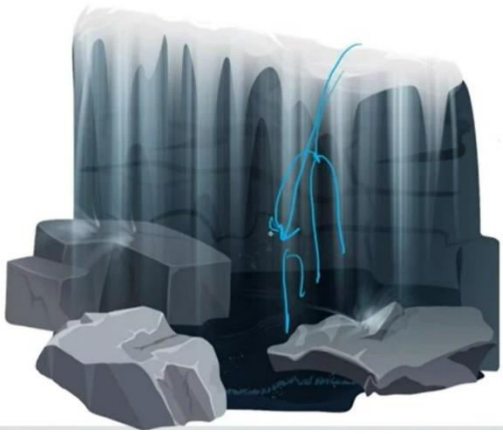
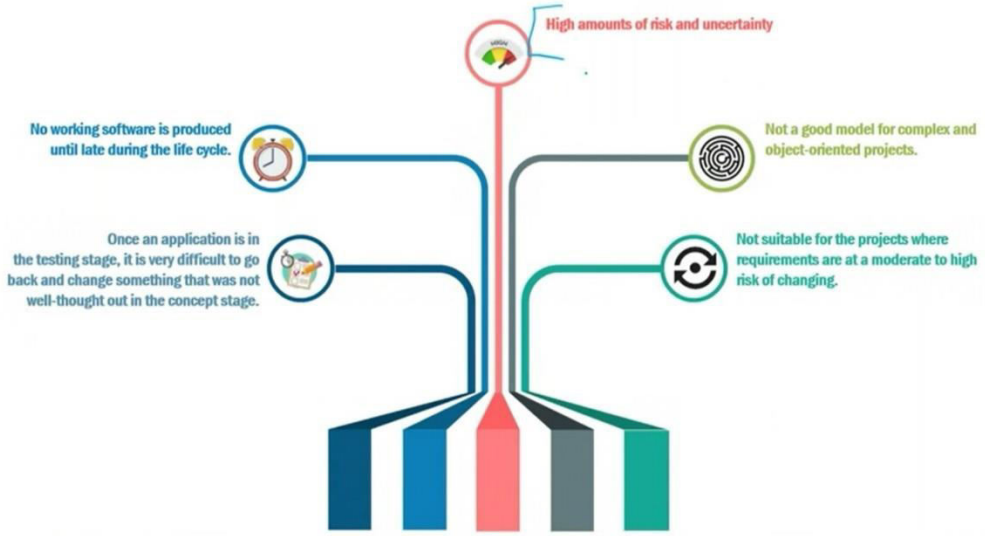
Waterfall Model

It has distinct goals for each phase of development. Imagine a waterfall on the cliff of a steep mountain. Once the water has flowed over the edge of the cliff, it cannot turn back.

