**DevOps Professional: *Open-Source Software (OSS)* - I**

**Final Assessment 2023**

**TASK 1**

**DevOps Concepts:**

1. a) What is DevOps? How does DevOps Work?

In 2009, Patrick Debois coined the term “development operations.” He said, “Development operations is an extension of Agile development environments that aims to enhance the process of software delivery as a whole.” DevOps is a recognition that development and operations must stop working in silos. They have to start working together. DevOps is the practice of development and operation engineers working together during the entire development lifecycle, following lean and Agile principles that allow them to deliver software in a rapid and continuous manner.

1. b) Describe the DevOps lifecycle.
2. The DevOps lifecycle involves seven phases that facilitate continuous software delivery and deployment, collaboration among development and operations teams, and efficient feedback loops. Here is a brief description of each phase:

* Development: In this phase, developers write and test code for new features, fixes, or improvements. They work on code changes in a local environment or a shared repository and use version control tools to manage changes.
* Integration: In this phase, developers merge their changes into a shared codebase, and the integrated code is built and tested as a whole to ensure that it works as expected. This phase helps identify conflicts and compatibility issues early in the development process.
* Testing: In this phase, developers and testers perform automated and manual tests to validate the functionality, performance, security, and scalability of the software. Various testing techniques are used such as unit, integration, regression, acceptance, and performance testing.
* Monitoring: In this phase, software systems are monitored in production environments to track their performance, availability, and user experience. Monitoring helps identify issues and anomalies and provides insights for continuous improvement.
* Feedback: In this phase, developers and operations teams receive feedback from users, customers, and stakeholders, and use it to improve the software and the development process. Feedback can be collected through various channels such as surveys, support tickets, social media, and analytics.
* Deployment: In this phase, software changes are packaged, tested, and deployed to production environments using automated deployment pipelines. Deployment can be done continuously or at regular intervals, and requires collaboration among development, operations, and security teams.
* Operations: In this phase, software systems are operated and maintained in production environments to ensure their availability, performance, and security. Operations teams use various tools and techniques such as monitoring, logging, alerting, and incident management to keep the systems running smoothly. They also provide support to users and customers, and implement changes based on feedback and monitoring data.

1. c) Describe DevOps Principles.
2. The key principles of DevOps are given below:

* Collaboration: DevOps emphasizes close collaboration between development teams (responsible for creating software) and operations teams (responsible for deploying and maintaining software in production). Collaboration is fostered through shared goals, shared responsibilities, and cross-functional teams that work together to deliver value to users.
* Continuous Integration and Continuous Deployment (CI/CD): DevOps promotes the use of automation tools and practices for continuous integration and continuous deployment. This involves automating the build, testing, and deployment of software, allowing for frequent and reliable releases.
* Infrastructure as Code (IaC): DevOps encourages treating infrastructure as code, which means defining and managing infrastructure (servers, networks, storage, etc.) using code and version control. This allows for consistency, repeatability, and scalability in managing infrastructure, and enables automated provisioning and configuration management.
* Automation: Automation is a key principle of DevOps, enabling the elimination of manual and error-prone tasks, reducing the risk of human errors, and increasing efficiency. Automation is applied to various aspects of the software development lifecycle, such as build and deployment processes, testing, monitoring, and operations.
* Continuous Monitoring: DevOps promotes continuous monitoring of applications and infrastructure in production to detect issues, gather performance metrics, and gain insights into system behavior. Monitoring is used to identify and resolve issues quickly, ensure system reliability, and drive continuous improvement.
* Agile Practices: DevOps aligns with Agile development methodologies, emphasizing iterative and incremental development, frequent feedback, and rapid response to changes. Agile practices such as Scrum, Kanban, and Lean are often integrated with DevOps practices to enable fast and flexible delivery of software.
* Culture of Learning and Improvement: DevOps promotes a culture of learning and improvement, encouraging continuous learning, experimentation, and innovation. It encourages collaboration, openness, and feedback, and fosters a blameless culture where failures are treated as learning opportunities rather than as sources of blame.
* Security: DevOps incorporates security as an integral part of the software development lifecycle. It emphasizes the need for secure coding practices, automated security testing, and continuous monitoring for vulnerabilities and threats. Security is not an afterthought, but rather an ongoing concern throughout the entire software delivery process.

