



**National Competency Standards  
for  
“Computer Networking and Cloud Computing”  
“Cloud Configuration Assistant”  
Level-4**



**National Vocational and Technical Training Commission (NAVTTTC),  
Government of Pakistan**



## **ACKNOWLEDGEMENT**

National Vocational and Technical Training Commission (NAVTTTC) extends its gratitude and appreciation to representatives of business, industry, academia, government agencies, provincial TEVTAs, sector skill councils and trade associations who spared time and extended their expertise for the development of National Vocational Qualifications for the trade of **Computer Networking and Cloud Computing**. This work would not have been possible without the technical support of the above personnel.

NAVTTTC initiated development of CBT&A based qualifications for 200 traditional / hi-tech trades under the Prime **Minister’s Hunarmand Pakistan Program**, focusing on Development & Standardization of 200 Technical & Vocational Education & Training (TVET) Qualifications. NAVTTTC efforts have received full support from the Ministry of Federal Education and Professional Training which highly facilitated progress under this initiative.

It may not be out of place to mention here that all the experts of Industry, Academia and TVET experts of TEVTAs, BTEs and PVTC work diligently for making this qualification worthy and error free for which all credit goes to them. However, NAVTTTC accepts the responsibility of all the errors and omissions still prevailing in the Qualification document.

It is also noteworthy that development of Skill Standards is a dynamic and ongoing process, and the developed skill standards needs periodic review and updating owing to the constant technological advancements, development in scientific knowledge, and growing experience of implementation at the grass root level as well as the demand of industry. NAVTTTC will ensure to keep the qualifications abreast with the changing demands of both national and international job markets.

**Dr. Nasir Khan,  
Executive Director,  
NAVTTTC**



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## 1. Introduction

In an enterprise, IT infrastructure is needed to provide employees with the necessary hardware and software to do their job. The key component of the IT infrastructure is the network that connects servers, desktop computers, and mobile devices. The IT infrastructure in an enterprise is a high-cost and high-maintenance unit. It requires expensive hardware and software and skilled IT service staff members to keep it running.

Cloud Computing is the delivery of computing services such as servers, storage, databases, networking, software, analytics, intelligence, and more, over the Cloud (Internet). Cloud computing has become the new trend in delivering business applications and services. The cloud is a cost-effective, flexible, reliable IT infrastructure to support e-commerce and e-learning. Cloud computing can also provide a collaboration platform for developers to participate in an application development project from anywhere and anytime. The cloud resources that are owned and operated by a third-party cloud service provider are termed as public clouds. It delivers computing resources such as servers, software, and storage over the internet. The cloud computing resources that are exclusively used inside a single business or organization are termed as a private cloud. A private cloud may physically be located on the company's on-site datacenter or hosted by a third-party service provider. The combination of public and private clouds, which is bounded together by technology that allows data applications to be shared between them. Hybrid cloud provides flexibility and more deployment options to the business.

Since a cloud can be considered an online IT infrastructure, the network is also a key component of the cloud. Networking theories and practice have been widely used in cloud computing. To understand the usage of the cloud in an enterprise, one has to have a thorough understanding of networking theories and practice.

Being cognizant of this fact, National Vocational & Technical Training Commission (NAVTTTC) developed competency standards for Computer Networking and Cloud Computing under National Vocational Qualifications Framework (NVQF). These competency standards have been developed by a Qualifications Development Committee (QDC) and validated by the Qualifications Validation Committee (QVC) having representation from the leading development houses and research labs of the country.



## **2. Purpose of the Qualification**

The competency based NVQ has been developed to train the unskilled men and women of Pakistan on the technical and entrepreneurial skills to be employed / self-employed and inevitably set sustainable impact on their lives by enhancing their livelihood income.

The purpose of these qualifications is to set professional standards for upcoming experts, who will serve as key elements enhancing quality of Pakistan’s networking, cloud computing & network security sector. The specific objectives of developing these qualifications are as under:

- Improve the professional competencies of individual in computer networking and cloud computing
- Capacitate the local community and trainers in modern CBT trainings, methodologies and processes as envisaged under NVQF
- Provide flexible pathways and progressions in computer networking and cloud computing
- Enable the trainees to perform their duties in efficient manner
- Establish a standardized and sustainable system of training in Pakistan
- Enabling the youth with greater employment opportunities



### 3. Date of Validation

The level 5 Computer networking and cloud computing qualification has been validated on 4<sup>th</sup> to 8<sup>th</sup> August, 2020 at PITAC, Lahore, by the qualification validation committee (QVC) members.

### 4. Date of Review

The level 4 in Computer networking and cloud computing qualification has been reviewed on 20<sup>th</sup> Dec 2021, by the qualification validation committee (QVC) members.

### 5. Codes of Qualifications

The International Standard Classification of Education (ISCED) is a framework for assembling, compiling and analyzing cross-nationally comparable statistics on education and training. ISCED codes for these qualifications are assigned as follows:

ISCED Classification	
Code	Description
061303	National Certificate of level-2 Qualification, in “Computer Networking & Cloud Computing “(Cloud Configuration Assistant)



## 6. Members of Qualification Development Committee

The following members participated in the qualification development process at PITAC, Lahore.