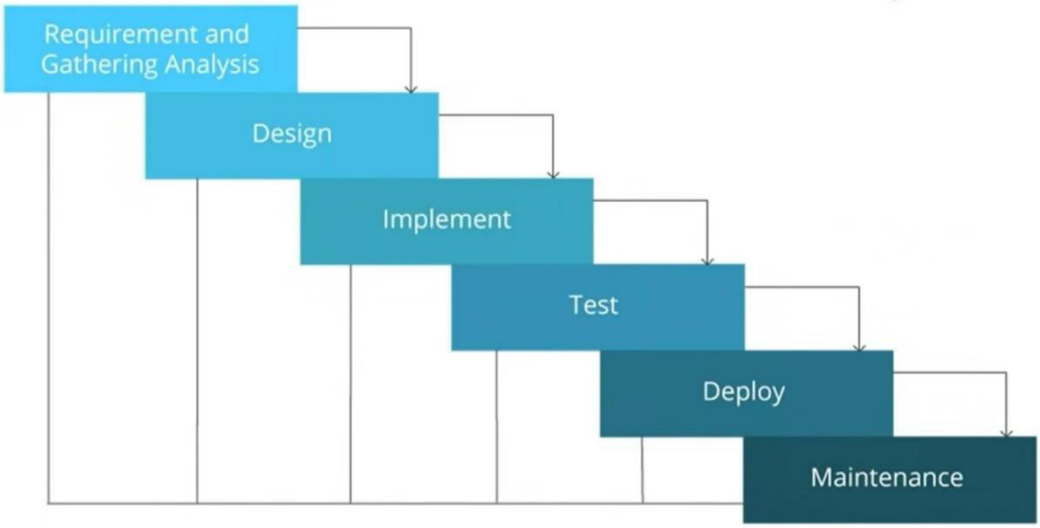


Limitations of Waterfall Model



Traditional Waterfall Model

SDLC → methodology

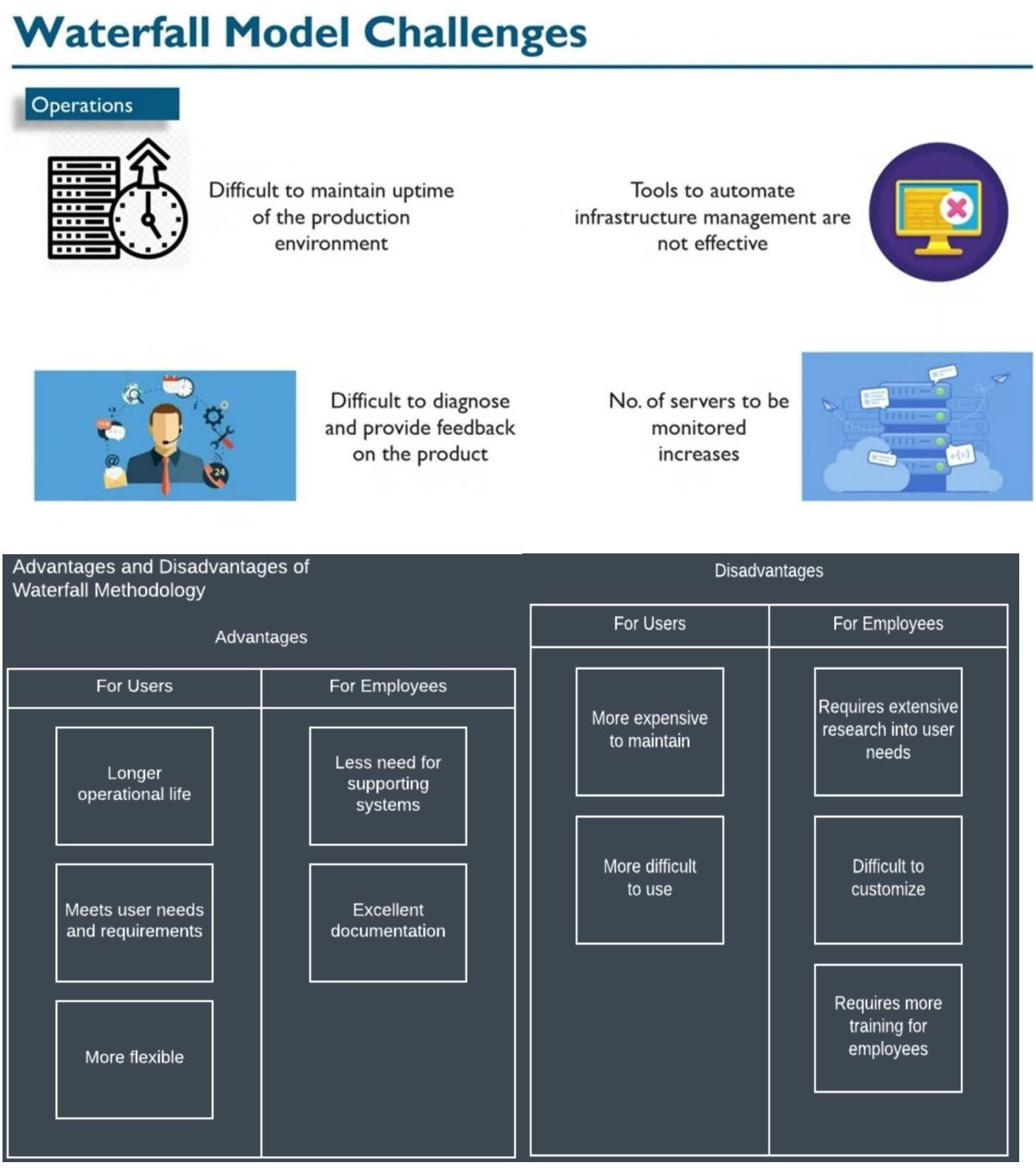


Waterfall Model Challenges

Developers

Huge waiting time for code deployment

Pressure of work on old and pending code



Advantages of waterfall model

- This model is simple and easy to understand and use.
- It is easy to manage due to the rigidity of the model – each phase has specific deliverables and a review process.
- In this model phases are processed and completed one at a time. Phases do not overlap.

- Waterfall model works well for smaller projects where requirements are clearly defined and very well understood.

Disadvantages of waterfall model

- Once an application is in the **testing** stage, it is very difficult to go back and change something that was not well-thought out in the concept stage.
- No working software is produced until late during the life cycle.
- High amounts of risk and uncertainty.
- Not a good model for complex and object-oriented projects.
- Poor model for long and ongoing projects.
- Not suitable for the projects where requirements are at a moderate to high risk of changing.

