

# IT602 Final term subjective solved

## 1. Network Virtualization

Network Virtualization (NV) refers to the process of abstracting physical network resources and delivering them as virtual network services. It allows multiple physical networks to be combined into a single virtual network or a single physical network to be divided into multiple virtual networks.

### Key Features:

- **Decouples network services from hardware:** Network functionalities like routing, switching, and firewalling are delivered in software.
  - **Allows programmatic network management:** Administrators can create, configure, and manage virtual networks through software.
  - **Enables flexibility and scalability:** Virtual networks can be adjusted easily without modifying the physical infrastructure.
  - **Enhances security and efficiency:** Virtualized networks allow better control over data traffic and resource utilization.
- **Example:** Cloud environments where multiple tenants share the same physical network but have separate, secure virtual networks through VLANs or VXLANs.
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## 2. Container Technology

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Container Technology is a type of server virtualization that allows multiple isolated environments (containers) to run on the same operating system kernel. Unlike traditional virtual machines, containers do not require a separate OS installation for each instance, making them lightweight and efficient.

### **Key Features:**

- **Isolation:** Each container runs independently with its own libraries and dependencies.
- **Portability:** Containers can run consistently across different environments, such as on-premises servers and cloud platforms.
- **Lightweight:** Containers consume fewer resources than virtual machines since they share the host OS kernel.
- **Fast Deployment:** Applications in containers can be deployed quickly, making them ideal for DevOps and microservices architectures.

□ **Example: Docker** and **Kubernetes** are popular containerization platforms used to manage and deploy containers efficiently.

### **Short Questions**

#### **1. Network Virtualization**

Network Virtualization (NV) is the process of abstracting physical network resources and delivering them as virtual network services. It allows multiple physical networks to be combined into a single virtual network or a single physical network to be divided into multiple virtual networks.

#### **2. Special Purpose Operating System Names**

Some examples of special-purpose operating systems are:

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- **RTOS (Real-Time Operating System)** – Used in embedded systems like medical devices and industrial automation.
- **Embedded Linux** – Used in smart appliances and IoT devices.
- **QNX** – Used in automotive and mission-critical applications.
- **VxWorks** – Used in aerospace and defense.

### **3. Drawbacks of Virtualization**

- **Increased Resource Consumption** – Running multiple virtual machines on a single server can lead to performance degradation.
- **Security Risks** – If a vulnerability exists in the hypervisor, all virtual machines can be compromised.
- **Management Complexity** – Requires additional tools, training, and expertise to maintain virtual environments.

### **4. What is Vendor Lock-in?**

Vendor lock-in occurs when a company becomes dependent on a particular vendor's technology, making it difficult to switch to another provider due to compatibility issues, high switching costs, or proprietary technologies.

### **5. What is RAID Penalty and How Much is It?**

RAID penalty refers to the extra write operations required in certain RAID levels due to parity calculations.

- **RAID 1:** No penalty (just mirroring).
- **RAID 5:** Write penalty of **4** (each write requires 4 disk operations).
- **RAID 6:** Write penalty of **6** (due to double parity calculations).

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## **6. How to Achieve Transparency in Ethics (Any 3 Points)**

- **Clear Communication** – Ensure all policies, procedures, and decisions are communicated openly.
- **Access to Information** – Employees and stakeholders should have access to relevant data and decision-making processes.
- **Accountability** – Ethical guidelines must be followed, and violations should be addressed through proper channels.

## **Long Questions**

### **1. Layered Network Topology and Its Layers**

Layered Network Topology is an approach to designing network architecture by dividing it into multiple layers. This improves network performance, scalability, and security.

#### **Layers of Layered Network Topology:**

1. **Core Layer** – The backbone of the network, ensuring high-speed data transmission.
2. **Distribution Layer** – Acts as a middle layer, aggregating data from access switches and forwarding it to the core layer.
3. **Access Layer** – The first point of connection for end-user devices, such as computers and phones.

Each layer serves a specific function and helps in efficient network traffic management.

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## **2. READ Command in OS**

The **READ** command in an operating system is used to retrieve data from storage devices such as hard drives or memory.

### **Functions of the READ Command:**

- Allows programs to access and retrieve data from files.
- Works with system calls like `read()` in UNIX/Linux.
- Ensures efficient data transfer between memory and storage devices.
- Can be synchronous (blocking) or asynchronous (non-blocking).