**Date:** 6<sup>th</sup> to 10<sup>th</sup> July'2020

S#	Name	Designation
1.	Dr. Adnan Noor Mian	Professor – ITU, Lahore
2.	Muhammad Yasir	Deputy Director - NAVTTC
3.	Kashif Babar	Manager – KICS, UET,Lhr
4.	Fahmeed Akram	Manager – KICS, UET,Lhr
5.	Engr. Tayyaba Amin	Sr. Instructor – Tevta, Lahore
6.	Imran Akhtar	Network Lecturer - PUCIT
7.	Mazhar Javed	Assistant Professor - UMT, Lahore
8.	Amir Amin	HOD Electrical – Malaysian Institute
9.	Hafiz M. Ishtiaq Rafique	Asst. Manager IT – ITU, Lahore
10.	Shoaib Bhatti	Manager IT – ITU, Lahore
11.	Ehtasham-ul-Haq	Administrator – LEADS
12.	Ayyaz Ahmed	Research Officer – KICS, UET Lahore
13.	Mushtaq Ahmed	AM (Trainings) – Tevta, Lahore
14.	Faisal Sarwar	PBTE Representative, Lahore
15.	Muhammad Hassaan	GIZ Consultant, Daccum Facilitator



## 7. Members of Qualification Validation Committee

The following members participated in the qualification development process at PITAC, Lahore.

**Date:** 4<sup>th</sup> to 8<sup>th</sup> August, 2020

S#	Name	Designation
1.	Dr. Adnan Noor Mian	Professor, ITU, Lahore
2.	Muhammad Yasir	Deputy Director - NAVTTC
3.	Hafiz M. Ishtiaq Rafique	Asst. Manager IT – ITU, Lahore
4.	Muhammad Akram	Regional Project Manager, ZTE, Faisalabad
5.	Aemal	Support Engineer, Oracle Pakistan
6.	Sumera Perveen	Instructor, GCTW, Bahawalpur
7.	Kashif Babar	Manager – KICS, UET, Lahore
8.	Muhammad Zubair	Manager Research, KICS, UET, Lahore
9.	Engr. Naseebullah	Lecturer IT – GPI Quetta
10.	Shoaib Bhatti	Manager Network, ITU, Lahore
11.	Hammad Ameer	Corvit System, Lahore
12.	Faisal Sarwar	PBTE Representative, Lahore
13.	Muhammad Hassaan	GIZ Consultant, DACUM Facilitator





## **8. Entry Requirements**

Entry requirement for this Level 4 qualification would be Level-3 in Computer Networking & Cloud Computing

## **9. Regulation of the Qualification and schedule of units**

Not Applicable



## 10. Summary of Competency Standards

Sr No	Competency Standards	NVQF Level	Category	Estimated Hours			
				Th	Pr	Total	Cr Hr
Level 4		Cloud Configuration Assistant					
1. Install Server Operating System		Level 4	Technical	16	33	49	4.9
2. Configure Inter-VLAN Routing by using Multi-Layer Switch (MLS)		Level 4	Technical	12	48	60	6
3. Configure Basic Wireless Network		Level 4	Technical	16	33	49	4.9
4. Perform Window Based Network Administration		Level 4	Technical	12	48	60	6
5. Perform LINUX Based Network Administration		Level 4	Technical	20	84	104	10.4
6. Manage Video Conference and Meeting		Level 4	Technical	15	33	48	4.8
7. Install configure CCTV and NVR		Level 4	Technical	15	33	48	4.8
8. Perform NAS Configuration		Level 4	Technical	15	33	48	4.8
9. Develop Programs Using Object Oriented Concepts		Level 4	Technical	14	93	107	10.7
10. Perform Deployment of Cloud Application		Level 4	Technical	14	63	77	7.7
11. Develop Application on any High-Level Programming Language		Level 4	Technical	11	93	104	10.4
12. Perform Debugging of Cloud Application		Level 4	Technical	30	60	90	9
13. Develop API Function		Level 4	Technical	16	63	79	7.9
14. Build Application by Using Command Line Interface (CLI)		Level 4	Technical	11	93	104	10.4



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and Software Development Kits (SDK)						
<b>15.</b> Create Virtual Machines/Hypervisor in Data center	Level 4	Technical	15	65	80	8
<b>16.</b> Manage Virtual Machines/Hypervisor	Level 4	Technical	12	51	63	6.3
<b>17.</b> Perform Basic Green Skills	Level 4	Generic	10	20	30	3
<b>Total</b>			<b>254</b>	<b>946</b>	<b>1200</b>	<b>60</b>



## 11. Detail of Qualification and its Competency Standards

### LEVEL 4

#### 061303-A Install Server Operating System

**Overview:** This competency unit covers the skills and required knowledge to install and configure computer operating systems (windows, Linux etc.), hardware and networks. The underpinning knowledge regarding computer operating systems, hardware and networks will be suffice.

Competency Unit	Performance Criteria
<b>CU1. Perform server installation</b>	<b>P1.</b> Configure YAML file. <b>P2.</b> Create web server gateway interface (WSGI) application. <b>P3.</b> Write Scripts according to application requirements. <b>P4.</b> Perform a Sanity check.
<b>CU2. Perform Window Installation</b>	<b>P1.</b> Check the compatibility of hardware according to requirement <b>P2.</b> Install the operating system on workstation as required
<b>CU3. Perform maintenance &amp; troubleshooting</b>	<b>P1.</b> Identify system error and rectify <b>P2.</b> Create backup and recovery <b>P3.</b> Re-install the server operating system if required

#### Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes:

- Basic knowledge of current industry-accepted operating system i.e Microsoft, LINUX, Unix etc., hardware and software products
- Compatibility of an operating system with Hardware of different manufacturers
- Function of single-user and multi-user operating systems
- Interoperability between operating systems
- Concept of Active Directory and DNS.
- Setting up of DHCP, Routing and remote access.



