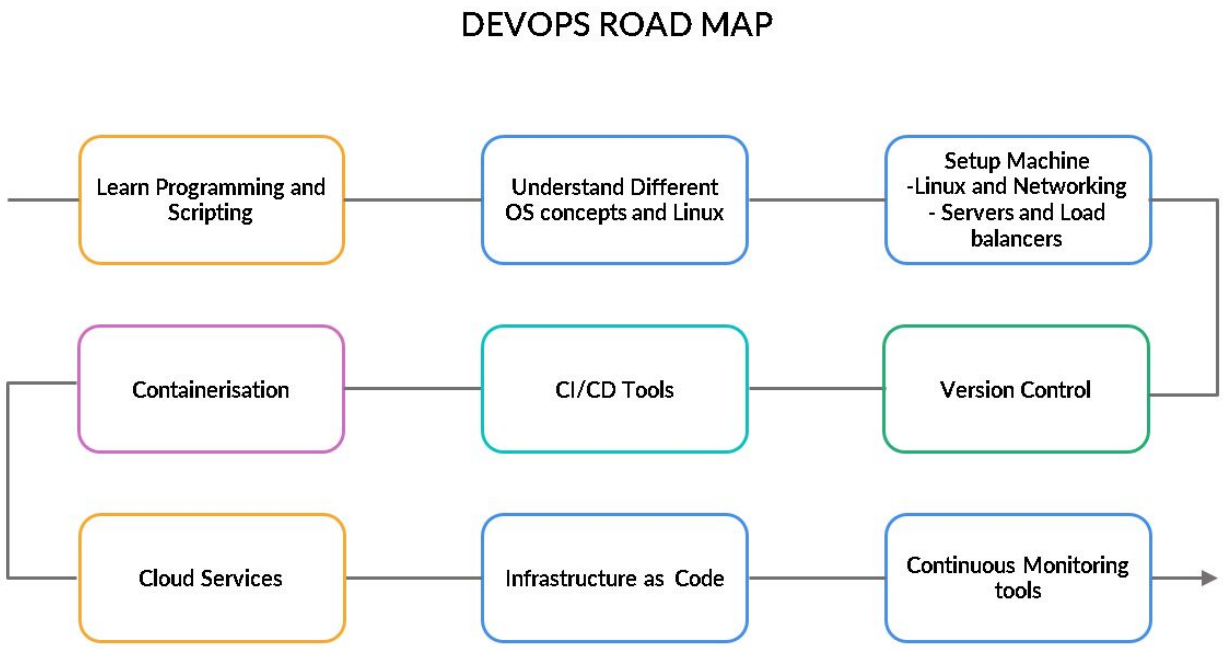
Lecture Notes: DevOps Road Map

3.1 DevOps Roadmap



3.2 Version Control

Source Code Management (SCM) or Version control

1. Version control is a class of systems responsible for tracking and managing changes in the computer programs, documents, large web sites, or other collections of information.

2. The SCM helps to keep track of changes in a file. The previous version of that file can be restored at any point of time.

3. SCM also helps multiple developers work parallelly on the same codebase and merge their code in the central repository by resolving conflicts if they arise during merging.

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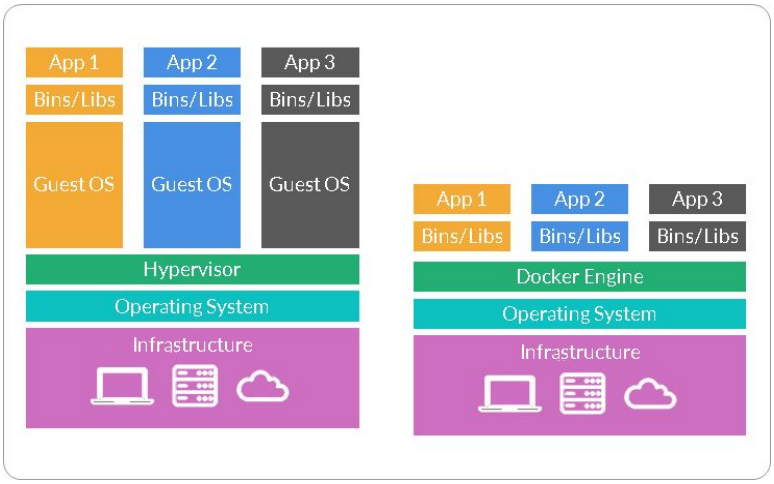
4. Git, SVN, CVS and Mercurial are also the well known SCM tools.

