CSE- 321
Software Engineering

Lecture: 10
Software Processes
(part-04)

Fahad Ahmed

Lecturer, Dept. of CSE

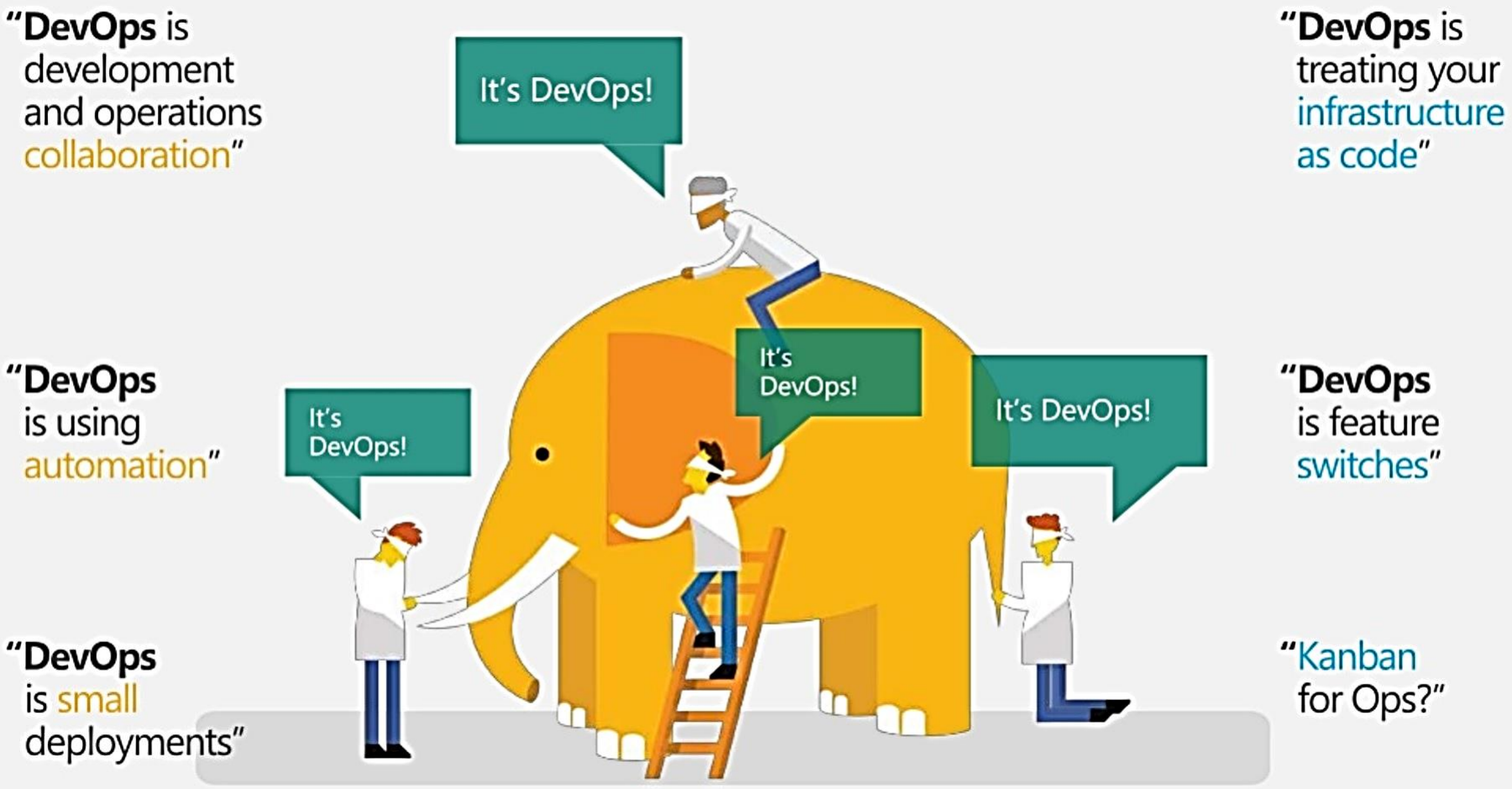
E-mail: fahadahmed@uap-bd.edu

Lecture Outlines

- DevOps
- How DevOps Works?
- Database DevOps Solutions
- How is DevOps different from agile methodology?
- Project that needs to implement DevOps
- DevOps: Miscellaneous

DevOps

Can you define DevOps?