## **Tools and Equipment**

The tools and equipment required for this competency standard are given below:

S. No.	Items
1	Server Machines and OS installation Kit
2	Software CDs/USB
3	Computer/Laptop

## **Critical Evidence(s) Required**

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Perform server installation
- Develop Dynamic Web App
- Perform maintenance & troubleshooting



## 061303-B Configure Inter-VLAN Routing by using Multi-Layer Switch (MLS)

**Overview:** This unit describes the skills and knowledge required to manage different departments in Local area Network, and how to forward traffic from one VLAN to another VLAN by using MLS.

Competency Unit	Performance Criteria
<b>CU1. Install network switch &amp; PC's</b>	P1. Perform console connection to the switch P2. Connect PC's or devices to Switch with ethernet cables P3. Configure a Trunk Link between switches P4. Assign IP addresses to PC's
<b>CU2. Configure VLANs</b>	P1. Configure two VLAN's 10 & 20 with name as IT & Accounts respectively P2. Assign the ports to specific VLAN P3. Ping from IT department (VLAN 10) to Accounts department (VLAN 20)
<b>CU3. Perform Inter-VLAN Routing by MLS</b>	P1. Configure two switch virtual interfaces (SVI) P2. Assign IP addresses P3. Communicate within the department
<b>CU4. Perform Troubleshooting</b>	P1. Troubleshoot the trunk link and status of ports P2. Troubleshoot the VLAN, SVI's & their IP addresses P3. Secure LAN from Internal & External attacks

### Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes:

- Knowledge of Basic Switching(broadcast domain,collision domain,MAC address table, CAM table,ARP request,ARP reply,ARP table )
- 3 Tier Design Hierarchy
- Basic Configurations of Switch
- Understanding of link types (Access,Trunk & Hybrid mode)
- Understanding of IEEE 802.1Q Standard
- Knowledge of Ethernet Frame Tagging
- Understanding & configurations of VLAN,advantages & Usage.
- Knowledge of switch virtual interfaces, its usage & benefits
- Understanding of STP,its working & flavours (RSTP,MSTP)



- Understanding of Etherchannel/Port channel/Link Aggregation Group
- Understanding of Portfast, Port Mirroring, Port Forwarding & Port-Security

### **Tools and Equipment**

The tools and equipment required for this competency standard are given below:

S. No.	Items
1	PC
2	Multi-layer Switch (MLS)
3	Console Cable
4	Hyper terminal/Secure CRT/Putty
5	Ethernet cables/Patch Cords
6	Power cables

### **Critical Evidence(s) Required**

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Install network switch & PC's
- Configure VLANS
- Perform Inter-VLAN Routing by MLS
- Perform Troubleshooting



## 061303-C Configure Basic Wireless Network

**Overview:** This unit describes the skills and knowledge required to learn the extension of wired local area network and how to setup Wireless Local Area Network (WLAN) for wireless Clients/Station.

Competency Unit	Performance Criteria
<b>CU1. Login and Configure Wireless Settings</b>	<b>P1.</b> Connect the computer to the router <b>P2.</b> Login using default username / password <b>P3.</b> Configure SSID for your wireless network <b>P4.</b> Configure wireless security <b>P5.</b> Clean the threat /malware using antivirus tool <b>P6.</b> Configure DHCP settings. <b>P7.</b> Change the default administrative password
<b>CU2. Connect a Wireless Client</b>	<b>P1.</b> Select the configured SSID <b>P2.</b> Enter the password <b>P3.</b> Test the connectivity with Wi-Fi router/AP.

### Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes:

- Understanding of Radio Frequency (RF), Frequency Band, Frequency Channels, Wireless Organizations, WLAN IEEE 802.11 standards, types of Antenna
- Knowledge about different Wireless Local Area Network (WLAN) deployment Models.
- Understanding of Autonomous Access Point (AP) & Controller based AP
- Identify the existing hardware, network problems and Wireless client issues
- Knowledge about different available manufacturer’s Access Point & Wireless LAN Controller (WLC).
- Capable to resolve the issue of Coverage & Security.
- Capable to perform Authentication of wireless Clients
- Knowledge about legal regulations and corporate policies

### Tools and Equipment

The tools and equipment required for this competency standard are given below:

S. No.	Items
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1	A Windows computer with wired and wireless network cards installed
2	Wireless router
3	Ethernet patch cable

### Critical Evidence(s) Required

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Login and Configure Wireless Settings
- Connect a Wireless Client



## 061303-D Perform Window Based Network Administration

**Overview:** This unit describes the skills and knowledge required to configure, manage & maintain the DHCP & DNS server on Enterprise Network.

Competency Unit	Performance Criteria
<b>CU1. Configure Active directory</b>	<b>P1.</b> Login to the Server <b>P2.</b> Install the required software for active directory services <b>P3.</b> Configure the Active Directory as per instruction <b>P4.</b> Test the Active Directory
<b>CU2. Configure DHCP Server</b>	<b>P1.</b> Install the required software DHCP Server <b>P2.</b> Configure the DHCP Server <b>P3.</b> Test the DHCP server with client
<b>CU3. Configure DNS Server</b>	<b>P1.</b> Install the required software DNS Server <b>P2.</b> Configure the DNS Server <b>P3.</b> Test the DNS server with client
<b>CU4. Configure IIS Server</b>	<b>P1.</b> Install the required software IIS Server <b>P2.</b> Configure the IIS Server as per instructed <b>P3.</b> Test the IIS server with client
<b>CU5. Perform Troubleshooting of Window Based Network Administration</b>	<b>P1.</b> Identify the problem in Server <b>P2.</b> Check the log files <b>P3.</b> Use the command lines tool for investigation <b>P4.</b> Go to graphical interface of webserver for fixing the issue <b>P5.</b> Apply the necessary command lines/graphical tools for fixing the issue <b>P6.</b> Conduct the test to check server and client

### Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes:

- Securing Windows in the enterprise network
- Security within Windows is generally pretty good; however, windows need to be configured in order to increase overall system security
- Monitor networks to ensure security and availability to specific users.
- Strong technical knowledge in IT Operations/Infrastructure/ Support and in related components such as LDAP, DNS, SSL or other system requirements.