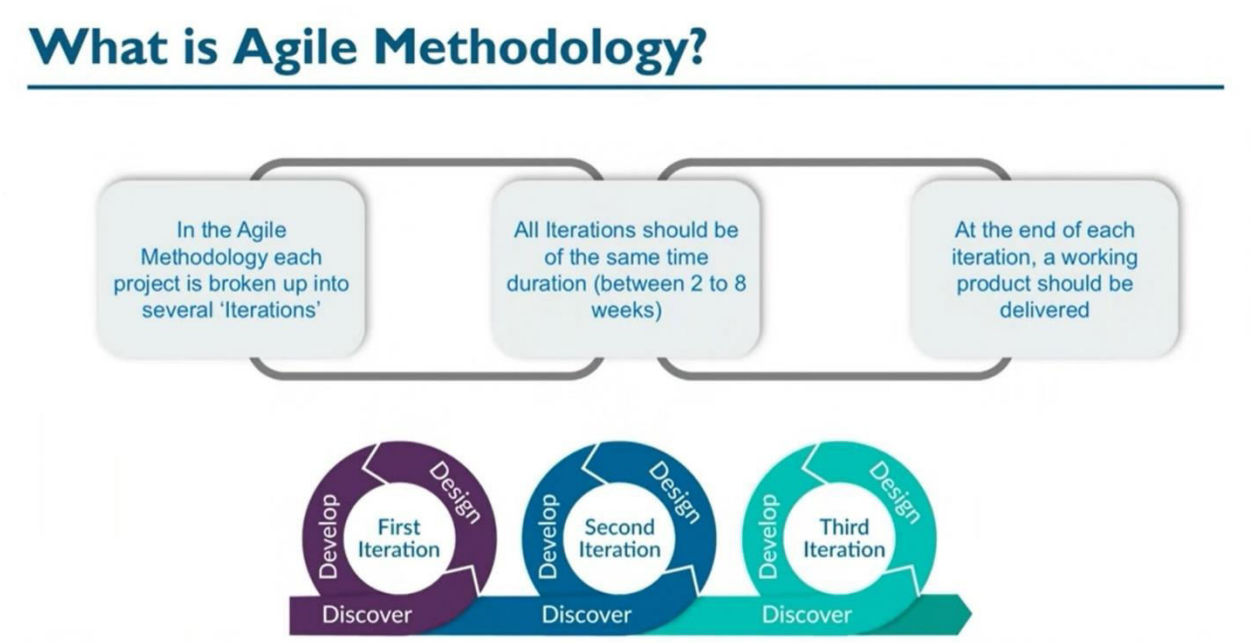
When to use the waterfall model

- This model is used only when the requirements are very well known, clear and fixed.
- Product definition is stable.
- Technology is understood.
- There are no ambiguous requirements
- Ample resources with required expertise are available freely
- The project is short.

In Waterfall model, very less customer interaction is involved during the development of the product. Once the product is ready then only it can be demonstrated to the end users.

Once the product is developed and if any failure occurs then the cost of fixing such issues are very high, because we need to update everything from document till the logic.

In today's world, Waterfall model has been replaced by other models like iterative, agile etc.



Advantages of Agile model:

- Customer satisfaction by rapid, continuous delivery of useful software.
- People and interactions are emphasized rather than process and tools. Customers, developers and testers constantly interact with each other.
- Working software is delivered frequently (weeks rather than months).
- Face-to-face conversation is the best form of communication.
- Close, daily cooperation between business people and developers.
- Continuous attention to technical excellence and good design.
- Regular adaptation to changing circumstances.
- Even late changes in requirements are welcomed

Disadvantages of Agile model:

- In case of some software deliverables, especially the large ones, it is difficult to assess the effort required at the beginning of the software development life cycle.
- There is lack of emphasis on necessary designing and documentation.
- The project can easily get taken off track if the customer representative is not clear what final outcome that they want.
- Only senior programmers are capable of taking the kind of decisions required during the development process. Hence it has no place for newbie programmers, unless combined with experienced resources.

When to use Agile model:

- When new changes are needed to be implemented. The freedom agile gives to change is very important. New changes can be implemented at very little cost because of the frequency of new increments that are produced.
- To implement a new feature the developers need to lose only the work of a few days, or even only hours, to roll back and implement it.
- Unlike the **waterfall model** in agile model very limited **planning** is required to get started with the project. Agile assumes that the end users' needs are ever changing in a dynamic business and IT world. Changes can be discussed and features can be newly effected or removed based on feedback. This effectively gives the customer the finished system they want or need.
- Both system developers and stakeholders alike, find they also get more freedom of time and options than if the software was developed in a more rigid sequential way. Having options gives them the ability to leave important decisions until more or better data or even entire hosting programs are available; meaning the project can continue to move forward without fear of reaching a sudden standstill.

Difference between: Waterfall Model vs Agile Model

There are many differences between Waterfall and Agile model as shown below.

Waterfall Model	Agile Model
Planning – Waterfall model requires planning for long term which requires complete clarity in requirements	Planning in Agile projects is generally on a short term since the work product is delivered in 2 to 4 weeks
Project success is dependent on implementing the requirements closely	Project success is based on delivery of business value to the client
Waterfall projects are driven from the top of a projects hierarchy	Teams are self governing in an Agile project
Sequential planning with clearly defined milestone details and predictability are characteristics of Waterfall projects	Planning in Agile projects is iterative in nature and adapts to changing requirements
There are many roles in a Waterfall project and these projects can also have several levels of hierarchy	Agile projects teams have significantly lesser roles, for example Scrum teams can get by with only three roles
There is significant amount of communication with the user during requirements gathering (at the beginning) and testing (at the end)	There is a steady on-going communication with the user during the project
There is no much dependency on the end users during the development and other intermediate phases	There is significant dependency on the users, all the way through the lifetime of the project
Complete requirements are clearly documented to begin with	Requirements continue to develop over the lifetime of the project and are defined when they are needed, i.e, just in time
Team members with different roles have different responsibility levels	Equal responsibility is shared between the roles
Change control is strictly enforced and rigorous change control processes are followed. Thus change is discouraged and they do not respond well to change.	Agile projects are open to change, they accept them openly and respond well
Quality Control activities like Testing are performed towards the end of the project	Quality Control activities are performed throughout the project
The steps in the processes in Waterfall model are rigorously followed since this model is more process oriented	Agile model is more people oriented and lesser importance is placed on processes with the option to skip those processes whose value is low
Delivery of the project at the end is characterized by a big bang event	Working product features are delivered in each sprint of the project
It is difficult to measure the progress of the project in the middle of the project	Progress of the project can be easily measured since working features are delivered frequently
Progress of the project is generally reviewed with the team once a week	Progress of the project is reviewed with the team on a daily basis in the standup meeting

Have you seen Waterfall model being used in your organization? Please share your experience in the comments below.