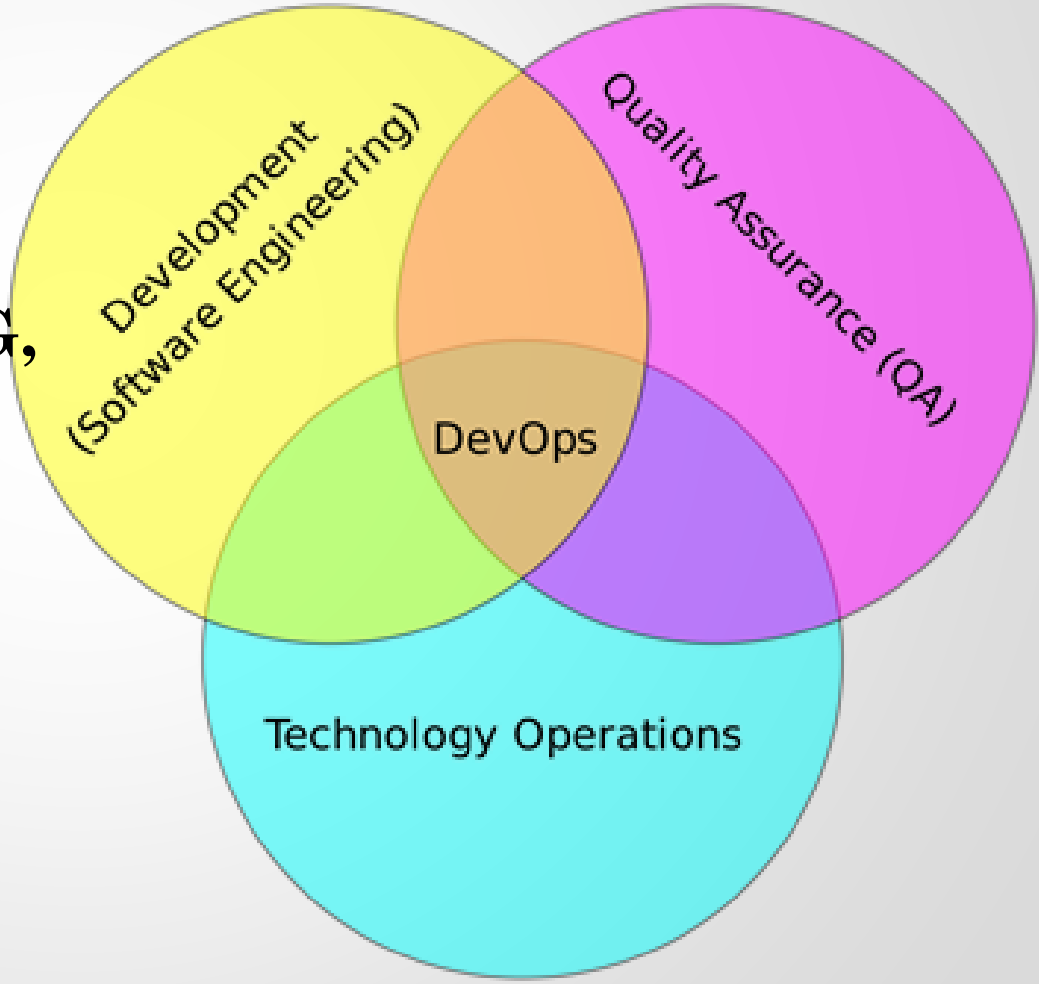


Kanban process visualizes the workflow which is easy to understand.

DevOps

DevOps isn't any single person's job. It's everyone's job.

Robert Krohn
HEAD OF ENGINEERING, DEVOPS AT ATLASSIAN

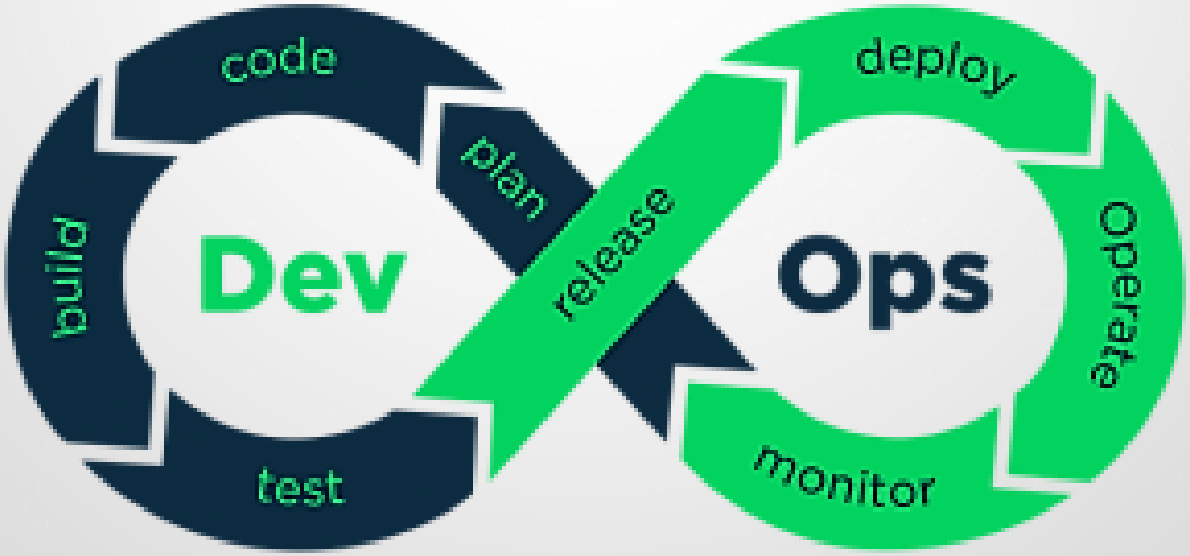


DevOps

Can you define DevOps?

DevOps philosophy permeates the modern world of software development. The DevOps **culture** is a practical implementation of the modified Agile methodology, and nowadays, it is the most efficient approach in software development.

DevOps is a software development methodology that improves the collaboration between developers and operations teams using various automation tools.



DevOps

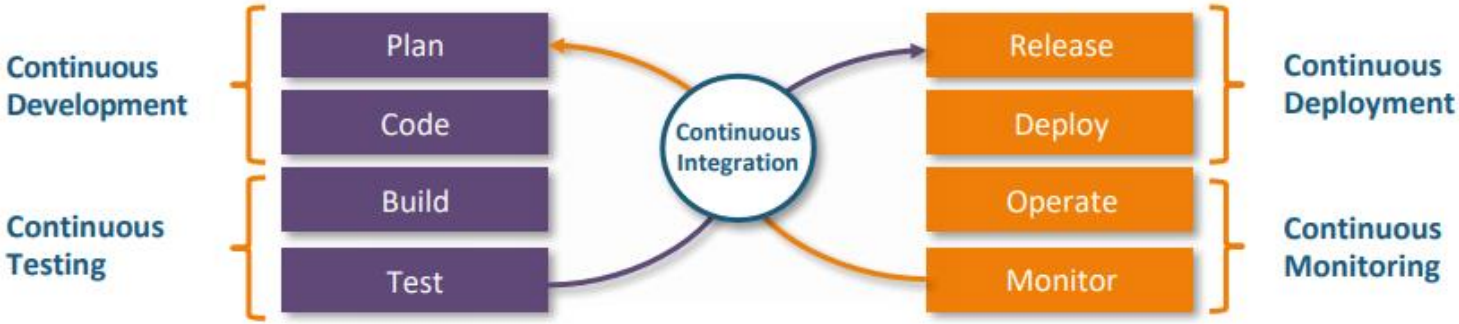
Can you define DevOps?