1. d) Explain the benefits of DevOps.
2. DevOps, which combines development and operations practices, brings numerous benefits to organizations, some of which are listed below:

* Faster Time-to-Market: DevOps practices enable organizations to deliver software faster, with shorter development cycles and faster deployment times. Continuous integration, continuous deployment, and automation of build, testing, and deployment processes reduce the time required to release new features, enhancements, and bug fixes, enabling faster time-to-market and competitive advantage.
* Improved Collaboration and Communication: DevOps fosters closer collaboration and communication between development, operations, and other cross-functional teams. This leads to better alignment of goals, improved understanding of requirements, faster issue resolution, and increased transparency. Collaborative and cohesive teams can work together more effectively, leading to improved overall performance and productivity.
* Higher Quality and Reliability: DevOps practices such as automated testing, continuous monitoring, and infrastructure as code help ensure higher quality and reliability of software. Automated testing catches defects early in the development process, reducing the likelihood of production issues. Continuous monitoring allows for prompt detection and resolution of issues in production, ensuring better system reliability and uptime.
* Increased Efficiency and Productivity: DevOps emphasizes automation and elimination of manual tasks, reducing human errors, and increasing efficiency. Automation of build, testing, deployment, and operations tasks frees up resources to focus on higher-value activities. It also enables consistent and repeatable processes, reducing variability and improving overall productivity.
* Enhanced Flexibility and Agility: DevOps aligns with Agile development methodologies, enabling organizations to be more agile and responsive to changes. The ability to quickly and reliably release new features, bug fixes, and updates allows organizations to respond to market demands and customer feedback more rapidly, and adapt to changing business requirements.
* Better Risk Management: DevOps practices help organizations better manage risks associated with software development and operations. Continuous monitoring, automated testing, and infrastructure as code allow for early detection and resolution of issues, reducing the risk of production incidents and downtime. DevOps also emphasizes security as an integral part of the software development process, helping organizations identify and mitigate security vulnerabilities and threats.
* Cost Optimization: DevOps can help organizations optimize costs associated with software development and operations. Automation of tasks reduces manual effort, leading to cost savings. Faster time-to-market and improved quality reduce rework and maintenance costs. DevOps also enables better resource utilization and scalability through infrastructure as code, leading to cost-effective provisioning and management of resources.
* Innovation and Competitive Advantage: DevOps promotes a culture of learning, experimentation, and innovation. It encourages teams to continuously improve processes, tools, and practices, and fosters a culture of creativity and innovation. This can lead to the development of new ideas, products, and services, providing a competitive advantage in the market.

**TASK 2**

**Preparing Lab Environment:**

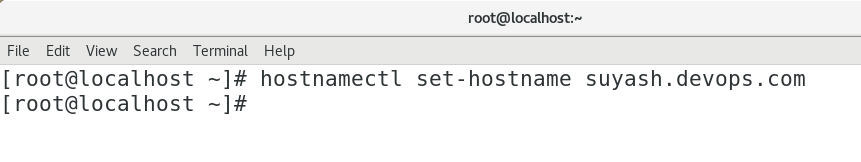
1. a) Installing VMware Workstation or VirtualBox.
2. Installing VMware Workstation:

* Download the VMware Workstation installation file from the official VMware website.
* Double-click the downloaded file to start the installation process.
* Follow the on-screen instructions to accept the license agreement, select the installation directory, and configure any additional settings.
* Once the installation is complete, launch VMware Workstation from the Start menu or desktop shortcut.

1. b) Creating Virtual Machine of CentOS 7.