For example, in **Linux**, the `read()` system call works as follows:

```
ssize_t read(int fd, void *buf, size_t count);
```

Where:

- `fd` = file descriptor
- `buf` = buffer to store the data
- `count` = number of bytes to read

## **3. System Management Console**

A **System Management Console** is a central interface used for monitoring and managing IT infrastructure, including servers, networks, and storage systems.

### **Functions of a System Management Console:**

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- **Monitoring:** Provides real-time system performance data.
- **Configuration Management:** Helps in setting up hardware and software parameters.
- **Alerts and Notifications:** Sends alerts about system failures or performance issues.
- **User Management:** Allows administrators to control user access and permissions.
- **Remote Management:** Enables system control from remote locations.

Examples:

- **Windows Admin Center** for Windows Server Management.
  - **VMware vSphere** for virtualization management.
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#### **4. Ethics in IT Infrastructure (Any 5 Points)**

Ethics in IT infrastructure ensures responsible use of technology and protects users' rights.

##### **Five Ethical Considerations:**

1. **Privacy Protection** – Ensuring users' personal data is secure and not misused.
2. **Transparency** – Clearly communicating IT policies, data usage, and security protocols.
3. **Security Compliance** – Following standard security measures to prevent cyber threats.

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4. **Data Integrity** – Ensuring data is accurate, reliable, and free from unauthorized modifications.
5. **Fair Access** – Providing equal access to technology and IT resources without discrimination.

## **Short Questions**

### **1) File Sharing Protocol Name**

Some common file-sharing protocols include:

- **SMB (Server Message Block)** – Used in Windows networks.
- **NFS (Network File System)** – Used in Unix/Linux systems.
- **FTP (File Transfer Protocol)** – Used for transferring files over the internet.

### **2) Define Network Virtualization**

Network Virtualization (NV) is a process where physical network resources are abstracted and provided as virtual services. It enables the creation of multiple virtual networks over a single physical network infrastructure.

### **3) RAID Penalty Meaning & Configurations**

- **RAID penalty** refers to the extra write operations required in certain RAID levels due to parity calculations.
  
- **Configurations & Write Penalty:**
  - **RAID 1 (Mirroring):** No write penalty.

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- **RAID 5 (Striping with Parity):** Write penalty = **4**.
- **RAID 6 (Double Parity):** Write penalty = **6**.

#### **4) Management Console Meaning & Uses**

A **Management Console** is a centralized interface used for monitoring and managing IT infrastructure.

##### **Uses:**

- **System Monitoring** – Tracks server performance and resource usage.
  - **Configuration Management** – Allows system setup and changes.
  - **Security & User Management** – Controls access to network resources.
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#### **Long Questions**

##### **1) Capacity Management Objectives**

Capacity Management ensures IT infrastructure resources are efficiently used to meet current and future demands.

##### **Objectives:**

1. **Optimize Resource Usage** – Ensures CPU, memory, and storage are efficiently utilized.
2. **Prevent Performance Issues** – Avoids system slowdowns due to overutilization.
3. **Cost Efficiency** – Reduces unnecessary hardware expenses.
4. **Scalability** – Helps in planning for future growth.

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5. **Proactive Monitoring** – Identifies potential capacity issues before they impact services.

## 2) Storage Replication Types & Differences

| Replication Type         | Definition  | Key Difference   |
|--------------------------|---|--|
| Synchronous Replication  | Data is written to both primary and secondary storage at the same time.                       | Ensures real-time data consistency but adds latency.                             |
| Asynchronous Replication | Data is first written to primary storage, then replicated to secondary storage after a delay. | Faster performance but may cause data loss if failure occurs before replication. |

## 3) Security Features & How They Work

1. **Firewalls** – Block unauthorized network traffic by filtering packets based on rules.
  2. **Encryption** – Protects data by converting it into unreadable formats using cryptographic keys.
  3. **Access Control** – Restricts system access using authentication methods like passwords and biometrics.
  4. **Intrusion Detection & Prevention (IDS/IPS)** – Monitors network activity and stops potential attacks.
  5. **Backup & Disaster Recovery** – Ensures data recovery in case of failure or cyberattacks.
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#### **4) How Performance Affects Operating System (3 Points + More)**

1. **CPU Utilization:** High CPU usage can slow down task execution.
2. **Memory Management:** Efficient RAM usage prevents system slowdowns and crashes.
3. **Disk I/O Speed:** Faster storage access improves OS responsiveness.