DevOps

How DevOps Works?

the process will look like the following:

1. **Plan** – This stage includes initial planning about how you envision the development process
2. **Code** – Coding the applications according to the requirements of the customer
3. **Build** – Integrate all of the various codes you have written
4. **Releases** – If the testing phase was successful, the application could go live
5. **Deploy** – The code is deployed to a cloud environment for additional usage
6. **Operate** – Conduct the operations on the code
7. **Monitor** – Keep an eye on how well the app is performing and make any changes necessary to satisfy the client.



https://www.edureka.co/blog/what-is-devops/

Mention some of the core benefits of DevOps.

The core benefits of DevOps are as follows:

Technical benefits

- Continuous software delivery
- Less complex problems to manage
- Early detection and faster correction of defects

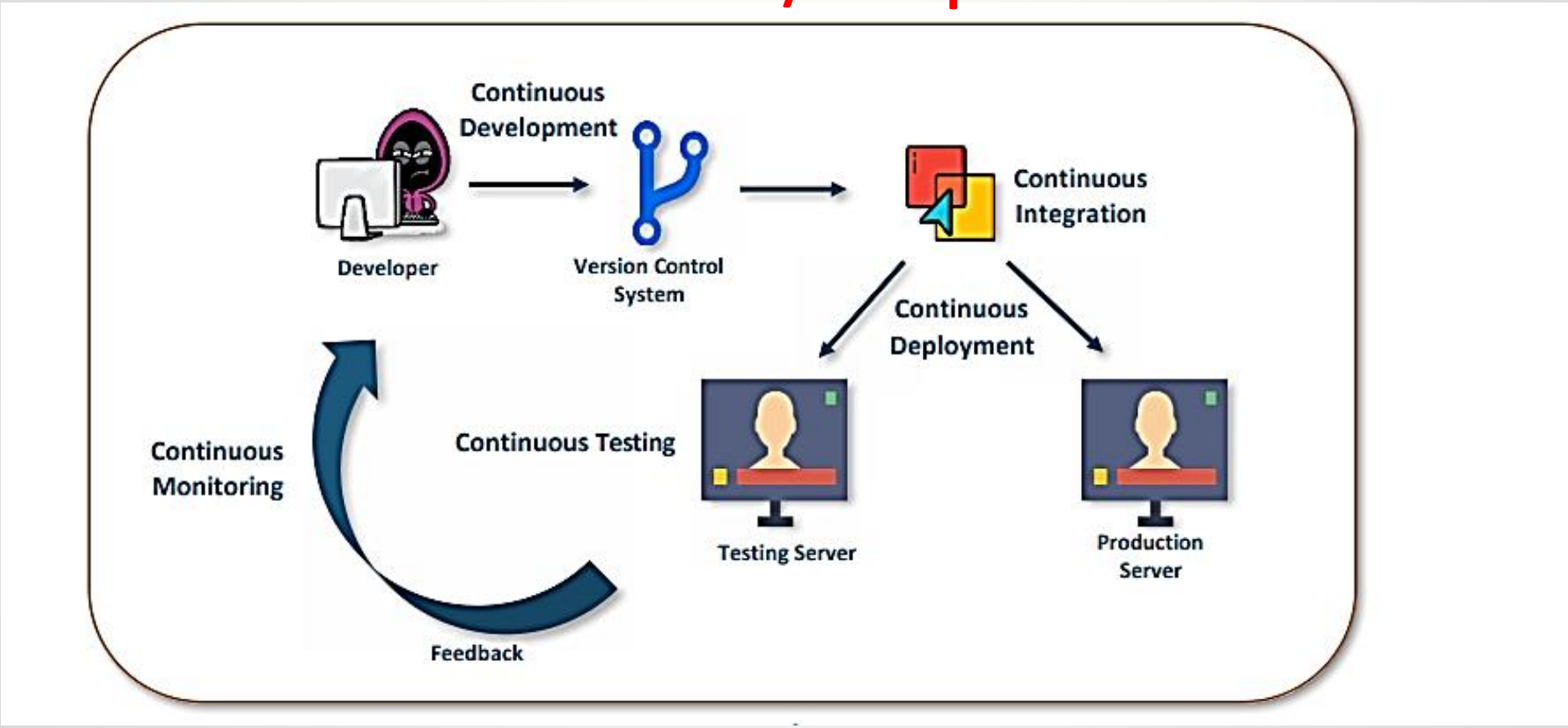
Business benefits

- Faster delivery of features
- Stable operating environments
- Improved communication and collaboration between the teams

DevOps

A **pipeline** is a process that drives software development through a path of building, testing, and deploying code, also known as **CI/CD**.

Automated CI/CD Pipeline



****Continuous Integration (CI) and Continuous Delivery (CD)**

https://www.geeksforgeeks.org/most-popular-devops-tools/

DevOps : CI-CD

Continuous Integration and Continuous Deployment

Adopting a DevOps culture allows you to deploy applications faster, meaning you can build, test and release software changes faster. This, in turn, leads to a 21% reduction in unplanned work and rework and a 19% increase in revenue. When you align database and application changes into a continuous integration and continuous deployment (CI/CD) workflow, you'll execute key database change management functions within your DevOps pipeline without compromising quality, performance or reliability, enabling your business to be more agile.

- **Source control integration**
- **Automated unit testing**
- **Automated code reviews**
- **Automated sensitive data protection**
- **Automated database, schema and data changes**

Database DevOps Solutions

Database Performance Monitoring

Get real-time alerting to database-related performance problems throughout the CI/CD pipeline in order to help expedite fast and effective corrective action. Use long-term history to compare performance patterns before and after changes to verify their impact.