Using VMware Workstation:

* Launch VMware Workstation and click on "Create a New Virtual Machine" option.
* Choose "Custom" configuration and click "Next".
* Select "I will install the operating system later" option and click "Next".
* Choose "Linux" as the guest operating system and "CentOS 7.x" as the version.
* Enter the name for your virtual machine, choose the location to save the virtual machine files, and click "Next".
* Choose the desired hardware configuration for your virtual machine, such as CPU, memory, network adapter, etc. and click "Next".
* Choose "Use ISO image file" and browse to the location of the CentOS 7 ISO file.
* Click "Finish" to create the virtual machine.
* Power on the virtual machine and install CentOS 7 by booting from the ISO file, following the CentOS 7 installation process, which includes selecting language, keyboard layout, installation destination, and setting up a root password.
* Once CentOS 7 is installed, configure the network settings, hostname, and other system settings as needed.

1. c) Assign the hostname of Linux machine as **<yourname>.devops.com**
2. 
3. d) Configure your network interface with **static ip address** and start the network service.
4. Graphical user interface, text, application, email

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5. e) Map your **static ip address** to your **hosts name** in configuration file **/etc/hosts**
6. Table

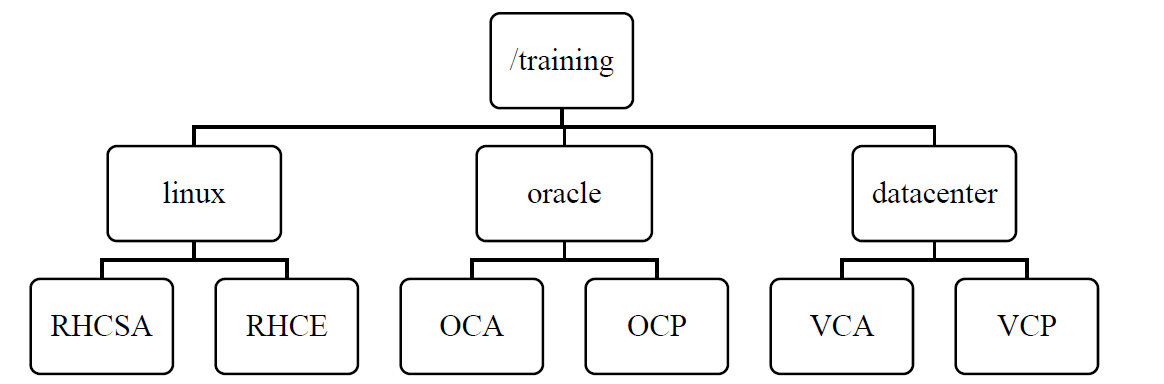
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**TASK 3**

**Linux Fundamentals:**

1. a) Write brief history of Linux.
2. Linux is a free and open-source operating system kernel that was created by Linus Torvalds in 1991. It is based on Unix, a family of operating systems that originated in the 1960s. Linus Torvalds initially developed Linux as a personal project and released it under the GNU General Public License (GPL), which allows for free use, modification, and distribution of the software.
3. Over the years, Linux has grown into a robust and versatile operating system that is used by millions of users worldwide. It has become the foundation for many popular Linux distributions (commonly referred to as "distros") such as Ubuntu, Fedora, Debian, CentOS, and others. These distributions package the Linux kernel with additional software, utilities, and tools to create complete operating systems that cater to various user needs, ranging from servers, desktops, embedded systems, and more.
4. Linux has gained widespread popularity due to its open-source nature, which promotes collaboration, customization, and innovation. It has also gained a strong presence in the enterprise and data center markets, powering a significant portion of the internet's infrastructure, servers, and supercomputers. Linux is known for its stability, security, and flexibility, and it continues to be actively developed and improved by a large community of developers and enthusiasts around the world.
5. b) Describe briefly about the following Linux Filesystems Hierarchy: **/boot, /root, /user, /home, /usr/bin, /bin, /user/sbin, /sbin, /usr/lib64, /lib64, /usr/lib, /lib, /dev, /etc, /media, /mnt, /opt, /proc, /tmp, /var, /run**