5. Github, Gitlab and Bitbucket are some Git-based version-control repository hosting services available over the web.

3.3 Containerisation

Containers allow a developer to pack up an application with all of its needs, such as libraries and other dependencies, and ship it all out as one package.
By doing so, the developer can be assured that the application will run on any other Linux machine regardless of any customised settings that the machine might have different from the machine used to write and test the code.



Docker is a tool that makes it easier to create containers and run the containerised applications that are isolated from one another.

In a way, this tool is a bit like a virtual machine. But unlike a virtual machine, rather than creating a whole virtual operating system, Docker allows applications to use the same Linux kernel as the system that they run on. In a container, you will ship only those files and configuration with the application that are not already present on the host machine.

The following are a few key points on containers:

1. They contain just the right amount of OS that is required to run the application in it.
2. Containers are isolated elements.
3. They are shippable.
4. Containers provide optimised resource utilisation.

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5. They provide a consistent environment throughout all the software development stages.

A text Dockerfile can be used to create an image, which is then shipped to different machines, and from this image, multiple instances of the same container can be initialised.
CloudFoundry, Docker and **Rocket** are a few popular containerisation tools.
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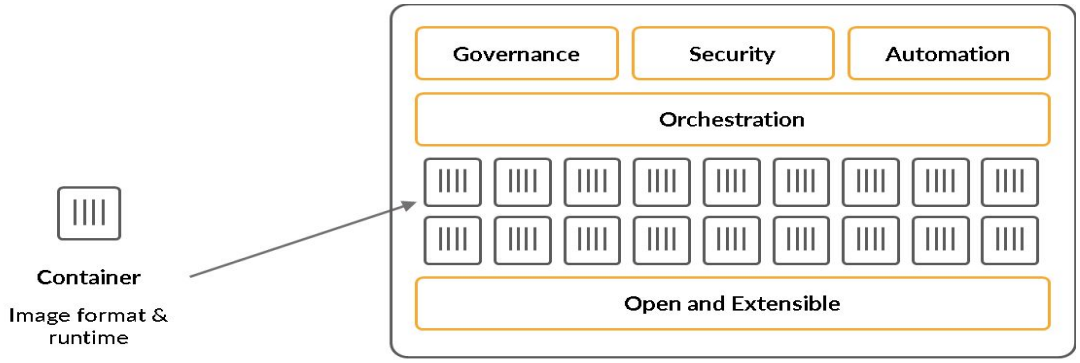
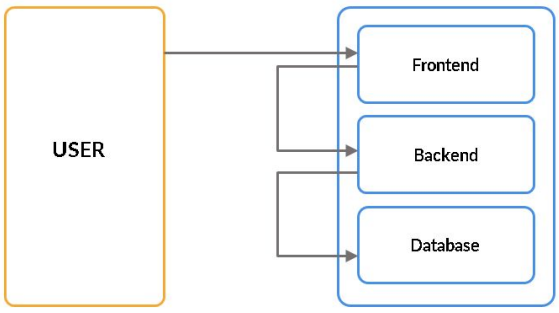
3.4 Container Orchestration

Multiple instances of a container are distributed among different nodes to form a cluster(a node is a single computer or VM). It is necessary to ensure that the optimal number of instances are working to serve the users' load of request.

Container orchestration tools such as **Kubernetes (K8S)** help in deploying and autoscaling of the containerised applications. It also manages networking and load balancing among different containers. Kubernetes handles most of the operational work that is needed to run a containerised application.