- Multi-platform dashboard with notifications
- Performance baseline deviation alarms
- Change tracking analysis
- Multi-dimensional workload analysis
- Long-term historical analysis

Database DevOps Solutions

Database Replication

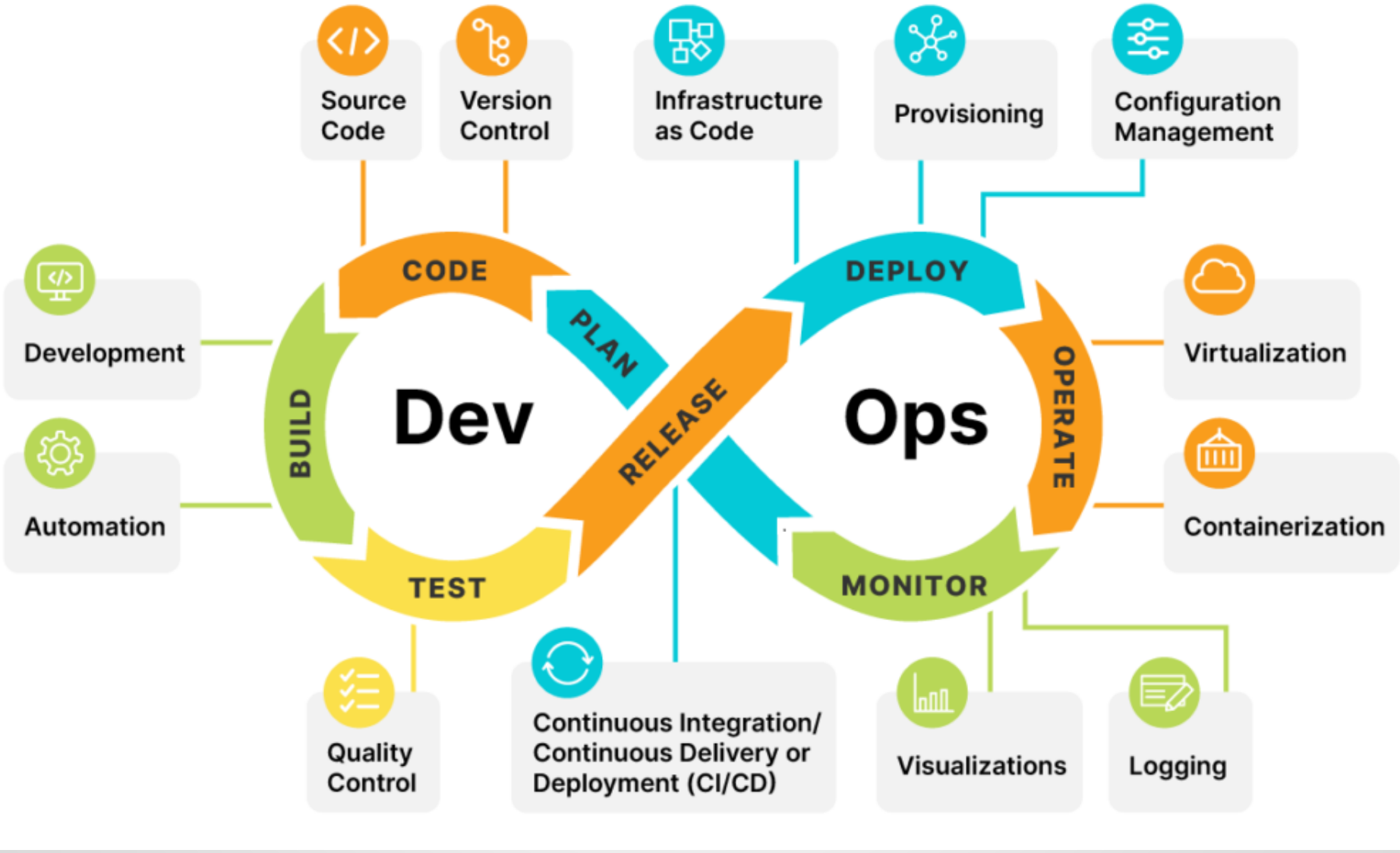
Easily achieve Oracle database high availability, increase scalability, integrate data and offload reporting with the all-inclusive solution your database vendor doesn't want you to know about.

- All-in-one license
- One tool, many uses – including offload reporting
- Safe Oracle database migrations and upgrades
- Near real-time data integration and replication

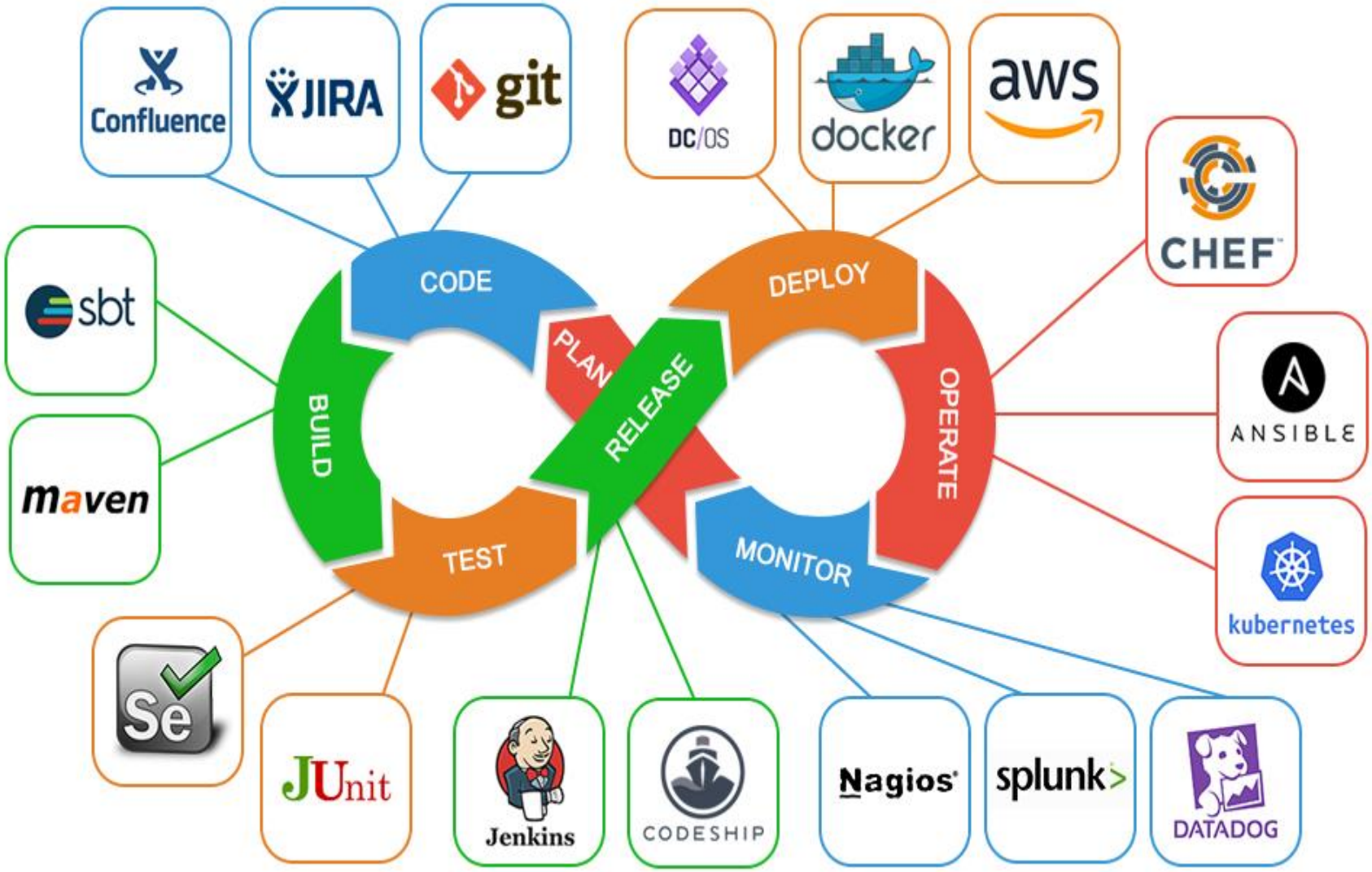
The judges at the 2020 **Computing DevOps Excellence Awards** were looking for the tool that best meets the needs of companies seeking to automate their delivery workflows.

