ProgressSoft Assignment

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Introduction

This assignment introduces key IT tools and technologies that are essential for managing and deploying modern applications. It provides a concise overview of Linux, Apache Tomcat, databases with SQL, Docker and Kubernetes. The goal is to give learners a foundational understanding of these technologies, making it useful for interview preparation or for anyone looking to strengthen their IT knowledge. By completing the tasks, learners will gain practical experience and develop a clear understanding of how these technologies work together in real-world IT environments.

Assignment Details	
Areas of Focus	Related Examples
Operating System (OS) and Linux	Linux
Application Server	Oracle
Database	Postgres
Cloud Computing	Tomcat
Containerization and Orchestration	Docker
DevOps	AWS
Automation Tasks	K8s
	Vagrant
	Scripts

Linux

1. Install Linux OS: Install CentOS, Red Hat, or Ubuntu on your VirtualBox (VBOX) or VMware. Write the commands with examples for the following task:

Task: Create a script to display all OS information as shown below:

System Information

- Executed By: root
- Hostname: postgres02
- Server IP: 10.0.2.15
- Public IP: 176.29.209.237
- OS Type and Version: Ubuntu 22.04.4 LTS
- Kernel Version: 5.15.0-116-generic
- Architecture: x86_64
- Virtualization: Oracle
- Server Time: Tue Jun 17 07:45:36 AM UTC 2025
- Timezone: Etc/UTC (UTC)
- Uptime: 51 minutes

Resource Usage

- Total Memory: 1.9 GiB
- Memory Usage: 297 MiB / 1.9 GiB
- Swap Usage: 0.0 KiB / 2.0 GiB
- CPU Cores: 1

2. Create a Linux user named PS with primary group PSgroup andsecondary group dba.
3. Modify the root password.
4. Install MySQL DB Engine and HAProxy on the Linux VM.
5. Allow TCP/UDP traffic only on port 3306 using firewall services and commands.
6. Copy a file from your local machine to the VM using FTP tools or command line (check all available options).
7. Read about Linux in general (architecture, directories, distributions, etc.).

SQL

1. Read about SQL/PLSQL and DML, DDL, and DCL.
2. What are the different types of JOINs?
3. What is RDBMS and NoSQL? Also, read about:
   - Aggregation functions
   - Date and string functions
   - Constraints and indexes

Answer the following SQL questions:

Q1: Create the tables shown below (you may create additional tables if needed).

MyEmployee	
Name	
ID Number	
LAST_NAME	String
FIRST_NAME	String
HIRE_DATE	DATE
USERID	Number
SALARY	Number
DEPT_ID	Number
Gender_ID	Number
University_ID	Number
EMP_IMAGE	BLOB

MyDepartment	
Name	Type
Dept_ID	Number
Name	String

Gender	
Name	Type
Gender_ID	Number
Name	String

University	
Name	Type
ID	Number
Name	String

Note: You need to create the necessary constraints on the tables above (Primary Key, NOT NULL, Foreign Key, and CHECK).

Q2: Write a SQL query to retrieve the following data:

- Employee Name
- Salary
- Department Name
- Manager (as Name)
- Gender (as Name)
- Employee University (as Name)

Q3: Display all job titles and the total monthly salary for each job title, where the total payroll exceeds $2500, excluding sales employees.

Q4: There are four coding errors in the following statement. Identify them:

SELECT empno, ename,

salary x 12 ANNUAL SALARY; FROM emp;

Q5: The HR department wants to determine the names of all employees who were hired after SCOTT. Write an Oracle function F_HR_QUERY to display the name and hire date of any employee hired after SCOTT.

Note: Insert initial data into the MyEmployee table to test the function. Example:

- SCOTT, Hire Date: 9/9/1987
- Ahmad, Hire Date: 10/10/1980
- Rami, Hire Date: 24/05/1986

Q6: Write an Oracle procedure (PL/SQL) to copy all data from the MyEmployee table to a new table MyEmployee_update.

Procedure Name: P_COPY_EMPLOYEE

Tomcat

1. In your own words, explain what JVM means.
2. In your own words, explain what an application server is.
3. In your own words, explain what a WAR file is, how Tomcat handles it, and where it should be deployed.

Practice:

1. Download and install Tomcat as a WebApp container. Set up a reverse proxy with Nginx and connect both so that the WebApp can be accessed through a DNS name over port 80.
2. Change the Tomcat port to 7070.
3. Create a Vagrantfile to perform the following:

Input:

- bento/ubuntu-24.04

Output:

- Vagrantfile and provision scripts (shell, Puppet, or Ansible)

Requirements:

1. Use the input image to create a virtual machine.
2. Forward guest port 7070 to host port 9090.
3. Set up VM memory to 2GB.
4. Install Java 8 and Apache Tomcat 9.

Note: Do not send any VM attachments, binaries, or zip files.

DevOps

Docker:

1. Read about Docker: what it is, use cases, and basic commands.
2. Create a Dockerfile for a Tomcat Docker image, deploy a sample WAR in it, and push it to a Docker registry.
3. Run Nginx and PostgreSQL as Docker containers.

Kubernetes:

1. What is Kubernetes?
2. Explain the purpose of master and worker nodes, and how to identify whether a node is master or worker.
3. Try installing K8s, K3s, or MicroK8s and perform a sample deployment.

Version Control (GitHub/GitLab):

1. Create your own project on GitHub or GitLab.
2. Use the command line to upload and download files in the project directory.
3. Read about common Git commands.

Key Concepts to Explore:

1. RAID (Redundant Array of Independent Disks)
2. DevOps
3. High Availability (HA) and Disaster Recovery (DR) – what they are, and technologies that can be used for them (examples: Oracle, PostgreSQL, or Tomcat)
4. Cloud Computing – vendor types and the difference between SaaS, PaaS, and IaaS
5. DNS and Load Balancers