

DevOps Pipeline

A pipeline in software engineering team is a set of automated processes which allows DevOps professionals and developer to reliably and efficiently compile, build, and deploy their code to their production compute platforms.

The most common components of a pipeline in DevOps are build automation or continuous integration, test automation, and deployment automation.

A pipeline consists of a set of tools which are classified into the following categories such as:

- Source control
- Build tools
- Containerization
- Configuration management
- Monitoring

Continuous Integration Pipeline

Continuous integration (CI) is a practice in which developers can check their code into a version-controlled repository several times per day. Automated build pipelines are triggered by these checks which allows fast and easy to locate error detection.

Some significant benefits of CI are:

- Small changes are easy to integrate into large codebases.
- More comfortable for other team members to see what you have been working.
- Fewer integration issues allowing rapid code delivery.
- Bugs are identified early, making them easier to fix, resulting in less debugging work.

Continuous Delivery Pipeline

Continuous delivery (CD) is the process that allows operation engineers and developers to deliver bug fixes, features, and configuration change into production reliably, quickly, and sustainably. Continuous delivery offers the benefits of code delivery pipelines, which are carried out that can be performed on demand.

Some significant benefits of the CD are:

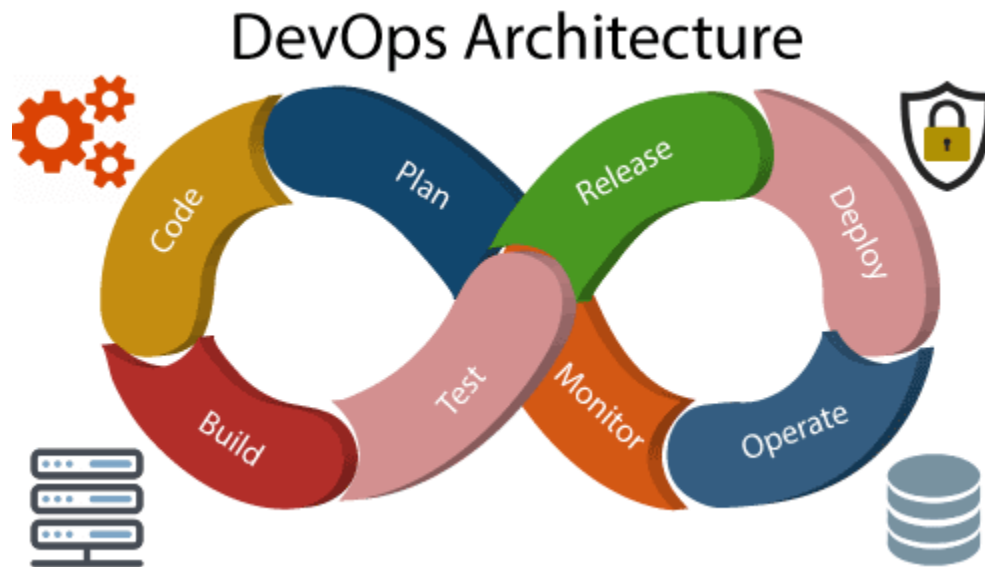
- Faster bug fixes and features delivery.
- CD allows the team to work on features and bug fixes in small batches, which means user feedback received much quicker. It reduces the overall time and cost of the project.

DevOps Methodology

We have a demonstrated methodology that takes an approach to cloud adoption. It accounts for all the factors required for successful approval such as people, process, and technology, resulting in a focus on the following critical consideration:

- **The Teams:** Mission or project and cloud management.
- **Connectivity:** Public, on-premise, and hybrid cloud network access.
- **Automation:** Infrastructure as code, scripting the orchestration and deployment of resources.
- **On-boarding Process:** How the project gets started in the cloud.
- **Project Environment:** TEST, DEV, PROD (identical deployment, testing, and production).
- **Shared Services:** Common capabilities provided by the enterprise.
- **Naming Conventions:** Vital aspect to track resource utilization and billing.
- **Defining Standards Role across the Teams:** Permissions to access resources by job function.