- Manage an organization’s computers and users using the directory services, Active Directory, and Open LDAP
- Maintain integrity of the network, server deployment, and security.
- Design and deploy networks.
- Perform network address assignment.
- Assign configuration of authentication and authorization of directory services.
- choose and manage the tools that your organization will use backup your organization’s data and know how to recover your IT infrastructure in the case of a disaster

### **Tools and Equipment**

The tools and equipment required for this competency standard are given below:

S. No.	Items
1	Workstation /Servers of Dell/Huawei/HP etc.
2	Microsoft Server Operating System

### **Critical Evidence(s) Required**

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Configure Active directory
- Configure DHCP Server
- Configure DNS Server
- Configure IIS Server
- Perform Troubleshooting of Window Based Network Administration



## 061303-E Perform LINUX Based Network Administration

**Overview:** This competency unit covers the skills and required knowledge to install and configure computer operating systems Linux. Linux networking topics include installing and supporting SSH, DNS, and the Apache Web server. Common security issues are discussed, configure and upgrade Linux systems running one of the three major Linux distribution families: Red Hat, SUSE, Debian/Ubuntu to provide the basis for the job at workplace.

Competency Unit	Performance Criteria
<b>CU1. Configure DHCP Server</b>	<b>P1.</b> Install the required software DHCP Server <b>P2.</b> Configure the DHCP Server options. <b>P3.</b> Test the DHCP server with client
<b>CU2. Configure DNS Server</b>	<b>P1.</b> Install the required software DNS Server <b>P2.</b> Configure the DNS Server <b>P3.</b> Test the DNS server with client
<b>CU3. Configure Web Server</b>	<b>P1.</b> Install the required software Web Server <b>P2.</b> Configure the Web Server <b>P3.</b> Test the Web server with client
<b>CU4. Perform Troubleshooting of DHCP Server</b>	<b>P1.</b> Identify the problem in DHCP Server <b>P2.</b> Check the log files <b>P3.</b> Use the command lines tool for investigation <b>P4.</b> Apply the necessary tools for fixing the issue <b>P4.</b> Conduct the test
<b>CU5. Perform Troubleshooting of DNS Server</b>	<b>P1.</b> Identify the problem in DNS Server <b>P2.</b> Check the log files <b>P3.</b> Use the command lines tool for investigation <b>P4.</b> Go to graphical interface of DNS for fixing the issue <b>P5.</b> Apply the necessary command lines/graphical tools for fixing the issue <b>P6.</b> Conduct the test
<b>CU6. Perform Troubleshooting of Apache Server</b>	<b>P1.</b> Identify the problem in IIS Server <b>P2.</b> Check the log files <b>P3.</b> Use the command lines tool for investigation <b>P4.</b> Go to graphical interface of webserver for fixing the issue <b>P5.</b> Apply the necessary command lines/graphical tools for fixing the issue <b>P6.</b> Conduct the test



## **Knowledge & Understanding**

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes:

- Detailed knowledge of the Linux platform, including regular system administration, kernel optimization, OS hardening and the Linux networking stack.
- Solid networking skills, ability to debug networking issues using standard Linux tooling.
- Good understanding with various storage technologies and SAN/NAS protocols.
- Demonstrated experience debugging OS issues in a complex business environment.
- Experience with one or more virtualization environment in a production setting.
- Strong proclivity for automation, including demonstrated experience building automated deployment tooling for Linux. Experience with Ansible a plus.
- Large-scale system configuration management, network services (DNS, DHCP, SNMP)
- Network infrastructure (IPv6, layer 2 switching, cabling)
- Linux/Unix Patch Management
- Middleware support
- Security hardening guides & tools (DISA STIGs, SCAP, ACAS (Tenable/Nessus), HBSS).

## **Tools and Equipment**

The tools and equipment required for this competency standard are given below:

S. No.	Items
1	Servers (DHCP, DNS, Web, Backup Server)
2	Operating Server (OS)
3	Internet
4	Toolkit

## **Critical Evidence(s) Required**

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Configure DHCP Server
- Configure DNS Server
- Configure Web Server
- Perform Troubleshooting of DHCP Server



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- Perform Troubleshooting of DNS Server
- Perform Troubleshooting of Apache Server



## 061303-F Manage Video Conference and Meeting

**Overview:** This competency unit covers the skills and required knowledge to setup, install, invite and operate Video conference and meeting in various configuration applications. The underpinning knowledge regarding video conference will be sufficient to provide the basis for the job at workplace.