Toad DevOps Toolkit was named the winner in the Best Continuous Deployment Tool category.

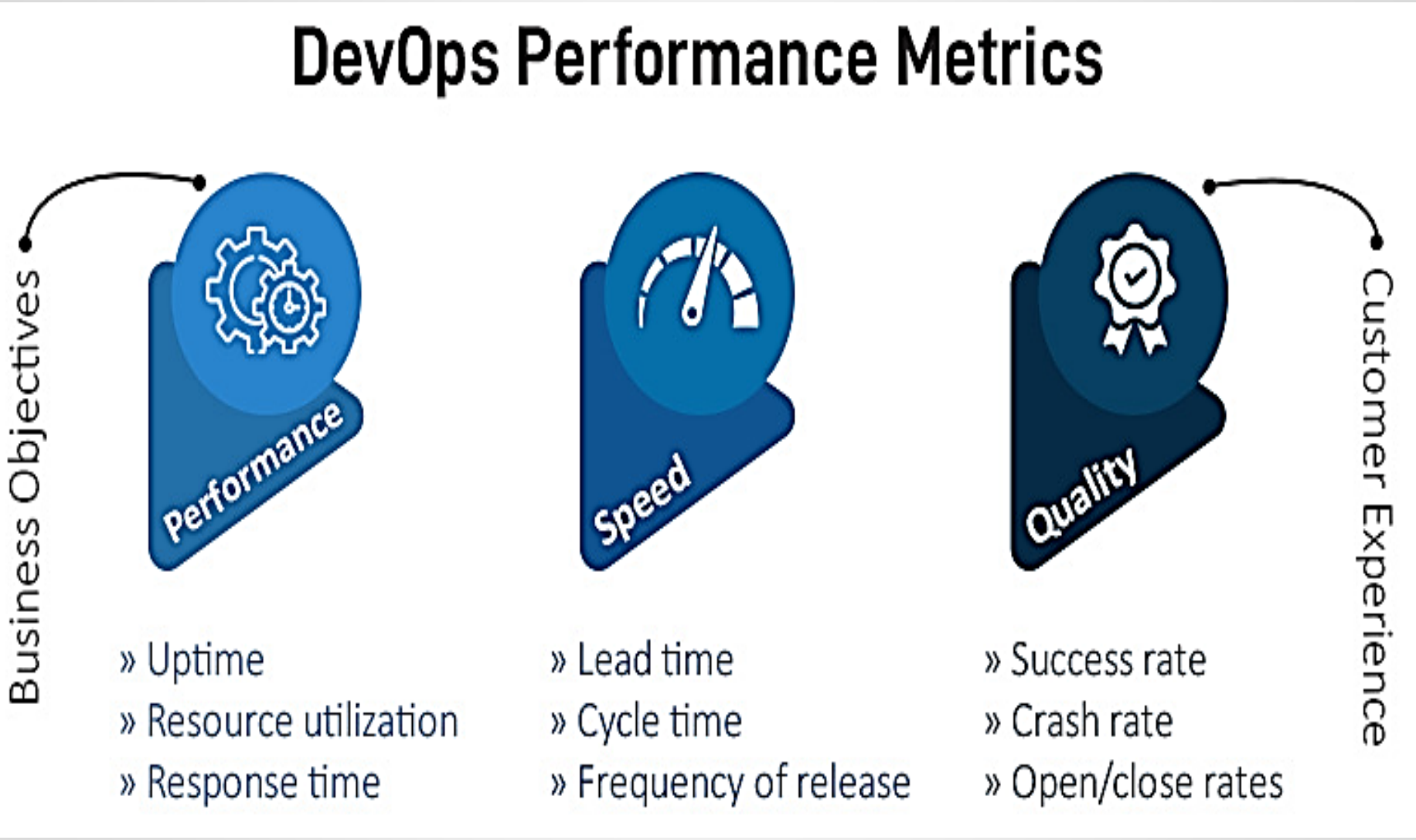
DevOps Process with a Toolchain Loop



DevOps Process with a Toolchain Loop



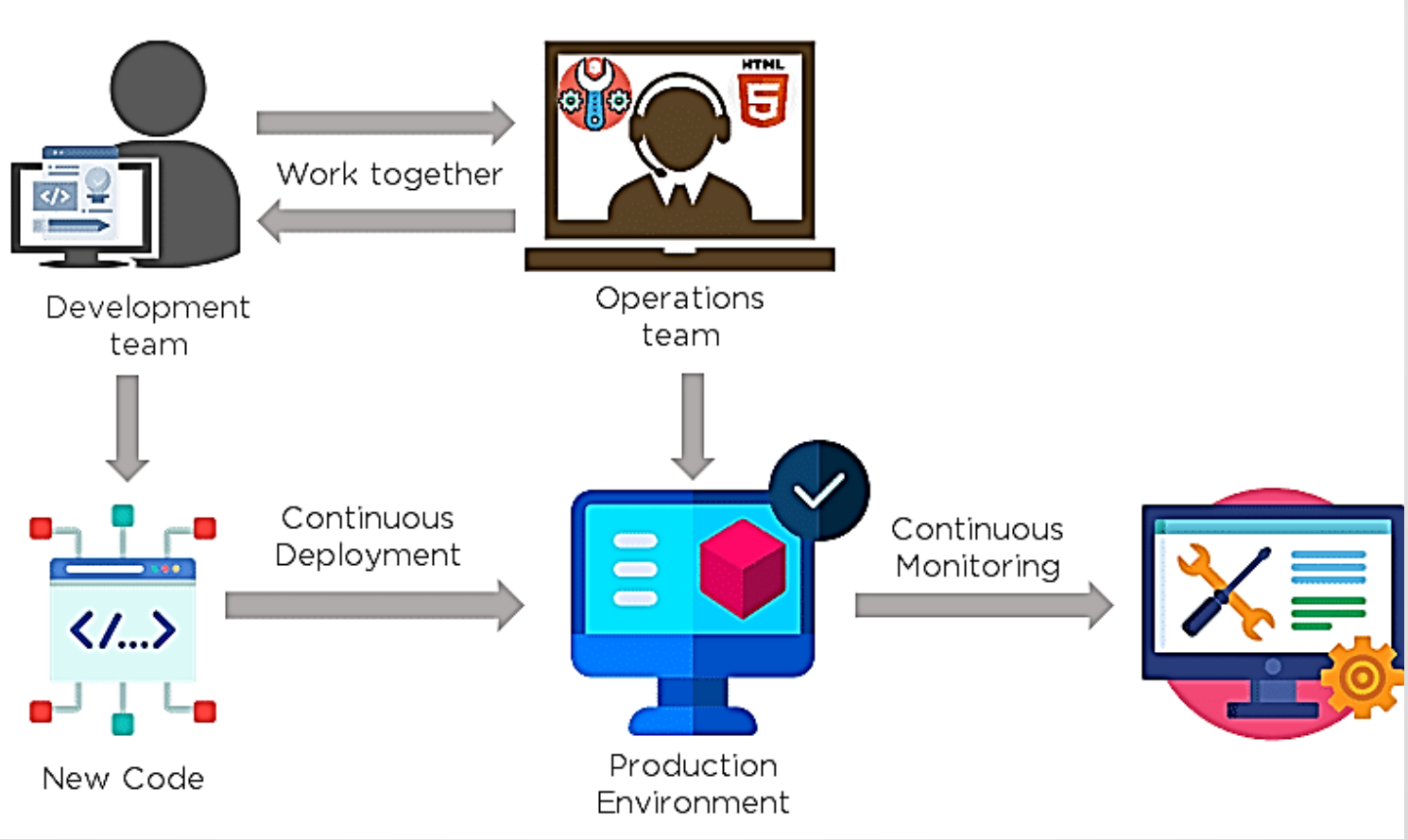
Performance Monitoring



How is DevOps different from agile methodology?