Development Without DevOps Culture

Release and Deploy Mismatch

Unpredictable Issues

Blame Game

Lack of monitoring and Feedback

Development With DevOps Culture

Streamlined Deliveries

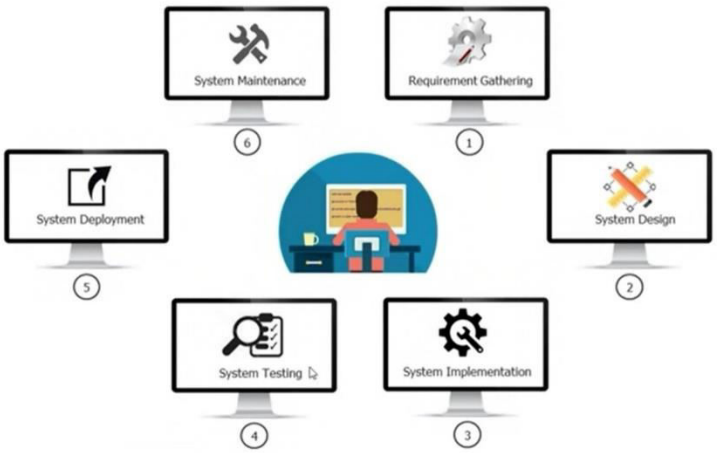
Team Work in Collaboration

Continuous Monitoring and Feedback

Traditional Development Model Challenges

Consider developing software in a traditional way using a Waterfall model

Waterfall Model Challenge: New phase in the development process begins only if the previous phase is complete

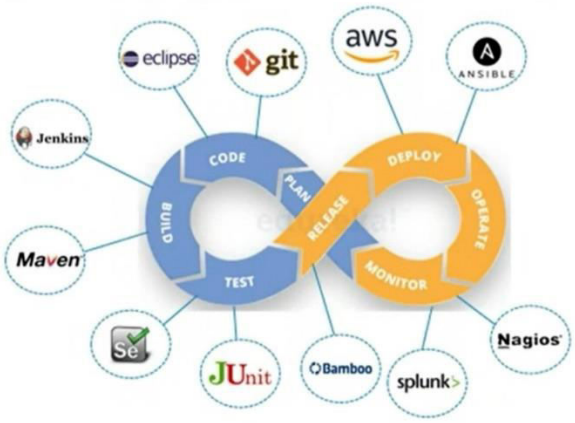


DevOps: What DevOps Is NOT!!

- DevOps is not a role, person or organization
- DevOps is not a separate team
- DevOps is not a product or a tool
- DevOps is not about just writing scripts or implementing tools

What Is DevOps?

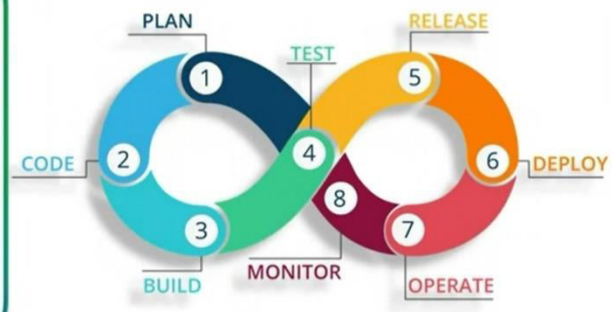
DevOps is a practice that allows a single team to manage the entire application development life cycle, that is, development, testing, deployment, and monitoring



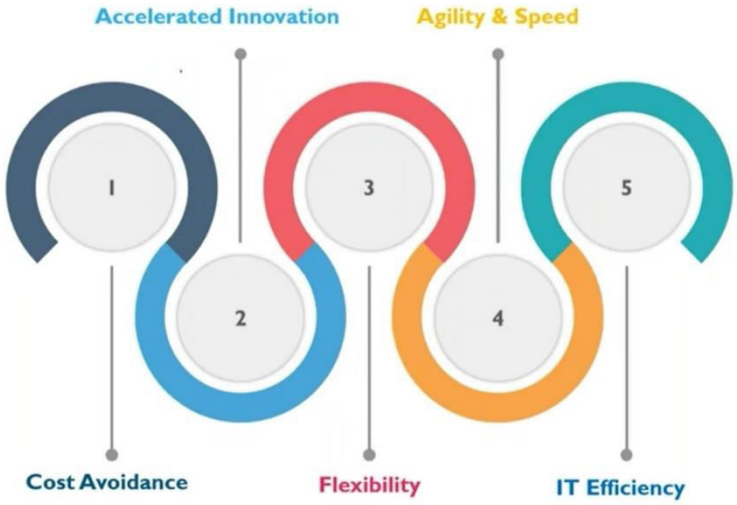
DevOps is a combination of software development (dev) and operations (ops). It is defined as a software engineering methodology which aims to integrate the work of development teams and operations teams by facilitating a culture of collaboration and shared responsibility.

What Does DevOps Do?