Competency Unit	Performance Criteria
<b>CU1. Install and Configure Video conference application</b>	<b>P1.</b> Install video conference apps on computer as per requirement <b>P2.</b> Authorize user for video meeting/conference <b>P3.</b> Schedule meeting through Date and time on video application <b>P4.</b> Send Invitation to users <b>P5.</b> Configure all setting and security before starting the meeting
<b>CU2. Share space with participants</b>	<b>P1.</b> Create sharable document <b>P2.</b> Assign permission on document <b>P3.</b> Shared the link with the participants

### Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes:

- Understand the evolution of video applications (Zoom/Google Meet/Webex/Skype), which are emerging for desktop and mobile.
- Knowledge of the main applications for video conference/meetings
- Types of video conferencing tools available
- Differentiate between analog and digital video, explain how video is processed and coded, and describe the available formats.
- Describe the differences between various video signaling protocols and Session Initiation Protocol (SIP).
- Explain the functional components of video infrastructure and their network requirements.
- Understand the Cisco Video Solution Architecture and associated environmental requirements

### Tools and Equipment

The tools and equipment required for this competency standard are given below:

S. No.	Items
1	Laptop/Desktop



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2	Internet Wifi
3	Mic
4	Web Cam if Desktop computer
5	Multimedia
6	Cisco Video Network Devices
7	LCD

### Critical Evidence(s) Required

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Install and Configure Video conference application
- Share space with participants





## 061303-G Install and Configure CCTV and NVR

**Overview:** This competency unit covers the skills and required knowledge to Installation of CCTV systems, whether analogue, digital or a combination of these technologies. The underpinning knowledge regarding CCTV systems and NVR's.

Competency Unit	Performance Criteria
<b>CU1. Install cameras &amp; NVR</b>	<b>P1.</b> Conduct survey of the site <b>P2.</b> Design solution and select equipment <b>P3.</b> Install the components for CCTV / IP camera system <b>P4.</b> Install display unit for monitoring <b>P5.</b> Install duct and mount servers in rack
<b>CU2. Perform configuration of cameras &amp; NVR</b>	<b>P1.</b> Connect NVR with LAN and internet <b>P2.</b> Connect DVR with CCTV camera and internet <b>P3.</b> Connect the IP cameras with NVR <b>P4.</b> Connect CCTV camera with DVR <b>P5.</b> Install desktop and mobile client to remotely access NVR and DVR <b>P6.</b> Configure firewall for the security of surveillance system <b>P7.</b> Configure storage parameters for CCTV/IP camera and NVR
<b>CU3. Perform maintenance &amp; troubleshooting</b>	<b>P1.</b> Rectify the CCTV/IP Cameras connectivity with NVR, DVR & display units <b>P2.</b> Check communication protocols between IP cameras and NVRS <b>P3.</b> Inspect cable health
<b>CU4. Conduct Test</b>	<b>P1.</b> Check accessibility over internet <b>P2.</b> Check the display unit to work properly <b>P3.</b> Check the data backup of CCTV/IP cameras

### Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes:

- Purpose(s) of the surveillance, Potential threat or activity to be monitored and/or recorded.
- Determination of the number of cameras, and their locations, required to monitor the agreed zones and objects.



- Intended target(s) of the surveillance and the frame rate appropriate to the target’s speed within the location under surveillance.
- Response required on detection of an event
- Knowledge of manner in which images will be viewed and recorded
- How data will be exported from the system to permanent record.
- Individuals who will require access to the recorded data.
- Selection of cameras and equipment depending on the operating environmental conditions.
- Control center configuration including secure location of control equipment.
- Power supplies; the use of a mini–UPS System should be considered in situations where there is no UPS in place.
- Compression technique to be used in recording (where appropriate).
- Installation / service of commercial alarm systems.
- Troubleshooting and repair of various systems
- Knowledge and understanding ONVIP

### **Tools and Equipment**

The tools and equipment required for this competency standard are given below:

S. No.	Items
1	Personal Protective Equipment
2	UPS
3	IP/CCTV Cameras
4	Coaxial Cable and Network Cables
5	Storage Device
6	switches and display unit
7	Routers
8	NVRs/DVRs
9	Tools Kit

### **Critical Evidence(s) Required**

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Install cameras & NVR
- Perform configuration of cameras & NVR
- Perform maintenance & troubleshooting



## 061303-H Perform NAS configuration

**Overview:** This unit describes the skills and knowledge required to perform NAS configuration.

Competency Unit	Performance Criteria
<b>CU1. Perform NAS configuration</b>	<b>P1.</b> Identify hardware requirements and specifications for storage <b>P2.</b> Configure IP addressing <b>P3.</b> Configure the components to ensure the connectivity
<b>CU2. Configure Storage Systems</b>	<b>P1:</b> Configure the shared storage as per instructions <b>P2:</b> Configure the user accounts as per instructions <b>P3:</b> Configure the permissions for the storage <b>P4:</b> Configure storage as a local drive

### Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes:

- NAS configuration
- Storage Systems
- Ip address

### Tools and Equipment

The tools and equipment required for this competency standard are given below:

S. No.	Items
1	Laptop/desktop
2	Huawei/Dell/HP/IP/IBM NAS
3	Connecting cables
4	WIFI

### **Critical Evidence(s) Required**

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Perform NAS configuration
- Configure Storage Systems



## 061303-I Develop Program using Object Oriented Concepts

**Overview:** This competency unit covers the skills and required knowledge to demonstrate the understanding of basic programming. It provides a detailed grasp on basic programming skills required for program development.