DevOps promotes collaboration between **Development** and **Operations** team to deploy code to production faster in an automated & repeatable way.

- Target areas: End to End business solution and fast delivery.
- Feedback comes from the internal team.
- Automation is the primary goal of DevOps.

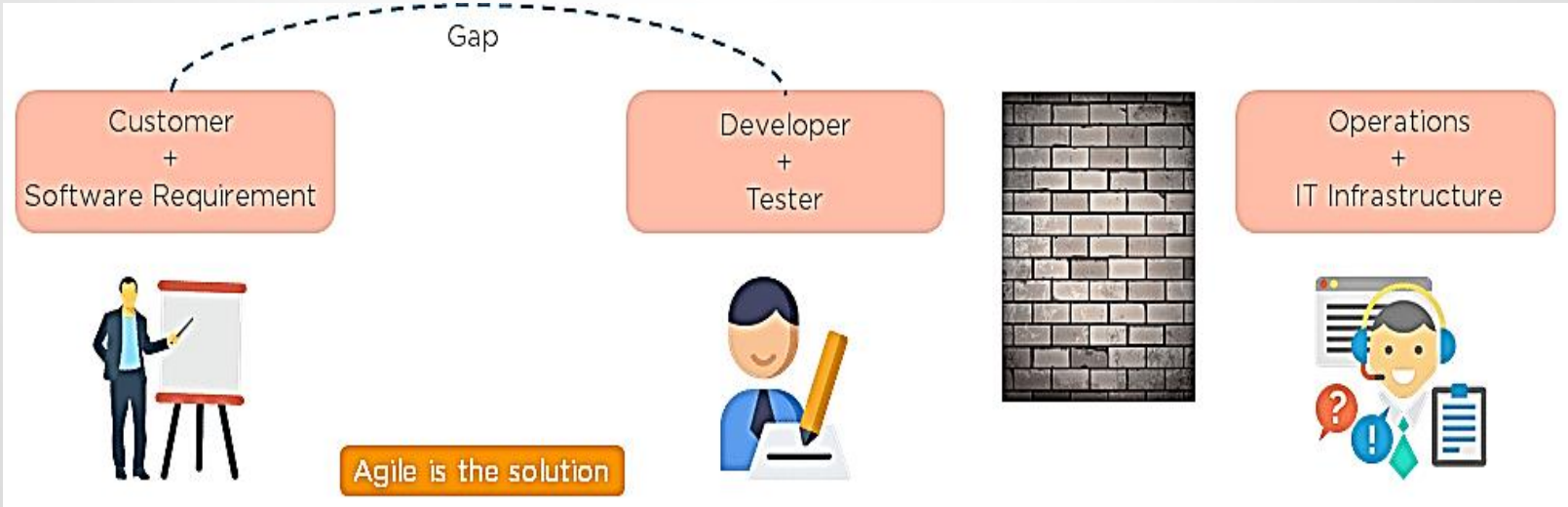


How is DevOps different from agile methodology?