- Integrates developers and operations teams
- Improves collaboration and productivity by:
  - ✓ Automating infrastructure
  - ✓ Automating workflows
  - ✓ Continuously measuring application performance



Benefits of DevOps



Cultural Transformation

- The workplace culture undergoes a major transformation while implementing cultural changes with DevOps.
- It is a long-term process that requires patience and endurance to maintain a positive and transparent atmosphere in the workplace with the changes being implemented.

Automate Everything

- Most of the legacy tools and systems used by organizations may not be conducive to automation and collaboration.
- Automation is essential since continuous testing and development are necessary for smooth deployment.

Adoption Of Tools

- The Dev and Ops teams have separate toolsets and metrics.
- It is necessary to integrate all the tools properly to make testing, deployment, and building all work together in a continuous manner.

Devops Tools:

Discover: Jira Product Discovery, Mural, Miro

Plan: Jira Software, Confluence, Slack

Build: Kubernetes, Docker

Iaas: Ansible, Chef, Docker, Puppet, Terraform

Source control and collaborative coding: BitBucket, GitLab, GitHub

Continous Delivery: Jenkins, AWS, BitBucket, CircleCI, Sonarsource

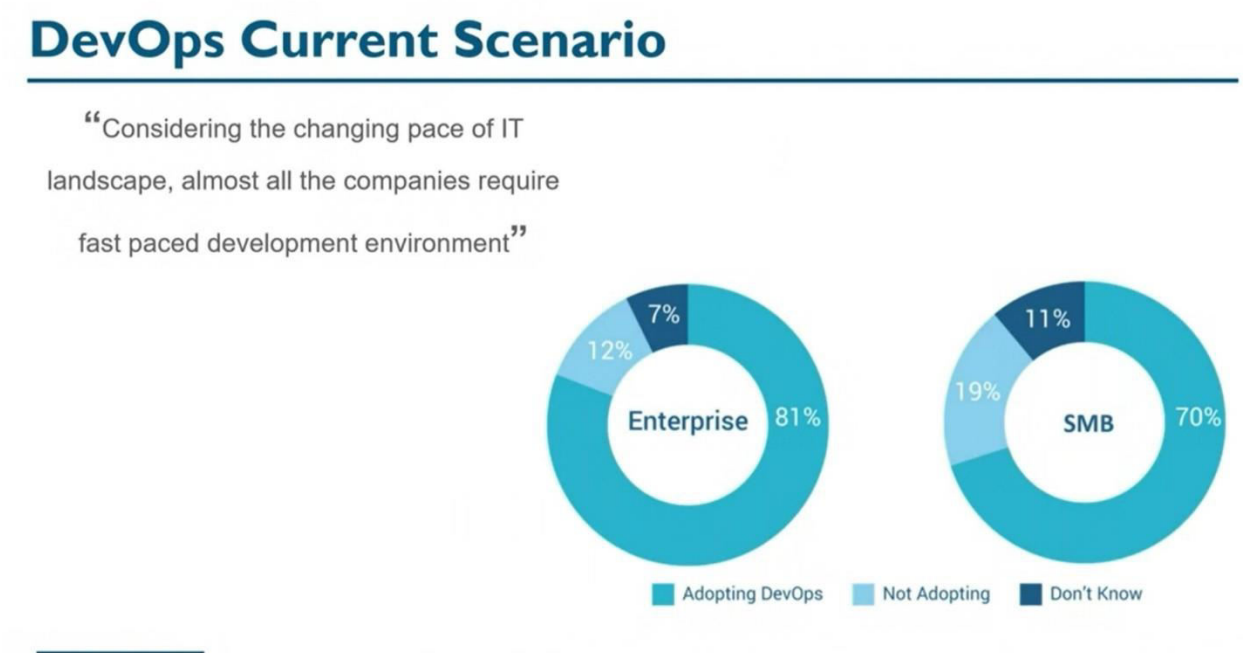
Test: XRAY, Zephyr Squad, Zyphyr Scale, Mabl, Snyk, Mend, Veracode, StackHawk

Deploy: Jira Software

Automated Deployment: Bitbucket, AWS CodePipeline

Operate: Jira Service Management, Jira Software, Opsgenie, Statuspage

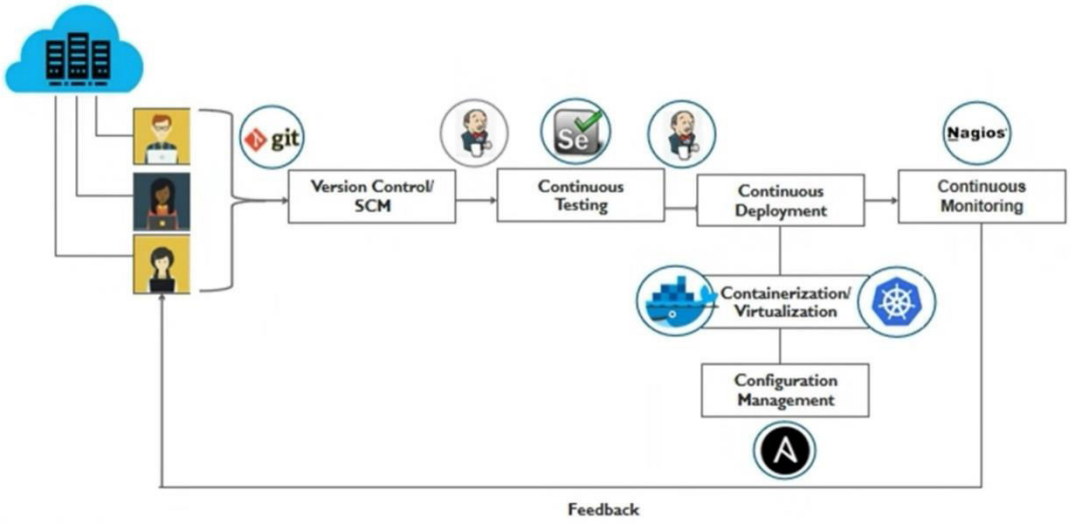
Observe: AppDynamics, Datadog, Slack, Splunk, New Relic, Opsgenie, Nagios, Dynatrace