Competency Unit	Performance Criteria
<b>CU1. Develop a program using built-in libraries</b>	<b>P1:</b> Open IDE for coding <b>P2:</b> Create basic program structure <b>P3:</b> Import the header file <b>P4:</b> Call the functions instructed by task from the built-in library. <b>P5:</b> Perform the task <b>P6:</b> Debug the code in case of error <b>P7:</b> Run the code to display the correct answer
<b>CU2. Develop programs using classes</b>	<b>P1.</b> Open IDE for coding <b>P2.</b> Create basic program structure and create simple class <b>P3.</b> Declare member functions and variables of the class <b>P4.</b> Create the objects of that class <b>P5.</b> Initialize the object <b>P6.</b> Access the functions and data of particular objects. <b>P7.</b> Debug the code in case of error <b>P8.</b> Run the code to display the correct answer
<b>CU3. Develop programs using encapsulation</b>	<b>P1:</b> Open IDE for coding <b>P2:</b> Create basic program structure and create simple class <b>P3:</b> Initialize the function header, with parameters and return type <b>P4:</b> Declare member functions and variables of the class <b>P5:</b> Apply encapsulation (private, public) on the classes <b>P6:</b> Create the objects of that class <b>P7:</b> Initialize the object <b>P8:</b> Access the functions and data of particular objects. <b>P9:</b> Debug the code in case of error <b>P10:</b> Run the code to display the correct answer
<b>CU4. Develop program using classes with inheritance</b>	<b>P1:</b> Open IDE for coding <b>P2:</b> Create basic program structure and create parent class <b>P3:</b> Declare child class/classes <b>P4:</b> Declare member functions and variables of these classes <b>P5:</b> Create the objects of both parent and child classes



	<p><b>P6:</b> Initialize the objects</p> <p><b>P7:</b> Access the functions and data of declared objects as per the requirement of the problem</p> <p><b>P8:</b> Debug the code in case of error</p> <p><b>P9:</b> Run the code to display the correct answer</p>
<b>CU5. Develop program using classes with polymorphism</b>	<p><b>P1:</b> Open IDE for coding</p> <p><b>P2:</b> Create basic program structure and create parent class</p> <p><b>P3:</b> Declare child class/classes</p> <p><b>P4:</b> Declare member functions and variables of these classes</p> <p><b>P5:</b> Create the objects of both parent and child classes</p> <p><b>P6:</b> Initialize the objects</p> <p><b>P7:</b> Access the functions and data of declared objects to show polymorphic behavior</p> <p><b>P8:</b> Debug the code in case of error</p> <p><b>P9:</b> Run the code to display the correct answer</p>
<b>CU6. Develop program using files</b>	<p><b>P1:</b> Open IDE for coding</p> <p><b>P2:</b> Create basic program structure</p> <p><b>P3:</b> Write the code to open file from program</p> <p><b>P4:</b> Write data in that file from the program.</p> <p><b>P5:</b> Write code to open another file from program</p> <p><b>P6:</b> Read data from that file and display it</p> <p><b>P7:</b> Debug the code in case of error</p> <p><b>P8:</b> Run the code to display the correct answer</p>

### **Knowledge & Understanding**

The trainee must be able to demonstrate knowledge and understanding required to carry out tasks covered in this competency standards which includes the knowledge of:

- Understanding the basic problem to be solved.
- Identification of programming concept required in it.
- Understanding of IDE being used for the selected language.
- Understanding of basic Data Types, Variables and Constants basic input and output statements.
- Understanding of decision control statements.
- Understanding of Repetition (Loops) statements.
- Understanding of Arrays
- Understanding of Functions



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- Understanding of commonly used built-in libraries
- Define Pointer and address handling
- Understanding of object-oriented programming (OOP).
- Differentiation between objects and classes
- Basic Understanding of Encapsulation and data abstraction
- Basic Understanding of Inheritance

**Tools and Equipment**

The tools and equipment required for this competency standard are given below:

S. No.	Items
1	IDE for C++ / Python (Py charm / Dev C++)
2	Laptop/Desktop

**Critical Evidence(s) Required**

The trainee needs to produce following critical evidence (s) to be competent in this competency standard

- Programs developed by the student



## 061303-J Perform Deployment of Cloud Application

**Overview:** After this competency, standard candidate will be able to deploy a cloud application.

Competency Unit	Performance Criteria
<b>CU1. Collect Requirement for Cloud Computing Platform</b>	<b>P1.</b> Organize interview sessions for clients. <b>P2.</b> Gather information regarding VM's or virtualization. <b>P3.</b> Gather information regarding storage spaces. <b>P4.</b> Gather information regarding networking. <b>P5.</b> Create prototype to help visualize processes <b>P6.</b> Get the requirements approved formally from client side
<b>CU2. Create and Configure application</b>	<b>P1.</b> Login to cloud server <b>P2.</b> Create a new application on cloud server <b>P3.</b> Configure application
<b>CU3. Configure application environment</b>	<b>P1.</b> Create web server environment as per requirement (single instance, load balancing or auto scaling environment) <b>P2.</b> Create worker environment <b>P3.</b> Build Environment type <b>P4.</b> Deploy application on cloud <b>P5.</b> Create environment inside a VPC
<b>CU4. Access uploaded application</b>	<b>P1.</b> Extract URL from dashboard <b>P2.</b> Review upload application

### Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes:

- Understanding of cloud
- Techniques to gather information
- Basic knowledge of cloud server.
- Understanding of Cloud Services and Platform
- Understanding of creating and managing environment
- Identify key features of cloud service providers
- Basic knowledge of industry standard certification for cloud service provider
- Basic knowledge of security certifications for cloud service provider



- Strong familiarity with Linux and Windows operating systems and cloud provider ecosystems like Amazon AWS, Microsoft Azure etc.,
- Practical knowledge of AWS/Azure/Google foundation services related to public cloud, deployment and management, automation technologies
- Understanding of complex enterprise environments and current technology areas like cloud and mobility Interoperability between operating systems

### **Tools and Equipment**

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	Computer System
2.	Internet Connection
3.	UPS
4.	Operating System (Windows, Linux)
5.	AWS account

### **Critical Evidence(s) Required**

The trainee needs to produce following critical evidence (s) to be competent in this competency standard

- Create and Configure application
- Configure application environment
- Access uploaded application





## 061303-K Develop Application on any High-Level Programming Language

**Overview:** After this competency, standard candidate will be able to develop application using any high-level programming language.