Agile is a **software development methodology** that focuses on iterative, incremental, small, and rapid releases of software, along with customer feedback. It addresses gaps and conflicts between the **customer** and **developers.**

The Agile software development focus on the **four core values**, such as:

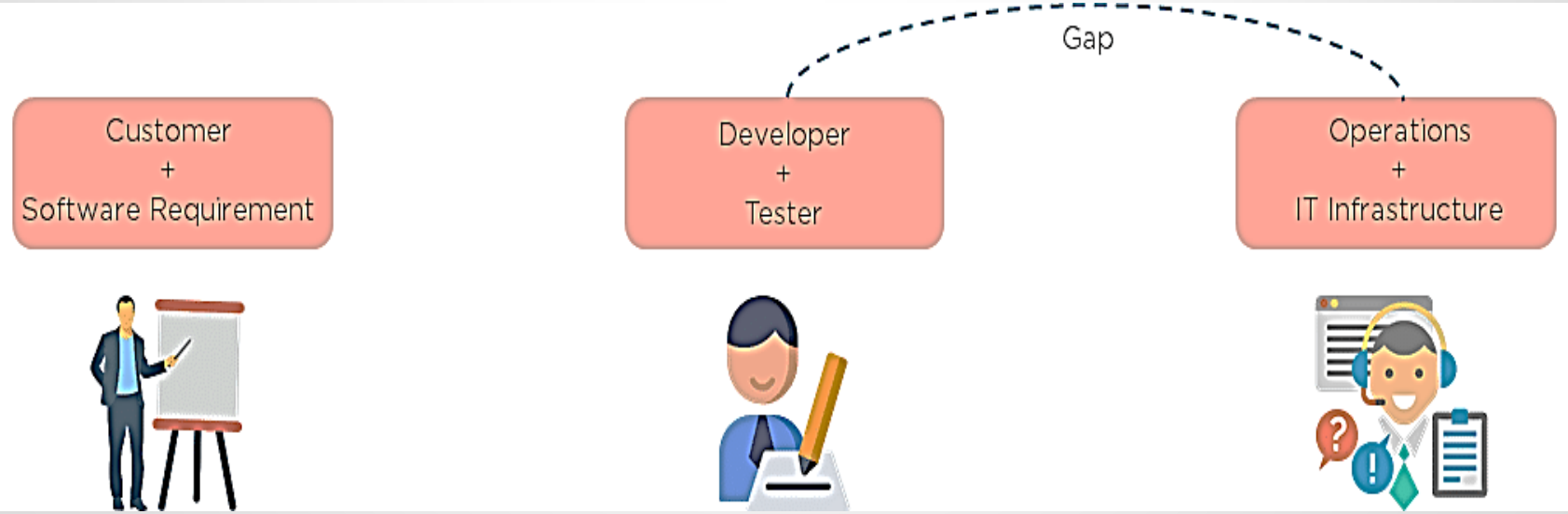
1. Working software over comprehensive documentation.
2. Responded to change over following a plan.
3. Customer collaboration over contract negotiation.
4. Individual and team interaction over the process and tools.



How is DevOps different from agile methodology?

DevOps is an extension of agile built around the practices that are not in Agile's focus. DevOps addresses gaps and conflicts between the **Developers** and **IT Operations**.

- Agile centers the flow of software from ideation to code completion — DevOps extends the focus to delivery and maintenance.
- Agile adds structure to planned work for developers — DevOps incorporates unplanned work common to operations teams.



Agile vs. DevOps

Characteristics	Agile	DevOps
Work Scope	Only Agility	Automation needed along with Agility
Focus Area	Main priority is Time and deadlines	Quality and Time management are of equal priority
Feedback Source	The main source of feedback - customers	The main source of feedback - self (tools used for monitoring)
Practices or Processes followed	Practices like Agile Kanban, Scrum, etc., are followed.	Processes and practices like Continuous Development (CD), Continuous Integration (CI), etc., are followed.
Development Sprints or Release cycles	Release cycles are usually smaller.	Release cycles are smaller, along with immediate feedback.
Agility	Only development agility is present.	Both in operations and development, agility is followed.

Agile vs. DevOps

Characteristics	Agile	DevOps
Basic Philosophy	A culture that focuses on continuously delivering small manageable increments of a project through iterative development and testing.	A practice in which the development and operations team work together is integrated to improve collaboration and productivity.
Use	It can be utilized in any department to help manage a complex project.	Focuses on the end-to-end engineering process.
Focus	Creating an environment that welcomes mid-project changes to improve quality.	Merging development and operations teams to ensure they practice continual testing and development.
Team	Smaller in number, team members work closely together and have similar skill sets.	A wide variety of skill sets inside a larger team which consists of multiple departments.
Delivery	Incremental deployments after each sprint (usually a weekly or biweekly period).	The goal is to provide continuous delivery daily (or even every few hours).
Documentation	Extremely light documentation to enhance flexibility in the development process.	Sufficient documentation to ensure the teams collaborate well. Emphasizing communication over official documentation.
Quality and Risk	The quality of the product increases, while the risk decreases after every sprint.	Production of high-quality products with low risk due to effective collaboration and automated testing.
Feedback	Focuses on customer feedback and adjusts the product accordingly.	Encourages internal feedback among teammates to improve and speed up delivery.
Tools	Kanboard, JIRA, Active Collab, Bugzilla, Slack, Trello.	TeamCity, AWS, Puppet, OpenStack, Docker, Jenkins, Kubernetes, GitLab.