#### **□ Other Factors Affecting OS Performance:**

- **Process Scheduling:** Optimized scheduling prevents bottlenecks.
- **Network Latency:** Slow networks can delay system responses.
- **Background Services:** Too many running services consume system resources.

#### **Short Questions**

##### **1) IT Infrastructure Process**

IT infrastructure process includes:

- **Planning & Design** – Setting up hardware, network, and security.
- **Deployment** – Installing servers, networks, and storage.
- **Monitoring & Maintenance** – Ensuring performance, security, and scalability.
- **Upgrades & Optimization** – Improving infrastructure based on usage.

##### **2) RAID Penalty Types?**

RAID penalty refers to additional write operations required for redundancy and data protection.

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| RAID Level                           | Write Penalty                                      |
|--------------------------------------|--|
| RAID 1 (Mirroring)                   | No penalty (Data is simply copied)                 |
| RAID 5 (Striping with Single Parity) | 4 (Each write = Read, Modify, Write, Parity Write) |
| RAID 6 (Striping with Double Parity) | 6 (Each write = Two Parity Calculations)           |

### 3) Security Concern Process

- **Risk Assessment** – Identifying security threats.
  - **Access Control** – Managing user permissions.
  - **Data Encryption** – Protecting data from unauthorized access.
  - **Incident Response** – Handling breaches and security issues.
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### 4) IT Infrastructure (Accountability Aspects)

- **Transparency** – Clear policies and responsibilities.
  - **Responsibility** – Ensuring IT staff follow security and compliance rules.
  - **Audit & Compliance** – Regular checks to meet security standards.
  - **Risk Management** – Identifying and mitigating IT risks.
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### 5) File Sharing Protocol Names

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- **SMB (Server Message Block)** – Windows-based file sharing.
  - **NFS (Network File System)** – Unix/Linux-based file sharing.
  - **FTP (File Transfer Protocol)** – Internet-based file transfer.
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## **6) Network Virtualization**

Network Virtualization abstracts physical networking hardware into software-based virtual networks. It enables multiple isolated virtual networks over a single physical network infrastructure.

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### **Long Questions**

#### **1) READ Command in OS**

The **READ** command in an operating system retrieves data from storage devices like hard drives or memory.

#### **Functions:**

- Allows programs to access files and retrieve data.
- Works through system calls like `read()` in UNIX/Linux.
- Can be **blocking (synchronous)** or **non-blocking (asynchronous)** for performance optimization.

#### **Example in C (Linux read system call):**

```
ssize_t read(int fd, void *buf, size_t count);
```

Where:

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- `fd` = File descriptor.
- `buf` = Buffer to store read data.
- `count` = Number of bytes to read.

## **2) Network Layer Protocol & Layers**

The **Network Layer** is responsible for routing and delivering data between devices across different networks.

### **Protocols in Network Layer:**

- **IP (Internet Protocol)** – Responsible for addressing and routing packets.
- **ICMP (Internet Control Message Protocol)** – Used for diagnostics (e.g., Ping command).
- **ARP (Address Resolution Protocol)** – Maps IP addresses to MAC addresses.

### **Layers in Network Model:**

1. **Physical Layer** – Deals with transmission of raw data bits.
  2. **Data Link Layer** – Manages MAC addressing and error detection.
  3. **Network Layer** – Handles IP addressing and routing.
  4. **Transport Layer** – Ensures end-to-end communication (TCP/UDP).
  5. **Session Layer** – Manages sessions between applications.
  6. **Presentation Layer** – Data encryption and formatting.
  7. **Application Layer** – Provides network services to applications (HTTP, FTP, etc.).
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### **3) Vendor Bidding (Procurement in IT Infrastructure)**

**Vendor Bidding** refers to the process of selecting suppliers or service providers for IT infrastructure components.

#### **Key Steps:**

1. **Request for Proposal (RFP)** – Companies invite vendors to bid.
2. **Evaluation of Proposals** – Checking cost, features, and compatibility.
3. **Negotiation** – Finalizing price and contract terms.
4. **Selection & Procurement** – Choosing the best vendor and completing the deal.