Competency Unit	Performance Criteria
<b>CU1. Configure hosting plan</b>	<b>P1.</b> Create a feasible hosting plan. <b>P2.</b> Configure Web servers with hosting plan. <b>P3.</b> Download Python SDK (Software Development kit) and another framework required <b>P4.</b> Get request response for a webpage.
<b>CU2. Develop Static Web App</b>	<b>P1.</b> Configure YAML file. <b>P2.</b> Create web server gateway interface (WSGI) application. <b>P3.</b> Write Scripts according to application requirements. <b>P4.</b> Perform a Sanity check.
<b>CU3. Develop Dynamic Web App</b>	<b>P1.</b> Upgrade web application to use WSGI. <b>P2.</b> Create code or scripts to retrieve information from users. <b>P3.</b> Protect application from malicious users, using python escape functions <b>P4.</b> Perform frequent sanity checks
<b>CU4. Deploy application</b>	<b>P1.</b> Navigate to available cloud platform <b>P2.</b> Upload the application on your Hosting platform. <b>P3.</b> Review uploaded application using URL

### Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes:

- Basic knowledge of programming.
- Understanding of cloud services and platforms
- Understanding of creating and managing hosting services
- Understanding of Python and Databases.
- Define YAML and WSGI configurations.

### Tools and Equipment

The tools and equipment required for this competency standard are given below:



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S. No.	Items
1.	Computer System
2.	Internet Connection
3.	UPS
4.	Operating System (Windows, Linux)

### Critical Evidence(s) Required

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Develop basic web application using python as programming language.



## 061303-L Perform Debugging of Cloud Application

**Overview:** After this competency, standard candidate will be able to debug live python codes and cloud applications

Competency Unit	Performance Criteria
<b>CU1. Monitor Performance</b>	<b>P1.</b> Install Sentry <b>P2.</b> Monitor performance issues <b>P3.</b> Resolve errors and poor performing API calls
<b>CU2. Perform monitoring with stack traces</b>	<b>P1.</b> Locate local variables in Stack for prod errors <b>P2.</b> Write custom logics that gets executed on startup <b>P3.</b> Inspect errors on runtime <b>P4.</b> Extract additional errors from frame for any local variable
<b>CU3. Use built-in cloud functions</b>	<b>P1.</b> Enable logging using diagnostics <b>P2.</b> Extract application`s insight <b>P3.</b> Demonstrate visual profiling <b>P4.</b> Sync the remote desktop to the host Machine

### Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes:

- Basic knowledge of debugging an application.

### Tools and Equipment

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	Computer System
2.	Internet Connection
3.	UPS
4.	Operating System (Windows, Linux)
5.	Uploaded application or code on cloud

### Critical Evidence(s) Required

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Perform monitoring with stack traces
- Use built-in cloud functions



## 061303-M Develop API Functions

**Overview:** After this competency, standard candidate will be able to develop API functions.

Competency Unit	Performance Criteria
<b>CU1. Design the API</b>	<b>P1.</b> Build new services using REST (RE presentational State Transfer) or SOAP (Simple Object Access Protocol) <b>P2.</b> Attach to business capability <b>P3.</b> Gather resources from published information model <b>P4.</b> Choose suitable resource methods <b>P5.</b> Configure API security
<b>CU2. Perform Virtualization on API's</b>	<b>P1.</b> Utilize realistic data to fetch responses <b>P2.</b> Isolate API operations <b>P3.</b> Simulate network conditions and server capacity <b>P4.</b> Load test on virtual API's
<b>CU3. Build API's business logic</b>	<b>P1.</b> Apply the business logic <b>P2.</b> Apply security for Public API <b>P3.</b> Expose Database tables as REST resources <b>P4.</b> Test the APIs

### Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes:

- Basic knowledge of business models and business systems.
- Understanding of API integrations

### Tools and Equipment

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	Computer System
2.	Internet Connection
3.	UPS
4.	Operating System (Windows, Linux)

### Critical Evidence(s) Required



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The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Design the API
- Perform Virtualization on API's
- Build API's business logic



## 061303-M Build application by using Command Line Interface (CLI) and Software Development Kits (SDK)

**Overview:** After this competency, standard candidate will be able to write application using command line and SDK's.

Competency Unit	Performance Criteria
<b>CU1. Perform Virtual Environment (Virtualenv) functionality</b>	<b>P1.</b> Isolate project on using virtualenvs <b>P2.</b> Use pip to install virtualenv or use Pycharm as your IDE (as guided by instructor)
<b>CU2. Request library through python</b>	<b>P1.</b> Gather information from other applications. <b>P2.</b> Integrate data using JSON or XML format. <b>P3.</b> Run pip install requests command in shell.
<b>CU3. Manage vulnerabilities</b>	<b>P1.</b> Import search function from web scraper <b>P2.</b> Pass keyword argument from command line. <b>P3.</b> Run a lookup function from web scraper <b>P4.</b> Parse the name argument command.

### Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes:

- Basic knowledge of SDK's.
- Understanding of API integrations
- Knowledge of python

### Tools and Equipment

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	Computer System
2.	Internet Connection
3.	UPS
4.	Operating System (Windows, Linux)



### Critical Evidence(s) Required

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Perform Virtual Environment (Virtualenv) functionality
- Request library through python
- Manage vulnerabilities



## 061303-N Create Virtual Machines/Hypervisor in A Datacenter

**Overview:** This unit describes the skills and knowledge required to learn virtualization, hypervisor, network virtualization and VM operations as well as troubleshooting of VM.