DevOps Architecture



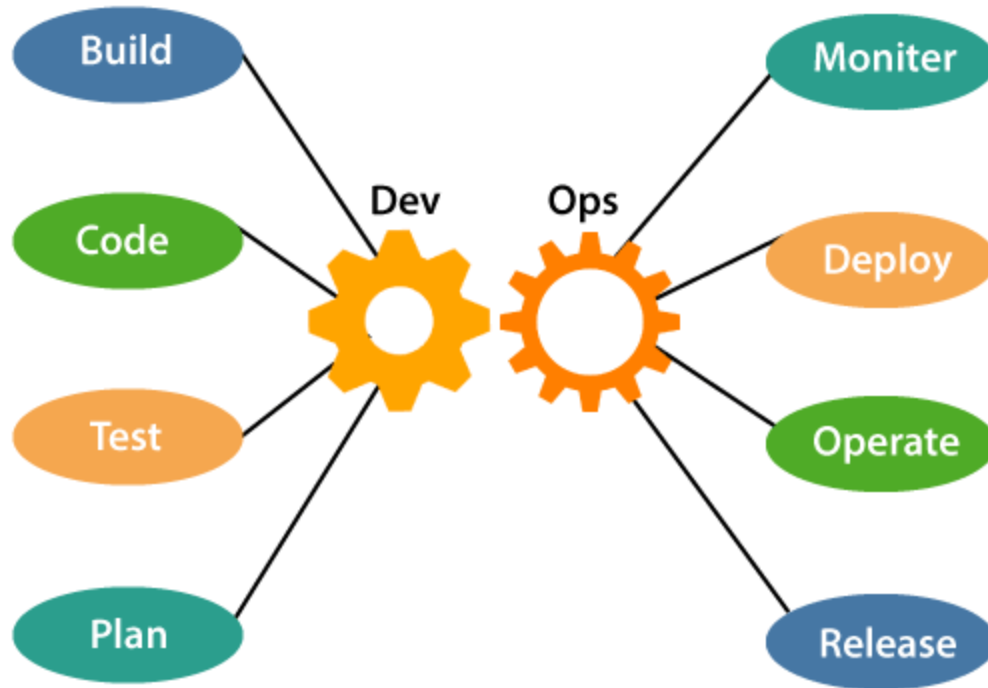
Development and operations both play essential roles in order to deliver applications. The deployment comprises analyzing the **requirements**, **designing**, **developing**, and **testing** of the software components or frameworks.

The operation consists of the administrative processes, services, and support for the software. When both the development and operations are combined with collaborating, then the DevOps architecture is the solution to fix the gap between deployment and operation terms; therefore, delivery can be faster.

DevOps architecture is used for the applications hosted on the cloud platform and large distributed applications. Agile Development is used in the DevOps architecture so that integration and delivery can be contiguous. When the development and operations team works separately from each other, then it is time-consuming to **design**, **test**, and **deploy**. And if the terms are not in sync with each other, then it may cause a delay in the delivery. So DevOps enables the teams to change their shortcomings and increases productivity.

Below are the various components that are used in the DevOps architecture:

DevOps Components



1) Build

Without DevOps, the cost of the consumption of the resources was evaluated based on the pre-defined individual usage with fixed hardware allocation. And with DevOps, the usage of cloud, sharing of resources comes into the picture, and the build is dependent upon the user's need, which is a mechanism to control the usage of resources or capacity.

2) Code

Many good practices such as Git enables the code to be used, which ensures writing the code for business, helps to track changes, getting notified about the reason behind the difference in the actual and the expected output, and if necessary reverting to the original code developed. The code can be appropriately arranged in **files, folders**, etc. And they can be reused.

3) Test

The application will be ready for production after testing. In the case of manual testing, it consumes more time in testing and moving the code to the output. The testing can be

automated, which decreases the time for testing so that the time to deploy the code to production can be reduced as automating the running of the scripts will remove many manual steps.

4) Plan

DevOps use Agile methodology to plan the development. With the operations and development team in sync, it helps in organizing the work to plan accordingly to increase productivity.

5) Monitor

Continuous monitoring is used to identify any risk of failure. Also, it helps in tracking the system accurately so that the health of the application can be checked. The monitoring becomes more comfortable with services where the log data may get monitored through many third-party tools such as **Splunk**.

6) Deploy

Many systems can support the scheduler for automated deployment. The cloud management platform enables users to capture accurate insights and view the optimization scenario, analytics on trends by the deployment of dashboards.