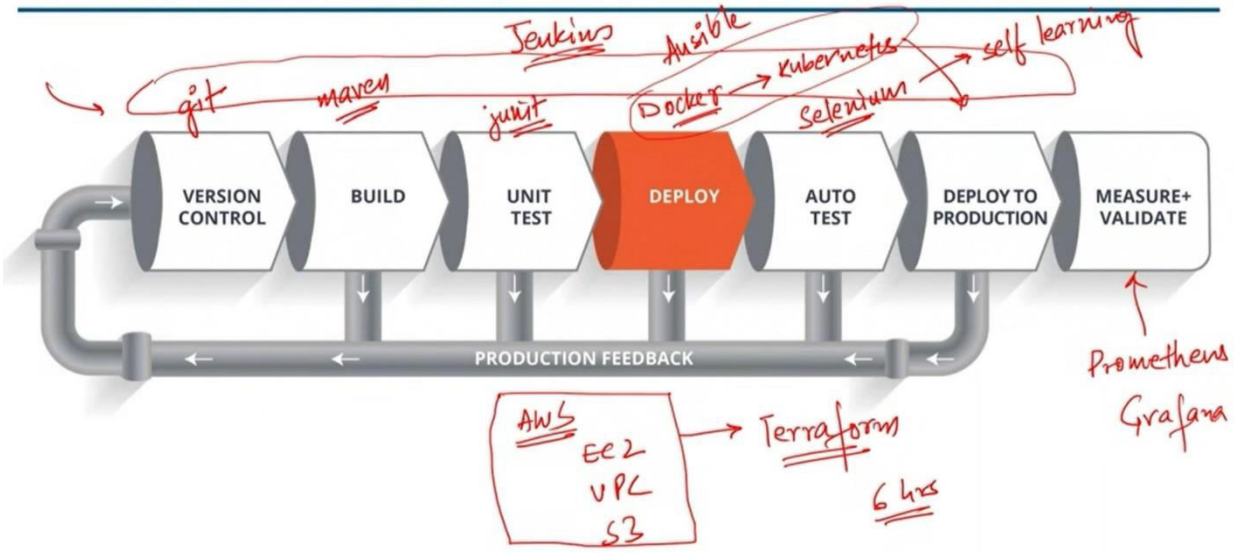
Skills Of A DevOps Engineer

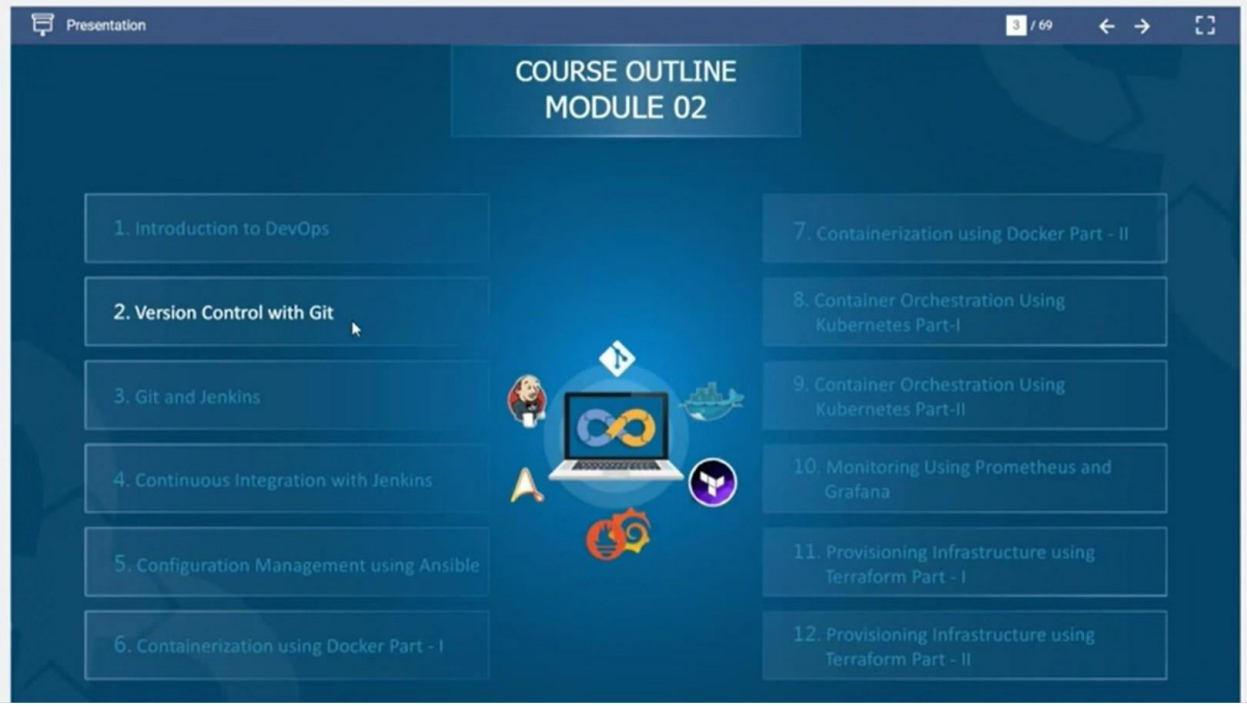
Skills	Description
Tools	• Version Control - GIT • Continuous Integration - Jenkins • Virtualization/ Containerization – Docker/Kubernetes • Configuration Management – Puppet/Ansible • Monitoring – Nagios
Networking Skills	• General networking skills – Establishing connection between the containers/Port Forwarding/ Container Orchestration
Other Skills	• People Skills • Process Skill • Customer Skill and Empathy • Cloud Awareness

