Automates and integrates the processes of software development and IT teams so they can build, test, and release software faster and more reliably.

DevOps is a set of cultural norms and technical practices that enable organizations to deliver better software more quickly

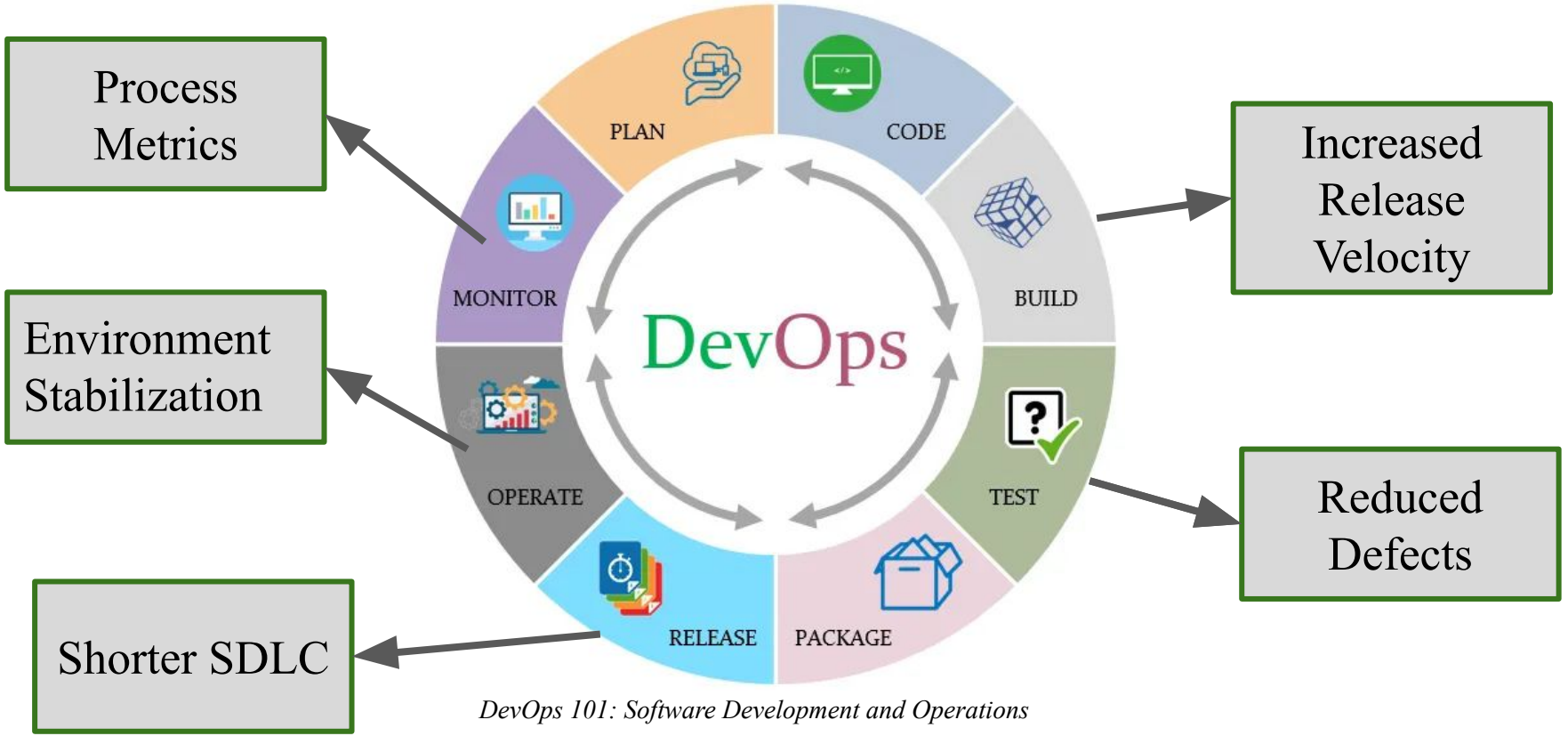
Defining DevOps

A set of processes that continuously delivers software reducing release time and improving the quality of the software iteratively.