□ **Risk of Vendor Lock-in:** Some vendors use proprietary technologies, making it difficult to switch providers later.

### **4) Layered Network Topology**

Layered Network Topology organizes network infrastructure into hierarchical layers for better performance, security, and scalability.

#### **Three Layers in Layered Network Model:**

1. **Core Layer** – High-speed backbone for network traffic.
2. **Distribution Layer** – Aggregates and forwards traffic between core and access layers.
3. **Access Layer** – Connects end-user devices like PCs and phones.

#### □ **Benefits:**

- Improves **scalability** and **performance**.
- Provides **security** by isolating traffic.

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- Supports **redundancy** and fault tolerance.

### **1) Define Network Virtualization**

Network Virtualization (NV) is the process of abstracting physical network resources and delivering them as virtual network services. It allows multiple physical networks to function as a single virtual network or a single physical network to be divided into multiple isolated virtual networks.

#### **Key Features:**

- Decouples network services from hardware.
  - Enables flexible and scalable network management.
  - Used in cloud computing and data centers.
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### **2) Meaning of RADIUS**

**RADIUS (Remote Authentication Dial-In User Service)** is a networking protocol used for centralized authentication, authorization, and accounting (AAA) of users accessing a network.

#### **□ Uses:**

- Provides authentication for network devices (e.g., routers, VPNs).
  - Manages user permissions and access control.
  - Used in enterprise and ISP environments for secure logins.
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### **3) IT Infrastructure's 3 Steps According to Ethics**

1. **Transparency:** Ensuring clear policies and ethical standards in IT operations.
2. **Security & Privacy:** Protecting user data from unauthorized access.
3. **Accountability:** Making IT staff responsible for ethical compliance and system integrity.

### **4) System Management Console**

A **System Management Console** is a centralized interface used for monitoring, configuring, and managing IT infrastructure.

#### **□ Functions:**

- **Monitoring:** Tracks system performance and usage.
- **Configuration:** Manages hardware and software settings.
- **Security:** Controls user access and permissions.

#### **Examples:**

- **Windows Admin Center** (for Windows Server management).
  - **VMware vSphere** (for virtualization management).
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### **5) Deployment Infrastructure Model Names**

There are **four** main deployment models for IT infrastructure:

1. **On-Premises (Traditional IT)** – Hardware and software managed in-house.

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2. **Cloud Infrastructure** – Resources hosted on cloud service providers like AWS, Azure, or Google Cloud.
  3. **Hybrid Infrastructure** – A mix of on-premises and cloud-based solutions.
  4. **Edge Computing** – Processing data closer to the source (IoT devices, remote locations).
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## □ Long Questions

### 1) Five Drawbacks of Virtualization

1. **Performance Overhead:** Running multiple virtual machines on a single host can reduce efficiency.
2. **Security Risks:** Hypervisor vulnerabilities can affect all virtual machines.
3. **Management Complexity:** Requires advanced tools and expertise for maintenance.
4. **Licensing Costs:** Some virtualization software requires costly licenses.
5. **Hardware Dependency:** High-performance hardware is needed for smooth operation.

### 2) Types of Network Layer Topology

1. **Layered Network Topology:** Divides the network into Core, Distribution, and Access layers for better efficiency.

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2. **Spine-Leaf Topology:** Used in Software-Defined Networking (SDN), connecting all leaf switches to spine switches.
3. **Mesh Topology:** Each node is connected to multiple nodes, providing redundancy.
4. **Star Topology:** All devices connect to a central switch, improving performance.

### **3) DTAP Model (Development, Testing, Acceptance, Production)**

The **DTAP model** is a structured approach to software deployment and IT infrastructure management.

#### **Phases:**

1. **Development (D):** Coding and building the application.
2. **Testing (T):** Finding and fixing bugs.
3. **Acceptance (A):** Evaluating if the software meets business needs.
4. **Production (P):** Deploying the final version for end-users.

#### **Uses:**

- Ensures stability and security before deployment.
  - Reduces risks of system failures.
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#### **4) Five Purposes of an Operating System**

1. **Process Management:** Allocates CPU resources to running applications.
  2. **Memory Management:** Manages RAM allocation for efficient operation.
  3. **File System Management:** Handles data storage and retrieval.
  4. **Security & Access Control:** Protects user data through authentication and encryption.
  5. **User Interface (UI):** Provides graphical or command-line interaction with the system.
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#### **Short Questions**

##### **1) Kernel ke baare mein**

The **Kernel** is the core component of an operating system that directly interacts with hardware and manages system resources.