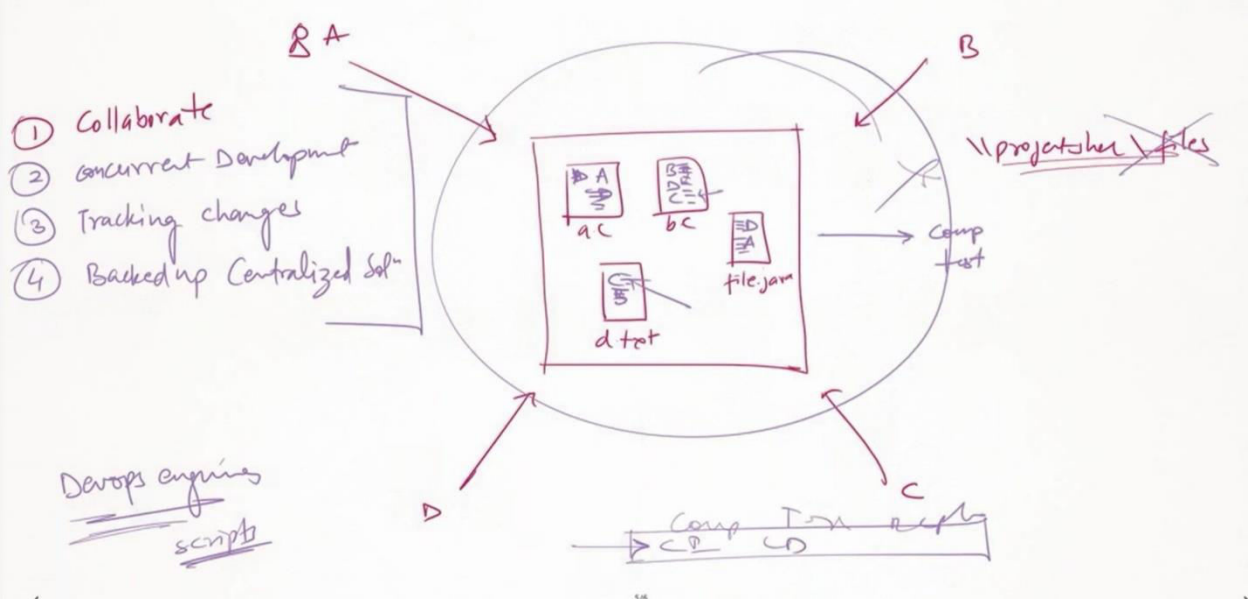
DevOps Stages



DevOps Delivery Pipeline

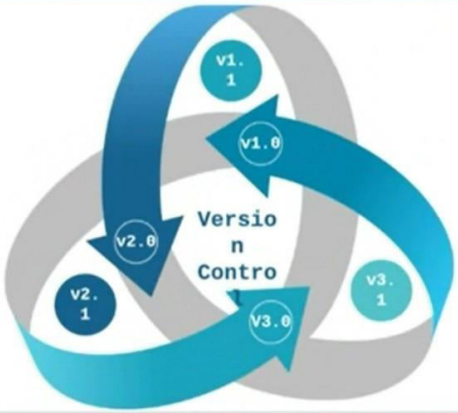






What Is Version Control?

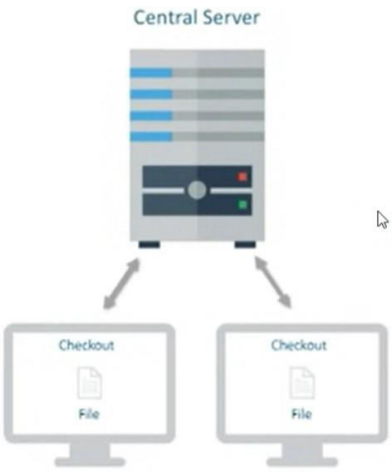
Version Control is a system that documents changes made to a file or a set of files. It allows multiple users to manage multiple revisions of the same unit of information. It is a snapshot of your project over time.