7) Operate

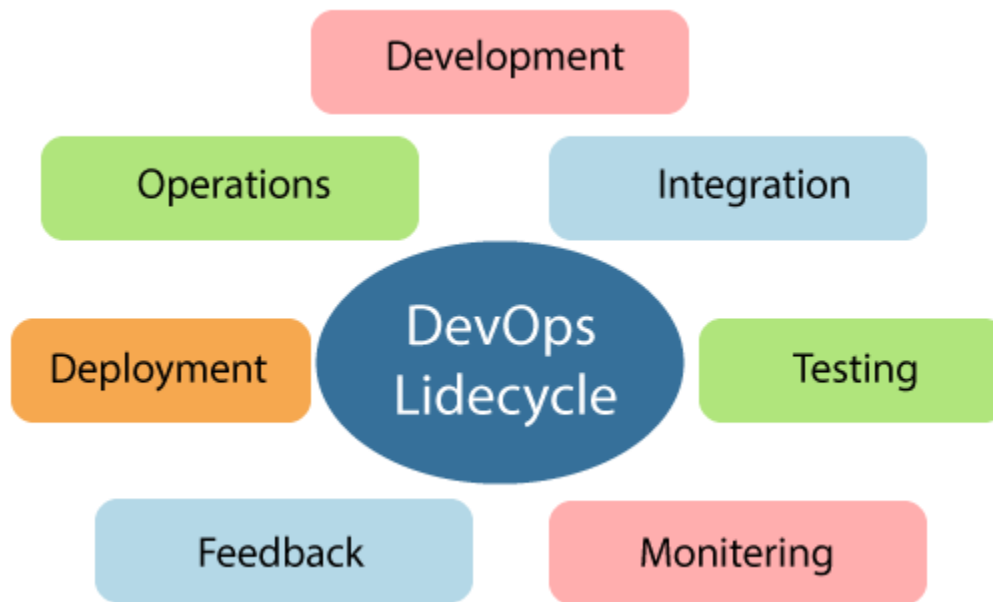
DevOps changes the way traditional approach of developing and testing separately. The teams operate in a collaborative way where both the teams actively participate throughout the service lifecycle. The operation team interacts with developers, and they come up with a monitoring plan which serves the IT and business requirements.

8) Release

Deployment to an environment can be done by automation. But when the deployment is made to the production environment, it is done by manual triggering. Many processes involved in release management commonly used to do the deployment in the production environment manually to lessen the impact on the customers.

DevOps Lifecycle

DevOps defines an agile relationship between operations and Development. It is a process that is practiced by the development team and operational engineers together from beginning to the final stage of the product.



Learning DevOps is not complete without understanding the DevOps lifecycle phases. The DevOps lifecycle includes seven phases as given below:

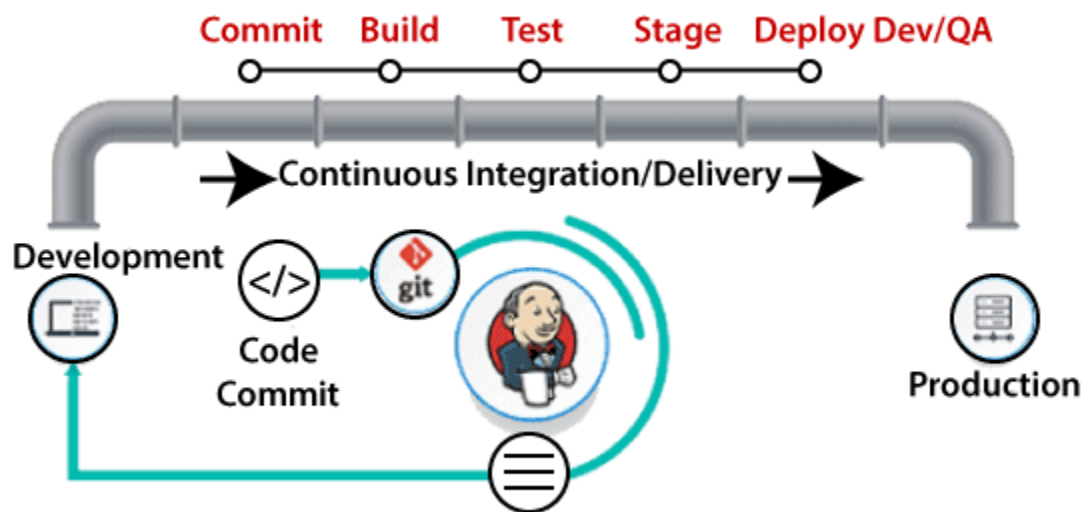
1) Continuous Development

This phase involves the planning and coding of the software. The vision of the project is decided during the planning phase. And the developers begin developing the code for the application. There are no DevOps tools that are required for planning, but there are several tools for maintaining the code.

2) Continuous Integration

This stage is the heart of the entire DevOps lifecycle. It is a software development practice in which the developers require to commit changes to the source code more frequently. This may be on a daily or weekly basis. Then every commit is built, and this allows early detection of problems if they are present. Building code is not only involved compilation, but it also includes **unit testing, integration testing, code review, and packaging**.

The code supporting new functionality is continuously integrated with the existing code. Therefore, there is continuous development of software. The updated code needs to be integrated continuously and smoothly with the systems to reflect changes to the end-users.



Jenkins is a popular tool used in this phase. Whenever there is a change in the Git repository, then Jenkins fetches the updated code and prepares a build of that code, which is an executable file in the form of war or jar. Then this build is forwarded to the test server or the production server.

