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**DevOps APPLICATION**

**Apply DevOps techniques**

**RQF Level: 5 Learning Hours**

**60**

**Credits: 6**

**Sector: ICT and MULTIMEDIA**

**Trade: SOFTWARE DEVELOPMENT**

**Module Type: Specific**

**Curriculum: ICTSWD5001 TVET CERTIFICATE V IN SOFTWARE DEVELOPMENT**

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**Issue Date: February 2024**

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| **Purpose statement** | This module describes the skills, knowledge and attitude required to apply DevOps techniques. It is prepared for students pursuing TVET Level 5 in Software Development. At the end of this module the student will be able to Perform server configuration, Deploy the system and Implement monitoring strategies. | | | | | |
| **Learning assumed to be in place** | Develop front-end using React Js, Develop Mobile Application using Flutter | | | | | |
| **Delivery modality** | **Training delivery** | | **100%** | **Assessment** | | **Total 100%** |
| Theoretical content | | 30% | Formative assessment | 30% | 50% |
| Practical work: | | 70% | 70% |
| Group project and presentation | 20% |
| Individual project /Work | 50% |
|  | | Summative Assessment | | | 50% |

**Elements of Competence and Performance Criteria**

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| **Elements of competence** | **Performance criteria** |
| 1. **Perform server configuration** | 1.1. Environment is properly prepared based on platform. |
| 1.2. Linux basics are properly applied based on Linux distribution. |
| 1.3.Server services are properly managed based on selected platform. |
| 1. **Deploy the system** | 2.1. Deployment environment is properly prepared based on the system to be deployed. |
| 2.2 Continuous delivery is properly used according to the identified area of automation. |
| 2.3 Container is properly configured based on scalability of applications. |
| 2.4 Migration is properly performed based on the system environment. |
| 1. **Implement monitoring strategies** | 3.1. Monitoring tools are proactively prepared according to their respective documentation. |
| 3.2. Performance metrics and feedback data are routinely analysed in accordance with system requirements. |
| 3.3 Monitoring report is properly documented based on analysed metrics. |

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| **Knowledge** | **Skills** | **Attitude** |
| * Identification of Linux distributions * Description of server services * Description of Devops principles * Identification of technologies used in system * Description significance of Data Analysis | * Installation of Linux operating system * Applying Linux basics commands * Management of server services * Configuration of server services * Installation of system dependencies * Configuration of CI pipeline * Configuration of CD pipeline * Implementation of Continuous Integration * Performing migration * Configuration of monitoring tools * Analysing Data in DevOps * Utilizing Monitoring Tools | * Team work * Being critical thinker * Being Innovative * Being creative * Practical oriented * Have Detail oriented * Being honesty * Have Passion for Learning * Problem-Solving Mindset * Collaboration and Communication * Have Attention to Security * Have Ethical Coding |

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**Course content**

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| **Learning outcomes** | | **At the end of the module the learner will be able to:**   1. Perform server configuration 2. Deploy the system 3. Implement monitoring strategies |
| **Learning outcome 1: Perform server configuration** | | **Learning hours:20** |
| **Indicative content** | | |
| * **Preparation of environment** * Definitions of key Terms * Server * Linux * Development Operations(DevOps) * DevSecOps * Container * Node * Infrastructure as Code IaC * IaaS * CI/CD * Identification of Linux distributions * Installation of Linux operating system * **Applying Linux basics commands** * System Information * File and Directory Management * Text Processing * Process Management * Package Management * User and Group Management * System Control * **Management of server services** * Description of server services * Web * Mail * File * SSH * Network * DNS * PROXY * Monitoring and Logging * Backup * Configure server services * Web * Mail * File * SSH * Network * DNS * PROXY | | |
| Resources required for the learning outcome | | |
| **Equipment** | * Computer, Server machine, Projector | |
| **Materials** | * Internet, Electricity, Flipchart, marker pen | |
| **Tools** | * Linux OS | |
| **Facilitation techniques or Learning activity** | * Brainstorming * Group Discussion * Jig Saw * Trainer guided | |
| **Formative assessment methods /(CAT)** | * Written assessment * Performance * Oral assessment | |

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| **Learning outcome 2: Deploy the system** | | **Learning hours: 30** |
| **Indicative content** | | |
| * **Preparation of deployment environment** * Definitions of key Terms * Deployment * Build agent * Containerisation * Docker * Kubernetes * Jargon * Dependence * Evolution of DevOps and its importance * DevOps advantages and Disadvantages * Description of DevOps technologies * Description of devOps principles * Description of DevOps lifecycle * Identification of technologies used in system to be deployed * Selection of deployment technologies and tools * Installation of system dependencies * **Use Continuous delivery** * Select CD tools * deployment orchestration * CI server * Performing Continuous integration (CI) * Configure server * Set up Automated build * Implement Automated testing * Check Code Quality * Artifact Management * Integration with version control * Configure CI pipeline * Continuous deployment (CD) * Develop deployment scripts * Use infrastructure as code (IaC) * Use deployment orchestration tool * Implement automated rollback * Configure CD pipeline * **Configuration of container** * Identification of containerisation tools * Setup docker * Build Docker Images * Store Docker Images * Implement Continuous Integration * **Perform migration** * Identify data migration best practice * Selecting the Right Tools & Technology * Creating a data migration pipeline * Implement Continuous Integration | | |
| Resources required for the indicative content | | |
| **Equipment** | * Computer, Server machine, Projector | |
| **Materials** | * Internet, Electricity, Flipchart, marker pen | |
| **Tools** | * Ansible * Chef * Puppet * SaltStack * Terraform * GitLab * Jenkins | |
| **Facilitation techniques or Learning activity** | * Brainstorming * Group Discussion * Jig Saw * Trainer guided | |
| **Formative assessment methods /(CAT)** | * Written assessment * Performance * Oral assessment | |