Version Control Types

Centralized Version Control (CVC)

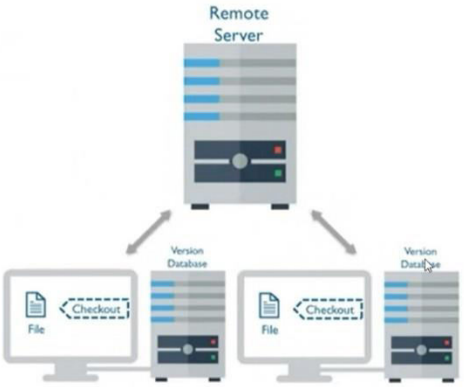
- Local Version Control's issues are resolved by Centralized Version Control
- In CVC, a central repository is maintained where all the versioned files are kept
- Now users can checkout, and check-in files from their different computers at any time



Version Control Types

Distributed Version Control

- Version Database is stored at every users' local system and at the remote server
- Users manipulate the local files and then upload the changes to the remote server
- If any of the servers die, a client server can be used to restore



Git:

- git-remote - Manage set of tracked repositories
- git revert vs restore: According to the official Git documentation, git reset is about moving the HEAD and changing the stage, git restore is about restoring working tree files, and git revert is about recording new commits to reverse the effect of earlier commits.
- GitHub personal access token vs SSH key: While SSH keys can be read-only or read-write enabled, or scoped to specific repositories, personal access tokens do have an

edge in terms of their finer-grained permissions model in comparison. This is likely why GitHub recommends tokens over SSH keys.

- How to authenticate GitHub repos using SSH keys: To add an SSH authentication key to your GitHub account, use the SSH-key add subcommand, specifying your public key. If you're prompted to request additional scopes, follow the instructions in the command line. To include a title for the new key, use the -t or --title flag.

GitHub
GIT CHEAT SHEET

Git is the free and open source distributed version control system that's responsible for everything GitHub related that happens locally on your computer. This cheat sheet features the most important and commonly used Git commands for easy reference.

INSTALLATION & GUIS

With platform specific installers for Git, GitHub also provides the ease of staying up-to-date with the latest releases of the command line tool while providing a graphical user interface for day-to-day interaction, review, and repository synchronization.

GitHub for Windows
https://windows.github.com

GitHub for Mac
https://mac.github.com

For Linux and Solaris platforms, the latest release is available on the official Git web site.

Git for All Platforms
http://git-scm.com

SETUP

Configuring user information used across all local repositories

`git config --global user.name "[firstname lastname]"`
set a name that is identifiable for credit when review version history
`git config --global user.email "[valid-email]"`
set an email address that will be associated with each history marker
`git config --global color.ui auto`
set automatic command line coloring for Git for easy reviewing

SETUP & INIT

Configuring user information, initializing and cloning repositories

`git init`
initialize an existing directory as a Git repository
`git clone [url]`
retrieve an entire repository from a hosted location via URL

STAGE & SNAPSHOT

Working with snapshots and the Git staging area

`git status`
show modified files in working directory, staged for your next commit
`git add [file]`
add a file as it looks now to your next commit (stage)
`git reset [file]`
unstage a file while retaining the changes in working directory
`git diff`
diff of what is changed but not staged
`git diff --staged`
diff of what is staged but not yet committed
`git commit -m "[descriptive message]"`
commit your staged content as a new commit snapshot

BRANCH & MERGE

Isolating work in branches, changing context, and integrating changes

`git branch`
list your branches. a * will appear next to the currently active branch
`git branch [branch-name]`
create a new branch at the current commit
`git checkout`
switch to another branch and check it out into your working directory
`git merge [branch]`
merge the specified branch's history into the current one
`git log`
show all commits in the current branch's history

INSPECT & COMPARE

Examining logs, diffs and object information

`git log`	show the commit history for the currently active branch
`git log branchB..branchA`	show the commits on branchA that are not on branchB
`git log --follow [file]`	show the commits that changed file, even across renames
`git diff branchB...branchA`	show the diff of what is in branchA that is not in branchB
`git show [SHA]`	show any object in Git in human-readable format

SHARE & UPDATE

Retrieving updates from another repository and updating local repos

`git remote add [alias] [url]`	add a git URL as an alias
`git fetch [alias]`	fetch down all the branches from that Git remote
`git merge [alias]/[branch]`	merge a remote branch into your current branch to bring it up to date
`git push [alias] [branch]`	Transmit local branch commits to the remote repository branch
`git pull`	fetch and merge any commits from the tracking remote branch

TRACKING PATH CHANGES

Versioning file removes and path changes

`git rm [file]`	delete the file from project and stage the removal for commit
`git mv [existing-path] [new-path]`	change an existing file path and stage the move
`git log --stat -M`	show all commit logs with indication of any paths that moved

REWRITE HISTORY

Rewriting branches, updating commits and clearing history

`git rebase [branch]`	apply any commits of current branch ahead of specified one
`git reset --hard [commit]`	clear staging area, rewrite working tree from specified commit

IGNORING PATTERNS

Preventing unintentional staging or commiting of files

```
logs/
*.notes
pattern*/
```

Save a file with desired patterns as .gitignore with either direct string matches or wildcard globs.

`git config --global core.excludesfile [file]`	system wide ignore pattern for all local repositories

TEMPORARY COMMITS

Temporarily store modified, tracked files in order to change branches

`git stash`	Save modified and staged changes
`git stash list`	list stack-order of stashed file changes
`git stash pop`	write working from top of stash stack
`git stash drop`	discard the changes from top of stash stack