Competency Unit	Performance Criteria
<b>CU1. Create virtual machine</b>	<b>P1.</b> Install hypervisor <b>P2.</b> Open hypervisor <b>P3.</b> Install a guest OS
<b>CU2. Manage networking of Virtual Machine</b>	<b>P1.</b> Open hypervisor <b>P2.</b> Open guest OS <b>P3.</b> Assign IP address to the VM <b>P4.</b> Connect the VM with others VM as per instruction <b>P5.</b> Perform operations on VM <b>P6.</b> Open the hypervisor <b>P7.</b> Clone a VM <b>P8.</b> Troubleshoot the VM

### Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes:

- What is Virtualization? What are virtual machines?
- Virtualization Landscape. Network Virtualization. Suitability for Organizations. Advantages of deploying Virtualization.
- Downsides of deploying Virtualization.
- Overview of Virtualization products, Bare metal, Hosted.
- Knowledge of General Security Concepts, Communication, Security, Infrastructure Security, and Unified Communications
- Knowledge of movement from a physical environment to a virtual one
- Install and configure virtual machine managers.
- Create and network virtual machines.
- Set priorities for accessing resources.
- Move and clone virtual machines.
- Ensure high availability for applications within virtual machines
- Building the architecture. Examining Bare Metal architecture. Server Virtualization. Leading Platforms of Server Virtualization. VMware ESXi, Hyper-V, Xen, KVM. Unique Features
- Virtualization and Storage. Virtualization and the Network. Systems Management. Opportunities for Application Developers





## **Tools and Equipment**

The tools and equipment required for this competency standard are given below:

S. No.	Items
1.	Server Xeon processor with 32 GB ram, 2TB HDD
2.	VMware ESXi, Hyper-V, Xen, KVM, Fusion Compute

## **Critical Evidence(s) Required**

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Create virtual machines/hypervisor in a datacenter



## 061303-O Manage Virtual Machines/Hypervisor

**Overview:** This unit describes the skills and knowledge required to learn management of virtual machines/hypervisor, disaster and recovery management as well as monitoring.

Competency Unit	Performance Criteria
<b>CU1. Modify the Virtual Machines</b>	<b>P1.</b> Identify the modification requirement for virtual machine <b>P2.</b> Run the hypervisor <b>P3.</b> Assign the required resources as per instruction <b>P4.</b> Verify the resources
<b>CU2. Create Virtual Machine Snapshots</b>	<b>P1.</b> Run the hypervisor <b>P2.</b> Create snapshot as per instruction <b>P3.</b> Save the snapshot as instructed
<b>CU3. Perform Resource Management and Monitoring</b>	<b>P1.</b> Run the hypervisor <b>P2.</b> Install the required tool for management <b>P3.</b> Install the required tools for monitoring of VMS <b>P4.</b> Monitor assigned resources utilization
<b>CU4. Troubleshoot the network connectivity</b>	<b>P1.</b> Check the network connectivity issue <b>P2.</b> Inspect the network through various third-party tools <b>P3.</b> Modify the setting <b>P4.</b> Verify the connectivity
<b>CU5. Troubleshoot the allocated resources</b>	<b>P1.</b> Check the resource issue <b>P2.</b> Inspect the network through various third-party tools <b>P3.</b> Modify the setting <b>P4.</b> Verify the solution

### Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes:

- Expert knowledge of VMware ESXi, Hyper-V, Xen, KVM and fusion compute
- Knowledge of disaster and recovery procedure Infrastructure Security, and Unified Communications
- Knowledge of high availability and load balancing of VMs
- Migration knowledge of Vms using Hypervisors.
- Basic knowledge of Server Virtualization
- Basic knowledge of network management tools i.e. Cacti, SolarWinds ,OpenNMS
- Basic knowledge of SNMP keys



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- Basic knowledge storage i.e., SSD, SAS.
- Knowledge of Virtual NIC.
- Basic knowledge of tools available in Hypervisor for monitoring

### Critical Evidence(s) Required

The candidate needs to produce following **Critical Evidence(s)** in order to be competent in this competency standard:

- Manage virtual machines/hypervisor
- Perform Troubleshooting of network connectivity, allocated resources and operating system



## 061303-P Perform Basic Green Skills

**Overview:** This unit describes the performance outcomes, skills and knowledge required to perform basic green skills. It will also allow you to manage sustainability of materials and manage waste at site. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Unit	Performance Criteria
<b>CU1. Manage sustainability of materials</b>	<b>P1.</b> Select sustainable materials as per requirement <b>P2.</b> Follow standard procedure to manage systems <b>P3.</b> Perform impact quantification of used material
<b>CU2. Manage waste</b>	<b>P1.</b> Identify various types of waste at site <b>P2.</b> Sort and categorize reusable waste <b>P3.</b> Dispose unusable waste as per set standards <b>P4.</b> Place reusable material at designated storage area

### Knowledge & understanding.

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- Environmental degradation
- Types of waste
- Waste reduction techniques
- Concept of 6 R approach (Reduce, Reuse, Recycle, Repair, Renew, and Rethink)
- Reusable materials
- Recyclable materials
- Methods for disposal of unusable materials
- Just-in-time (JIT) approach
- Basic knowledge of green energy resources (solar, biogas, natural light, rainwater, wind energy etc.)

### **Critical Evidence(s) Required**

The candidate needs to produce following Critical Evidence(s) in order to be competent in this competency standard:

- Fill checklist of incorporating waste/reusable materials, wastage controls, and resources management as per instructions.
- Prepare impact assessment report of material