3) Continuous Testing

This phase, where the developed software is continuously testing for bugs. For constant testing, automation testing tools such as **TestNG**, **JUnit**, **Selenium**, etc are used. These tools allow QAs to test multiple code-bases thoroughly in parallel to ensure that there is no flaw in the functionality. In this phase, **Docker** Containers can be used for simulating the test environment.



Selenium does the automation testing, and TestNG generates the reports. This entire testing phase can automate with the help of a Continuous Integration tool called **Jenkins**.

Automation testing saves a lot of time and effort for executing the tests instead of doing this manually. Apart from that, report generation is a big plus. The task of evaluating the test cases that failed in a test suite gets simpler. Also, we can schedule the execution of the test cases at predefined times. After testing, the code is continuously integrated with the existing code.

4) Continuous Monitoring

Monitoring is a phase that involves all the operational factors of the entire DevOps process, where important information about the use of the software is recorded and carefully processed to find out trends and identify problem areas. Usually, the monitoring is integrated within the operational capabilities of the software application.

It may occur in the form of documentation files or maybe produce large-scale data about the application parameters when it is in a continuous use position. The system errors such as server not reachable, low memory, etc are resolved in this phase. It maintains the security and availability of the service.

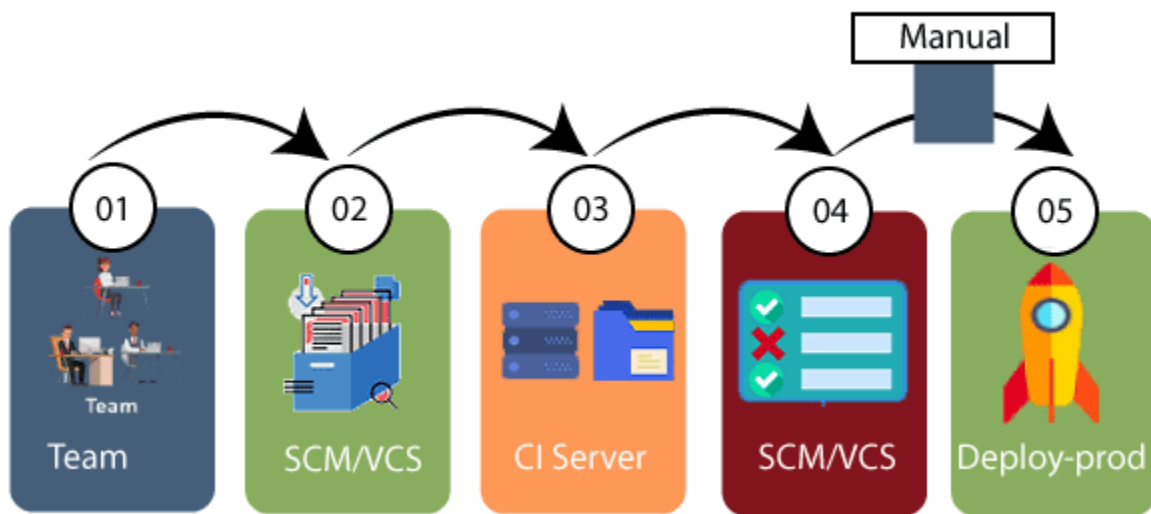
5) Continuous Feedback

The application development is consistently improved by analyzing the results from the operations of the software. This is carried out by placing the critical phase of constant feedback between the operations and the development of the next version of the current software application.

The continuity is the essential factor in the DevOps as it removes the unnecessary steps which are required to take a software application from development, using it to find out its issues and then producing a better version. It kills the efficiency that may be possible with the app and reduce the number of interested customers.

6) Continuous Deployment

In this phase, the code is deployed to the production servers. Also, it is essential to ensure that the code is correctly used on all the servers.



The new code is deployed continuously, and configuration management tools play an essential role in executing tasks frequently and quickly. Here are some popular tools which are used in this phase, such as **Chef**, **Puppet**, **Ansible**, and **SaltStack**.

Containerization tools are also playing an essential role in the deployment phase. **Vagrant** and **Docker** are popular tools that are used for this purpose. These tools help to produce consistency across development, staging, testing, and production environment. They also help in scaling up and scaling down instances softly.

Containerization tools help to maintain consistency across the environments where the application is tested, developed, and deployed. There is no chance of errors or failure in the production environment as they package and replicate the same dependencies and packages used in the testing, development, and staging environment. It makes the application easy to run on different computers.

7) Continuous Operations

All DevOps operations are based on the continuity with complete automation of the release process and allow the organization to accelerate the overall time to market continuingly.

It is clear from the discussion that continuity is the critical factor in the DevOps in removing steps that often distract the development, take it longer to detect issues and produce a better version of the product after several months. With DevOps, we can make any software product more efficient and increase the overall count of interested customers in your product.