DevOps 101: Software Development and Operations

Defining DevOps



DevOps 101: Software Development and Operations

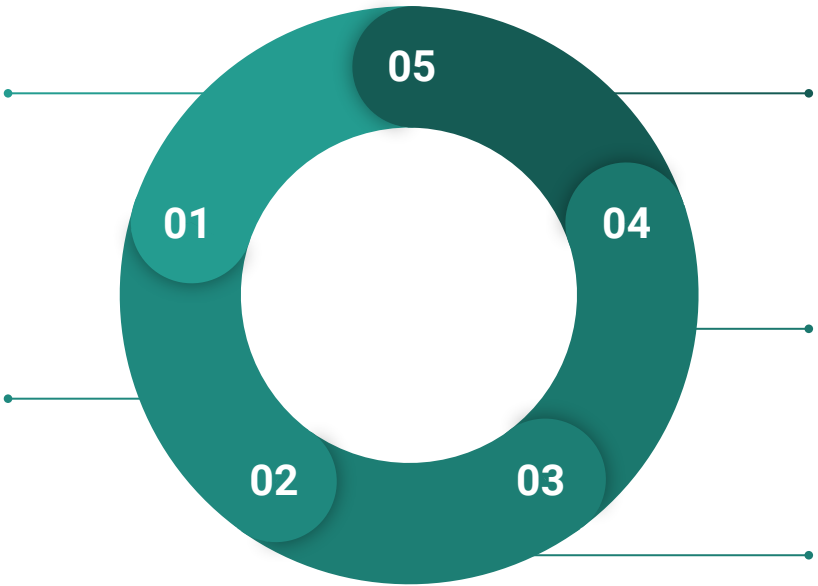
Process Perspective

Version Control	Automated Testing	Infrastructure as Code	CI/CD Pipeline	**Containeri-zation**
• Track Changes • Collaboration • Improve Code Quality	• Improve Software Quality • Speed up development	• Automation • Fault Tolerance • Scalability	• Automation • Collaboration • Speed up development	Containerization is a method of packaging, distributing, and managing software applications

Principle Perspective

Automation: Streamlining repetitive tasks.

Collaboration: Breaking down silos and fostering teamwork.

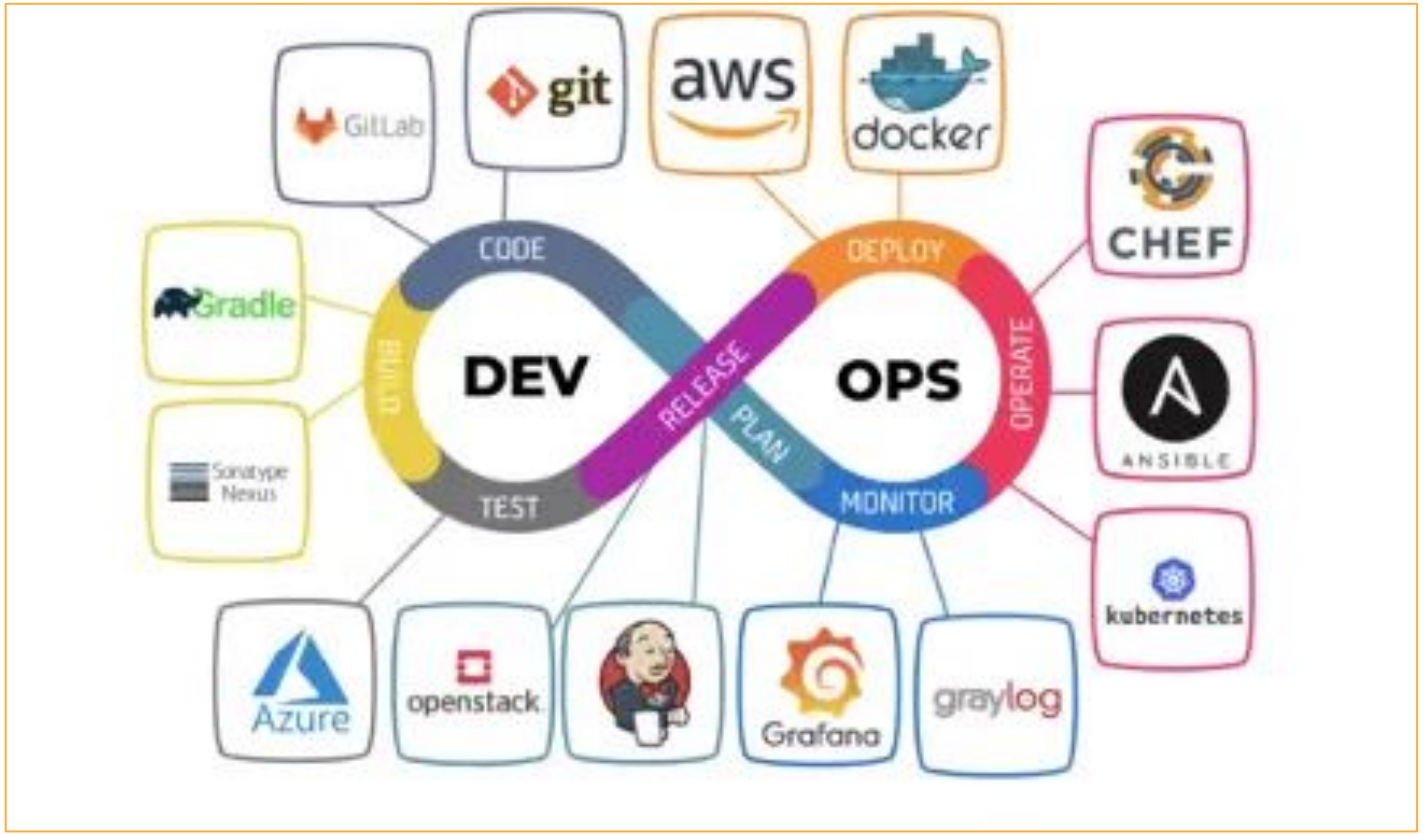


Monitoring and Feedback:

Continuous Deployment (CD)

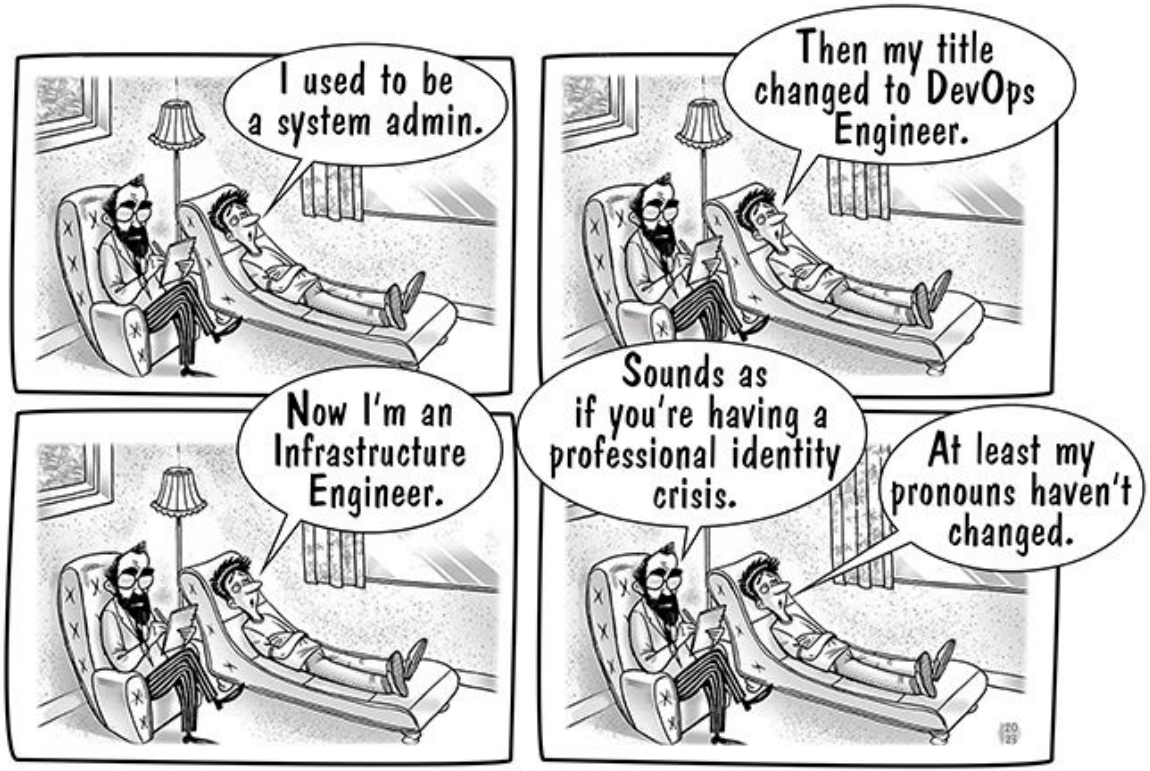
Continuous Integration (CI): Frequent code integration and testing