##### **□ Functions of Kernel:**

- **Process Management:** Handles running programs and multitasking.
- **Memory Management:** Allocates RAM for applications.
- **Device Management:** Controls hardware like disks, keyboards, and network devices.

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- **System Security & Access Control:** Ensures data protection and system integrity.

## 2) Two File Transfer Protocols

1. **FTP (File Transfer Protocol):** Used for transferring files over a network.
2. **SFTP (Secure File Transfer Protocol):** Secure version of FTP using SSH encryption.

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## 3) RAID Penalty Meaning & Explanation

RAID penalty refers to additional write operations required in certain RAID levels due to parity calculations.

| RAID Level             | Write Penalty | Explanation  |
|------------------------|---------------|--|
| RAID 1 (Mirroring)     | No penalty    | Data is simply copied to another disk.   |
| RAID 5 (Single Parity) | 4             | Each write operation requires reading old data, modifying it, writing new data, and updating parity. |
| RAID 6 (Double Parity) | 6             | Two parity calculations increase write overhead.   |

## 4) Capacity Management

Capacity Management ensures IT resources are used efficiently to meet current and future demands.

### Key Aspects:

- **Performance Optimization:** Ensures no resource bottlenecks occur.

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- **Scalability Planning:** Prepares infrastructure for future growth.
- **Cost Control:** Prevents over-provisioning of hardware and cloud services.

## **5) Resource Management Console**

A **Resource Management Console** is a centralized system used for monitoring and managing IT infrastructure.

### **□ Functions:**

- **System Performance Monitoring:** Tracks CPU, memory, and storage usage.
- **Configuration Management:** Allows changes in system settings.
- **User & Security Management:** Controls access permissions and security policies.

Examples: **Windows Resource Monitor, VMware vSphere Console**

## **6) Vendor Lock-in**

Vendor Lock-in occurs when a company becomes dependent on a particular vendor's technology, making it difficult or costly to switch to another provider.

### **□ Causes of Vendor Lock-in:**

- **Proprietary Technologies:** Incompatibility with other systems.
- **High Switching Costs:** Migration to a new vendor is expensive.
- **Contractual Restrictions:** Long-term agreements limit flexibility.

□ **Long Questions**

**1) Layered Network Topology (Detailed Explanation)**

Layered Network Topology organizes network components into different hierarchical layers to improve performance, security, and scalability.

□ **Three Main Layers:**

**1. Core Layer:**

- Acts as the high-speed backbone of the network.
- Handles fast packet switching and routing.
- Ensures minimal latency and high bandwidth.

**2. Distribution Layer:**

- Connects access layer devices to the core.
- Aggregates data traffic and applies security policies.
- Uses Layer 3 switches for efficient routing.

**3. Access Layer:**

- Connects end-user devices like PCs, printers, and IoT devices.
- Provides initial network access control and authentication.

□ **Benefits of Layered Topology:**

- **Improves scalability and performance.**
- **Enhances network security by isolating different layers.**
- **Simplifies troubleshooting and management.**

## **2) Cloud Computing (Detailed Explanation)**

Cloud Computing provides on-demand access to computing resources (e.g., servers, storage, and applications) over the internet.

### **□ Types of Cloud Computing:**

1. **Public Cloud:** Services offered by third-party providers (AWS, Google Cloud).
2. **Private Cloud:** Exclusive cloud infrastructure for a single organization.
3. **Hybrid Cloud:** Combination of public and private cloud environments.
4. **Multi-Cloud:** Use of multiple cloud providers for redundancy and flexibility.

### **□ Benefits of Cloud Computing:**

- **Cost Efficiency:** No need for heavy upfront hardware investment.
- **Scalability:** Resources can be increased or decreased as needed.
- **Accessibility:** Services are available from anywhere with an internet connection.

-----**THE END**-----

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**May Allah grant you success, ease your efforts, and bless you with wisdom and perseverance. Keep your faith strong, for with prayer, every challenge becomes an opportunity. I hope this file helps you a lot, and please remember me in your prayers.**

**Best wishes for Finals!**

**Maha 😊**