Project that needs to implement DevOps

How will you approach a project that needs to implement DevOps?

The following standard approaches can be used to implement DevOps in a specific project:

Stage 1: An assessment of the existing process and implementation for about two to three weeks to identify areas of improvement so that the team can create a road map for the implementation.

Stage 2: Create a proof of concept (PoC). Once it is accepted and approved, the team can start on the actual implementation and roll-out of the project plan.

Stage 3: The project is now ready for implementing DevOps by using version control/integration/testing/deployment/delivery and monitoring followed step by step.

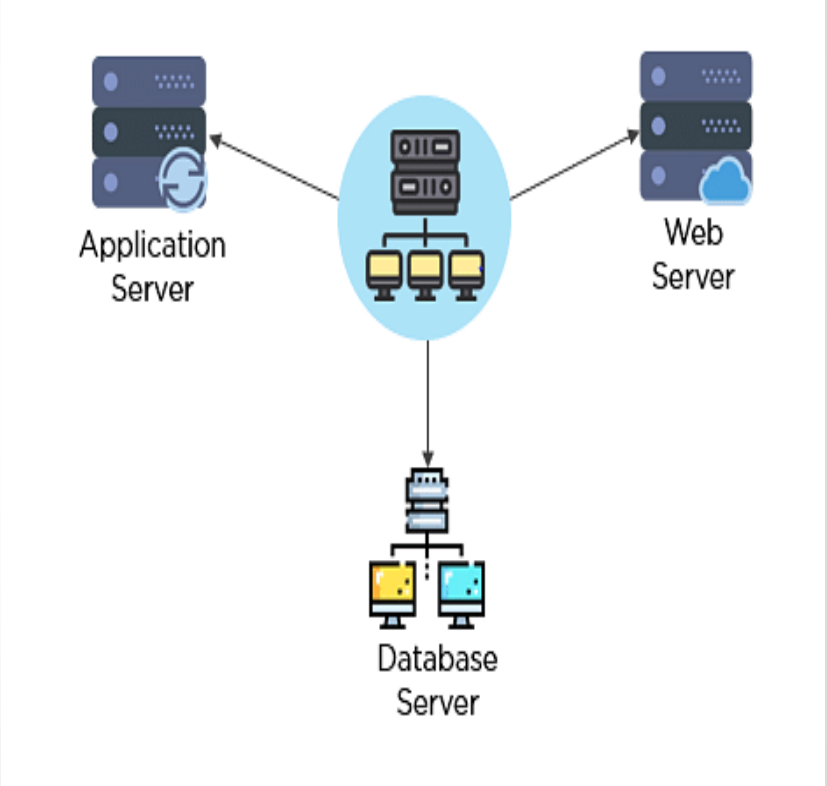
By following the proper steps for version control, integration, testing, deployment, delivery, and monitoring, the project is now ready for DevOps implementation.

DevOps: Continuous Monitoring

How does continuous monitoring help you maintain the entire architecture of the system?

Continuous monitoring in DevOps is a process of detecting, identifying, and reporting any faults or threats in the entire infrastructure of the system.

- Ensures that all services, applications, and resources are running on the servers properly.
- Monitors the status of servers and determines if applications are working correctly or not.
- Enables continuous audit, transaction inspection, and controlled monitoring.



DevOps: Continuous Monitoring

Prometheus

Prometheus is a monitoring and alerting toolkit built by sound cloud. It's an open-source tool mostly written in GoLang. It collects metrics from the given target and also triggers alerts when needed. It has a multidimensional data model for collecting time series data to generate tables and graphs.

- ❖ Stores time series both on memory as well as on local disk.
- ❖ It contains custom libraries that are easy to implement.

New Relic

New Relic is a cloud-based (SaaS) solution which is developed to work in real-time with a web app; It has a dynamic and flexible monitoring system that can monitor applications like Ruby, Java, NodeJs etc.

- ❖ Provides real-time insight into the running app.
- ❖ It performs the in-depth analysis of the app.
- ❖ It has real-time error analysis with on-demand diagnostic tools.

DevOps: Miscellaneous

Two-factor authentication is a security method in which the user provides two ways of identification from separate categories.

A **canary release** is a pattern which reduces the risk of introducing a new version software into the production environment. It is done by making it available in a controlled manner to a subset of the user. Before making it available to the complete user set.

Infrastructure as Code (IaC)
It is the concept of managing infrastructures like data server, storage, and networks using the code rather than operating them manually, in other words, we use machine-readable files to set up the infrastructure of a system.

Puppet is a useful project management tool. It helps you to automate administration tasks.

Slack has transformed business communication. It's the leading channel-based messaging platform, used by millions to align their teams, unify their systems, and drive their businesses forward.

DevOps: Miscellaneous

The **chef** is an automation DevOps tool that helps in achieving speed, scale, and consistency. It also used for defining Infrastructure as Code (IaC). It works on the client-server server architecture, and It uses pure-ruby, domain-specific language (DSL) for writing the configuration for the system.

Jenkins is a self-contained open source automation tool in DevOps, which can perform continuous integration and other automation tasks. It's entirely written in java, and it is one of the most widely used tools in the world.

Docker is a world-leading container platform, and it's an open-source DevOps tool that packages the application alongside with dependencies in the form of docker containers and deploys them on any platforms.

Selenium is an open-source automated testing tool, it works on a web framework, and it only tests web applications. Selenium does not check any mobile or desktop application.

DevOps: Miscellaneous

- DevOps vs. SysOps.
- DevSecOps vs. BizDevOps vs. GitOps
- DevOps as a service: As-a-service models

https://www.techtarget.com/searchitoperations/definition/DevOps

DevOps: Question

1. How is DevOps different from agile methodology?
2. What are the different phases in DevOps?
3. How does DevOps continuous monitoring help you maintain the entire architecture of the system?
4. What are the Common Practices for CI/CD?

https://www.quora.com/

No More Today

Thanks to All