* /boot: This directory contains the files required for booting the Linux system, such as the bootloader configuration, kernel images, and initial ramdisk.
* /root: This is the home directory for the root user, which is the superuser or system administrator. It contains the root user's files and settings.
* /user: This directory does not exist in the Linux filesystem hierarchy. It seems to be a typo in your list.
* /home: This directory contains the home directories of regular user accounts. Each user has a separate directory here to store their personal files and settings.
* /usr/bin: This directory contains binary executable files that are available for all users on the system. It typically includes common commands and utilities used by both system administrators and regular users.
* /bin: This directory contains essential binary executable files required for basic system functionality, such as commands used during system booting and recovery.
* /usr/sbin: This directory contains system administrator executables that are not essential for basic system functionality. It typically includes commands used for system maintenance and configuration.
* /sbin: This directory contains essential system administrator executables required for system maintenance and configuration, such as commands used during system booting and recovery.
* /usr/lib64: This directory contains 64-bit shared libraries, which are dynamically linked files used by programs at runtime.
* /lib64: This directory contains 64-bit shared libraries that are required for basic system functionality, such as system booting and recovery.
* /usr/lib: This directory contains shared libraries that are used by programs at runtime.
* /lib: This directory contains shared libraries that are required for basic system functionality.
* /dev: This directory contains special files that represent devices, such as hard drives, printers, and input/output devices, which are used by the system to interact with hardware.
* /etc: This directory contains system configuration files, such as configuration files for network settings, system services, and other system-wide settings.
* /media: This directory is used as a mount point for removable media, such as USB drives and CDs/DVDs.
* /mnt: This directory is used as a temporary mount point for mounting other file systems, such as network shares or external drives.
* /opt: This directory is used for installing optional software packages that are not part of the core system.
* /proc: This directory provides a virtual file system that contains information about system processes, hardware, and other system-related information.
* /tmp: This directory is used for temporary files that are created and used by various programs and processes.
* /var: This directory contains variable data files that change during system operation, such as log files, spool files, and temporary data files.
* /run: This directory contains temporary files that are created and used by running processes, such as process IDs, sockets, and other runtime information.

1. c) Login from root user then create folders according to following tree structure.
2. 

Text

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1. d) Copy all the files that have **.conf** filename extensions inside **/etc** directory to **/root/backup** directory.
2. Table

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3. e) Create a directory **/root/selected** then move all files of **/root/backup** directory that have ‘o’ or ‘a’ as the second character of their file name to **/root/selected** directory.
4. Graphical user interface, text, application

   Description automatically generated
5. f) Remove second character with r in path **/root/backup**.
6. A screenshot of a computer

   Description automatically generated with medium confidence
7. g) Remove all files and directories in path **/root/backup.**
8. Graphical user interface

   Description automatically generated with low confidence

**TASK 4**

**Users, Groups, Permission:**

1. a) Create a user named **student.**
2. 
3. b) Login from student user then create files and folders according to following tree structure. [where, d→ directory and f→ file]

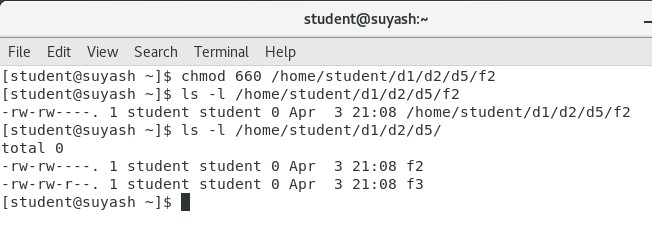
Diagram

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1. c) Change the permission of the file **f1** so that the owner will get full permission, group member will get read and execute permission and others will get read-only permissions.
2. Text, table