3.5 Three-Tier Web Architecture



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The three-tier application has the following three layers:

1. Presentation layer, that is, the front-end
2. Business logic or application layer, that is, the back-end
3. Database

3.6 Configuration Management

Describing the environment definitions such as the setup of servers, installation of certain packages, starting of services, network configurations and configuration like user roles in form of a code in a text file and then version controlling it and deploying it automatically on already provisioned servers come under configuration management.

Writing config as a code and maintaining a release pipeline that is separate from application release pipeline helps you to migrate the configuration from developers computer to the production environment as a separate artifact independent of application.

Tools such as chef, puppet, saltstack and Ansible are a few examples of the configuration management tools.

3.7 Cloud Hosting

Cloud computing is the on-demand availability of computer system resources, especially data storage and computing power, without the direct active management by the user.

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3.8 Infrastructure as a Code

With IaaC, engineers write code (generally, text files like YAML, JSON etc.) to describe the systems such as servers, load balancers and databases.
It is generally a declarative code which is used by the engineers to write the desired state of infrastructure in a file, which is then used to provision it repeatedly and consistently without any error.

Terraform and cloudFormation are some of the IaaC tools.

3.8 Continuous Monitoring

Continuous monitoring refers to the process and technology that is used to incorporate monitoring across each phase of your DevOps and IT operations lifecycles. It helps to continuously ensure the health, performance, and reliability of your application and infrastructure, as it moves from the development to production stages.

Application Performance Monitoring
It monitors the latency, request per minute, CPU usage, etc. on your application with tools such as **New Relic**.

Logging of Information

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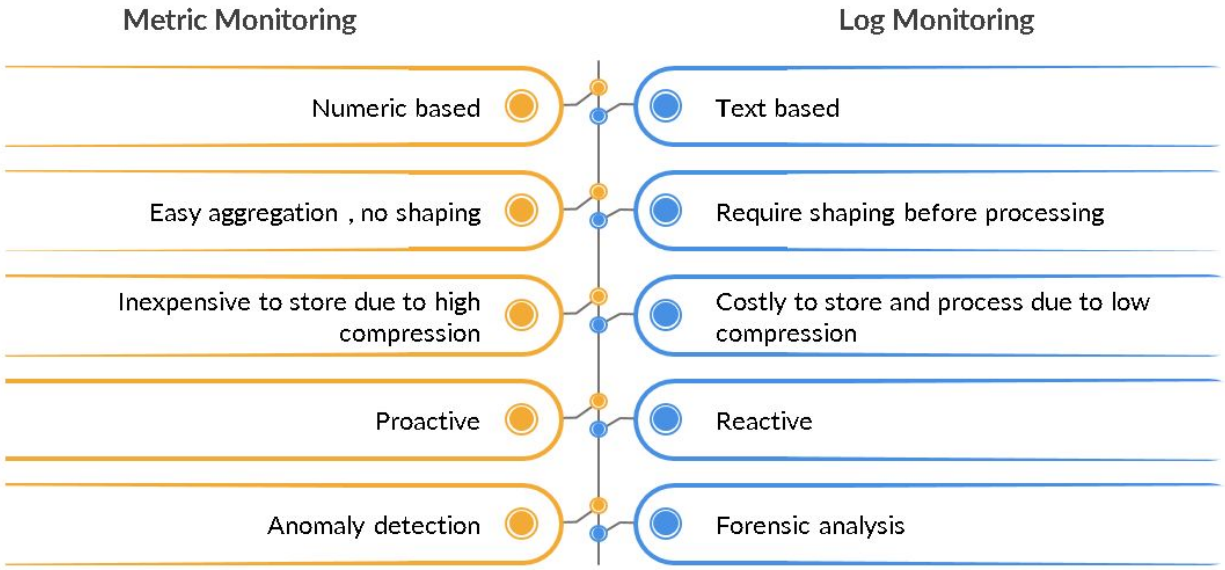
Source site and IP are logged for every request by using ELK stack - **Elasticsearch, Logstash and Kibana**.

Metric Monitoring
A few tools for metric monitoring are **Prometheus, influxDB (a time-series database), Grafana (visualisation tool), Splunk and Datadog**.

Further, the two types of monitoring are **log monitoring** and **metric monitoring.** The differences between the two are as follows:



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