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| **Learning outcome 3: Implement monitoring** | | **Learning hours: 10** |
| **Indicative content** | | |
| * **Preparation of monitoring tools in DevOps environment** * Benefits of DevOps monitoring * Importance of monitoring tools * Identification of monitoring tools types * Application tools * Networking tools * Infrastructure tools * Installation of monitoring tools * **Analysis of Performance Metrics and Feedback Data** * Introduce performance metrics and Feedback Data * Describe significance of Data Analysis * Describe types of data in Devops * Utilizing Monitoring Tools * Analysing Data in DevOps * Regular Review * Root Cause Analysis * Actionable Insights * Feedback Loop Integration * **Documentation of monitoring report­­­­­** * Executive Summary * Key Metrics * Report findings * Trends Analysis * Alerts and Incidents * Action Items * Optimization or remediation. * Conclusion * Appendix( Include additional details, charts, graphs, or raw data) | | |
| Resources required for the indicative content | | |
| **Equipment** | * Computers, Projector | |
| **Materials** | * Electricity, internet ,flipchart ,marker pen | |
| **Tools** | * Ansible * Chef * Puppet * SaltStack * Terraform | |
| **Facilitation techniques or Learning activity** | * Brainstorming * Group Discussion * Jig Saw * Trainer guided | |
| **Formative assessment methods /(CAT)** | * Written assessment * Performance * Oral assessment | |

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| Integrated/Summative assessment | | | | | | |
| DELVAL LTD, is a Software development company located in MUSANZE city, It has a service-oriented platform with a large user base of more than 2 million users. Their platform has 1 million user visits every day. The System consists of website, data store, notification system.  The different teams are continuously developing different parts of the system, but all different types of testing and deployment are carried out by system administrators manually, which takes much time and effort depending on tasks to be performed by administrator.  This current deployment method is error-prone and time consuming. Every day system administrator needs to assess and allocate infrastructure resources efficiently, but it does not happen on time.  Company wishes to automate deployment tasks performed by administrator.  You are hired as DevOps Engineer to:   * + - 1. Prepare new testing, development and production environment to the Company’s Teams to facilitate their team work, collaboration and communication.       2. Automate integration pipeline which allows developers from different teams to integrate their code quickly and get quick feedback from tests developed by developers and quality engineers.       3. Implement an automated delivery pipeline which helps developers to deploy their code instantly.       4. Enable the system to scale up or down automatically based on system load.       5. Ensure there are email notifications of different system alerts to the System Administrator.   Instructions:   1. Use Containerisation 2. The task will be done within 8 hours.   **All tools, materials and equipments will be provided.** | | | | | | |
| **1QA** | **Assessment criteria (Based on performance criteria)** | **Indicator** | **Observation** | | | **Marks allocation** | |
| **Yes** | **No** |  | |
| **Learning outcome 1:**  **Perform server configuration**  **(30%)** | **1.3. Server services are properly managed.** | Ind.1.Linux operating system is Installed |  |  | 4 | |
| Ind.2. Linux commands are applied depending on tasks to be performed |  |  | 8 | |
| Ind.2 Web Server services are configured |  |  | 3 | |
| Ind.3 Mail Server services are configured |  |  | 3 | |
| Ind.4 File Server services are configured |  |  | 3 | |
| Ind.5 SSh Server services are configured |  |  | 3 | |
| Ind.6 DNS Server services are configured |  |  | 3 | |
| Ind.7 Network Server services are configured |  |  | 3 | |
| **Learning outcome 2:**  **Deploy the system**  **(50%)** | **2.2. Continuous delivery is properly used** | Ind.1 Deployment technology and tools are selected |  |  | 2 | |
| Ind.2.System dependencies are installed |  |  | 3 | |
| Ind.3. Tools are selected |  |  | 4 | |
| Ind.4 CI pipeline are configured |  |  | 4 | |
| Ind.5 Integration with version control have been performed |  |  | 5 | |
| **2.3 Container is properly configured.** | Ind 1. Docker set up have been performed |  |  | 5 | |
| Ind 2. Development scripts are developed |  |  | 4 | |
| Ind3. Deployment orchestration is applied |  |  | 4 | |
| **2.4 The migration is properly performed** | Ind 1 Setup docker |  |  | 3 | |
| Ind 2 Build Docker Images |  |  | 2 | |
| Ind 3 Store Docker Images |  |  | 2 | |
| Ind 4 Tools and technology have been selected |  |  | 3 | |
| Ind 5 Data Migration pipeline have been created |  |  | 4 | |
| Ind 6 Continuous integration have been implemented |  |  | 5 | |
| **Learning outcome 3:**  **Implement monitoring strategies**  **(20%)** | **3.2. Performance metrics and feedback data are routinely analysed.** | Ind.1 Monitoring tools are configured |  |  | 6 | |
| Ind.2 Monitoring tools are utilised |  |  | 4 | |
| Ind.3Data are analysed |  |  | 6 | |
| Ind 4Monitoring report is generated |  |  | 4 | |
| **Total marks** | | **100** | | | | |
| **Percentage Weightage** | | **100%** | | | | |
| **Minimum Passing line % (Aggregate): 70%** | | | | | | |

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