Product Perspective



DevOps 101: Software Development and Operations

DevOps Personas



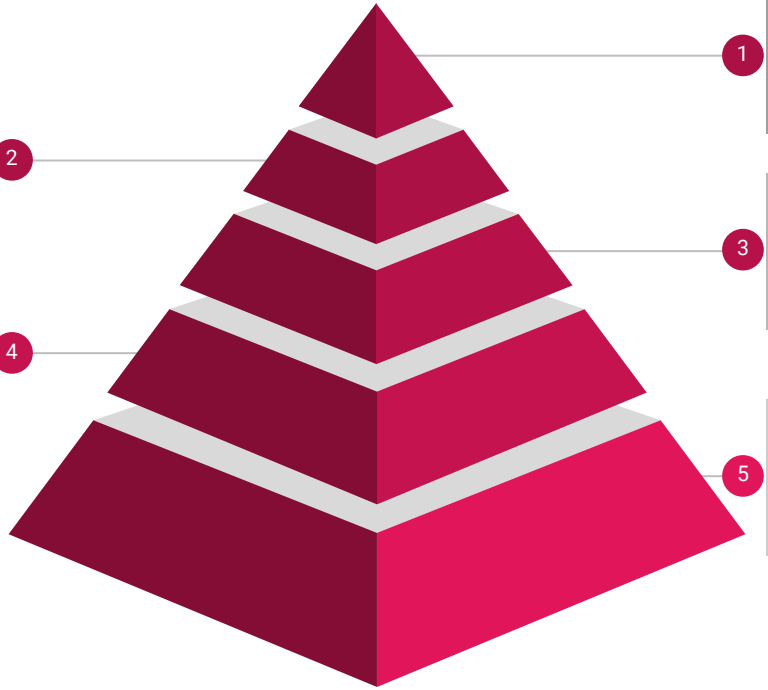
DevOps Personas

DevOps Engineer	**Responsible for designing, implementing, and managing the infrastructure, tools, and automation.**
Release Manager	**Release managers oversee the planning and coordination of software releases.**
Site Reliability engineer	**SREs focus on ensuring the reliability, performance, and availability of systems and applications**
CI/CD Engineer	**They ensure that code changes are automatically built, tested, and deployed, enabling a faster release cycle**
Containiration Specialist	**Containerization specialists focus on the use of container technologies such as Docker and Kubernetes.**

DevOps Practices

Requirements	Development	Build	Test	Deployment & Operations
Treat operational personnel as first class stakeholders.	Form small teams Use Unit testing Frameworks.	Support continuous integration. Adopt automated build tools	Perform Automated Testing Perform user acceptance testing	Support continuous deployment Continuously monitor and respond to error condition

Operational Perspective



1. Provisioning of Hardware
2. Business continuity and security.
3. Provisioning of Software
4. Capacity planning.
5. Service level agreements

DevOps Adoption in Industries and their impact

Netflix by implementing DevOps practices, Netflix achieved continuous deployment, enabling them to release new features and updates to millions of users seamlessly.

They use tools like Spinnaker for automated deployments and Chaos Monkey for resilience testing.

NETFLIX

DevOps Adoption in Industries and their impact

Facebook leverages DevOps for its fast-paced development and deployment.

They've built a robust automation framework that allows developers to continuously release code changes to a global audience while ensuring stability and security.

DevOps Adoption in Industries and their impact

NASA uses DevOps practices to manage its Mars Rover software. By implementing continuous integration and delivery, they reduced the time required to deploy and update software on the rover, ensuring mission success.

DevOps Adoption in Industries

Uber relies on DevOps practices to manage its extensive microservices architecture.

By automating deployment and monitoring, they ensure seamless and reliable ridesharing services on a global scale

Uber

Implementation challenges faced by industries

One of the most significant challenges in DevOps is **cultural transformation.** DevOps requires collaboration, communication, and a shared responsibility between development and operations teams. Overcoming cultural resistance, silos, and traditional ways of working can be challenging.

The DevOps landscape includes a wide array of tools for automation, continuous integration, containerization, orchestration, and monitoring. ***Selecting the right tools*** *and integrating them effectively can be a complex task, especially for organizations new to DevOps*

Implementation challenges faced by industries

Many organizations have ***legacy systems and processes*** that are not conducive to DevOps practices. Adapting these systems to work within a DevOps framework can be time-consuming and challenging. Legacy systems may **lack automation,** which is a core component of DevOps.

Effective monitoring and visibility into the entire DevOps pipeline are essential for identifying issues and ensuring continuous improvement. Setting up monitoring tools, creating meaningful metrics, and proactively addressing performance and reliability concerns can be a challenge.

Research Opportunities

- Security in DevOps
- Human Factors in DevOps
- Serverless and Microservices
- Machine Learning and AI in DevOps
- Performance Optimization
- Serverless and Edge Computing
- Container and Orchestration Security

Quiz time

Which of the following are THREE significant processes in DevOps

1. Version Control
2. Requirement Analysis
3. Automated Testing
4. Planning
5. Virtualization and Containerization

Quiz time

Which of the following drives the requirement analysis when DevOps is opted to manage software release cycle.THREE significant processes in DevOps

1. Separate functional requirements from non-functional.
2. Treat operational person as first class stakeholders
3. Quantify quality attributes
4. Identify test cases before use cases.

Quiz time

Which of the following is operational persona is responsible for overseeing reliability, availability and performance of a deployed application.

1. System Administrator
2. IT Manager
3. Chief Information Officer
4. Site Reliability Engineer

Quiz time

DevOps ecosystem is dominated by large number tools that automate release process

1. True
2. False

Quiz time

Developing robust automation tools to shorten the release process is on the of the best practice for organizations embracing DevOps culture.

1. True
2. False