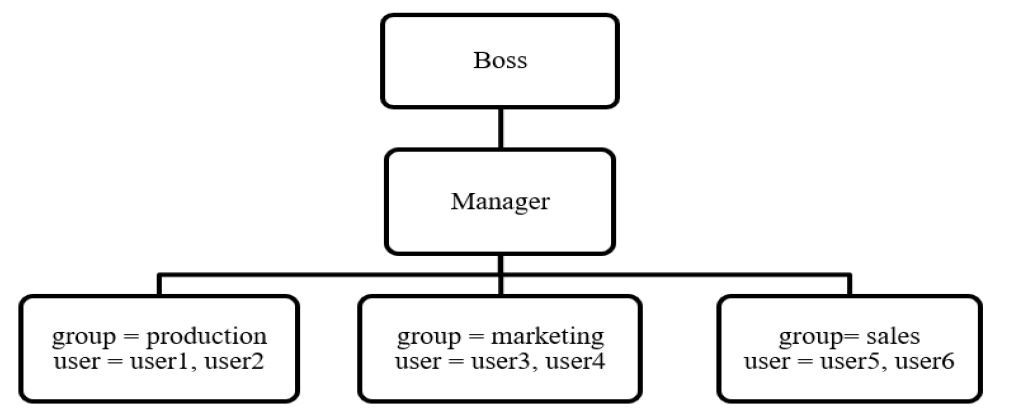
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3. d) Change permission of the file **f2** such that the owner’s and group members will get read and write permission but others will get no permission.
4. 
5. e) Change permission of directory **d3** such that all categories of users will get full permissions.
6. Table

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**TASK 5**

**User and Group Administration:**

**The tasks below are based on following structure.**



1. a) Create group for each department (**production, marketing, sales**)
2. A picture containing graphical user interface

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3. b) Create user account **(user1, user2, user3, user4, user5, user6, manager, boss**) for each employee assigning them respective group.

Text, table

Description automatically generated

1. c) Create a common directory (**production, marketing** and **sales**) for each department.
2. Graphical user interface, application

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3. d) Change ownership of group directories such that **boss** will become the owner and the respective groups will be group owner.
4. Table

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5. e) Change the permission of the group directories such that only the owner and group member will get full permission and other will not get any permission.

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**TASK 6**

**Package and Service Management, and Firewall Configuration in CentOS 7:**

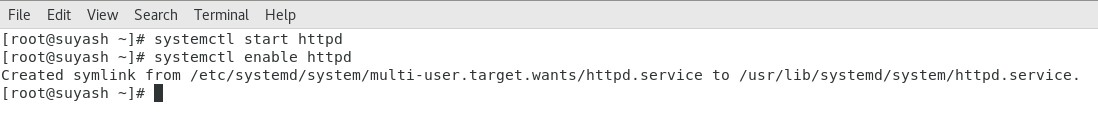
1. a) Enable EPEL repository (epel-release package) and verify the repo configuration in **/etc/yum.repos.d**
2. Table

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3. Graphical user interface, text, application, email

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4. b) Install firewalld package as well as start and enable firewall services.
5. Table

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6. A picture containing graphical user interface

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7. c) Install httpd package as well as start and enable httpd services.
8. Table

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9. 
10. d) Add the following services and ports to allow packets through the firewall. **[Service = http, smtp port = 25 /tcp, 25/udp, 110/tcp]**
11. Table

    Description automatically generated with low confidence
12. e) Remove the following services and ports to block packets through the firewall. **[Service = smtp port = 25 /tcp, 25/udp]**
13. Graphical user interface, text, application

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**TASK 7**

**Bash Shell Scripting:**

1. a) Write a command to find the path of the bash shell.
2. Graphical user interface, application, table

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3. b) Write a script named helloworld.sh to display “Hello World”.
4. Graphical user interface, text, application

   Description automatically generated with medium confidence
5. c) Write a script named age.sh to prompt for age and display it.
6. Text

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7. d) Write a script named guesspass.sh to guess amin password. [password = Redhat123]
8. Text

   Description automatically generated
9. e) Write a script to calculate simple interest.
10. Text

    Description automatically generated
11. f) Write a script to determine the type of tringle by reading the lengths of its sides.
12. Text

    Description automatically generated
13. g) Write a script to determine if a user-inputted number is positive, negative, or Zero.
14. Text

    Description automatically generated
15. h) Write a script to print the first 10 elements of Fibonacci series.
16. Graphical user interface, text, email

    Description automatically generated
17. i) Create a shell script named “bg.sh” inside /root directory which when execute with parameter ‘boy’, the output should be ‘girl’, when execute with the parameter ‘girl, the output should be ‘boy’ & when execute with some other parameter or no parameter the output should be “enter boy or girl only”.

Text

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