Module 11 CCNA -Automation and Programmability

• Beginner Question

1. Explain How Automation Impacts Network Management.

- ANS: Automation streamlines repetitive tasks in network management.
- It enhances efficiency and reduces human error.
- Network provisioning, configuration, monitoring, and troubleshooting can be automated.
- Automation leads to faster response times and improved network reliability.
- It enables better resource utilization and scalability.
- Network managers can focus on strategic planning and optimization with automation in place.

2. Compare Traditional network with Controller based networking.

- ANS: Traditional networks rely on manual configuration and management of individual devices.
- Controller-based networking centralizes control through a network controller, which automates configuration and management.
- Traditional networks are often more complex to manage and scale.
- Controller-based networking simplifies management and enables easier scalability.
- Traditional networks may experience configuration inconsistencies and slower response times.
- Controller-based networking offers more consistency and faster responses due to centralized control.
- Traditional networks require more manual intervention for troubleshooting and optimization.
- Controller-based networking provides more automated troubleshooting and optimization capabilities.

3. Explain Virtualization.

- ANS: Virtualization involves creating virtual instances of computing resources such as servers, storage, and networks.
- It enables multiple virtual machines (VMs) to run on a single physical machine, maximizing resource utilization.
- Virtualization abstracts hardware resources from the underlying physical infrastructure, allowing for flexibility and scalability.
- It facilitates the isolation of workloads, improving security and resource management.
- Virtualization enables the creation of virtual networks, allowing for easier management and configuration of network resources.
- It promotes disaster recovery and business continuity by enabling rapid deployment and migration of virtualized workloads.
- Virtualization is fundamental to cloud computing, enabling the efficient sharing and allocation of resources across multiple users or tenants.

• Intermediate Question

1. Describe Characteristics of REST-based API.

- ANS: **Statelessness:** Each request from a client to the server must contain all the necessary information for the server to understand and fulfill it, without relying on any context from previous requests.
- **Uniform Interface:** REST APIs have a uniform and consistent interface, typically using HTTP methods (GET, POST, PUT, DELETE) to perform operations on resources. They often use standard formats such as JSON or XML for data exchange.
- **Client-Server Architecture:** REST is based on a client-server model where the client and server are independent of each other, allowing for scalability and separation of concerns.
- **Resource-Based:** REST APIs are resource-centric, meaning that each entity or concept in the system is represented as a resource with its own unique identifier (URL).
- **Cacheability:** Responses from REST APIs can be cached to improve performance and reduce server load. Clients can include caching directives in requests to indicate whether responses can be cached.
- **Layered System:** REST APIs are designed to be layered, meaning that intermediaries such as proxies or gateways can be used to improve scalability, security, or other aspects without affecting the client-server interaction.
- **State Transfer:** REST emphasizes the transfer of state between client and server. This can be achieved through representations of resources, allowing clients to manipulate resource state through the use of standard methods.

• Advance Question

1. Explain methods of Automation

- ANS: **Scripting**: Writing scripts to automate repetitive tasks using programming languages like Python, Bash, or Power Shell.
- **Configuration Management Tools:** Using tools like Ansible, Puppet, or Chef to automate the provisioning and configuration of servers and infrastructure.
- **Orchestration**: Coordinating and automating workflows and processes across multiple systems and services using tools like Kubernetes, Docker Swarm, or Apache Airflow.

- **Monitoring and Alerting**: Implementing automated monitoring solutions like Nagios, Prometheus, or Data dog to detect issues and trigger alerts based on predefined thresholds.
- **CI/CD Pipelines**: Implementing Continuous Integration/Continuous Deployment pipelines using tools like Jenkins, GitLab CI/CD, or CircleCI to automate software development workflows from code commit to deployment.
- **Robotic Process Automation (RPA):** Automating repetitive tasks and workflows using software robots or bots to interact with applications and systems in a manner similar to humans.
- **Machine Learning and AI:** Leveraging machine learning and artificial intelligence techniques to automate decision-making processes, anomaly detection, and predictive analytics in various domains.

2. Explain SDN

- ANS: **Centralized Control:** SDN (Software-Defined Networking) centralizes network control, separating the control plane from the data plane.
- **Programmability:** It allows network administrators to program and automate network configurations using software-based controllers.
- **Dynamic Management:** SDN enables dynamic management of network resources, allowing for rapid provisioning, configuration, and optimization.
- **Flexibility:** Networks become more flexible and adaptable to changing business needs and traffic patterns through software-defined policies.
- **Virtualization:** SDN facilitates network virtualization, allowing for the creation of virtual networks that can be dynamically configured and managed.
- **Open Standards:** SDN often relies on open standards and protocols, promoting interoperability and vendor neutrality.
- **Traffic Engineering:** It enables fine-grained control over traffic flows, optimizing network performance and resource utilization.
- **Scalability:** SDN architectures can scale more easily than traditional network architectures, supporting large-scale deployments and cloud environments.

3. Explain DNA Center

- **ANS: Centralized Network Management:** DNA Center is a centralized network management platform provided by Cisco.
- **Intent-Based Networking (IBN):** It leverages IBN principles to translate business intent into network policies and configurations.

- **Automation:** DNA Center automates network provisioning, configuration, monitoring, and troubleshooting tasks.
- **Policy-Based Management:** It enables policy-based management of network devices, applications, and users.
- **Analytics and Assurance:** DNA Center provides analytics and assurance capabilities for gaining insights into network performance, security, and user experience.
- **Integration with Cisco Technologies:** It integrates with other Cisco technologies such as Cisco SD-WAN, Cisco Identity Services Engine (ISE), and Cisco Application Centric Infrastructure (ACI).
- **Streamlined Operations:** DNA Center streamlines network operations, improves efficiency, and reduces human errors.
- **Scalability and Security:** It offers scalability and security features to support large-scale enterprise networks and protect against threats.

4. Explain SD-Access and SD-WAN

ANS: SD-Access (Software-Defined Access):

- SD-Access extends the principles of SDN to the access layer of the network.
- It aims to simplify network segmentation, policy enforcement, and access control.
- SD-Access uses a centralized policy controller to define and enforce policies across the network.
- It enhances security by dynamically segmenting network traffic based on user identity, device type, and application requirements.
- SD-Access automates network provisioning and configuration, reducing manual intervention and improving agility.

SD-WAN (Software-Defined Wide Area Network):

- SD-WAN abstract the control plane from the physical infrastructure, allowing for centralized management and policy enforcement.
- It optimizes traffic routing and improves application performance over wide area networks, including MPLS, internet, and LTE connections.
- SD-WAN provide dynamic path selection, application-aware routing, and Quality of Service (QoS) capabilities to prioritize critical traffic.
- It simplifies branch office connectivity by enabling zero-touch provisioning and centralized management of remote devices.

- SD-WAN enhance network agility, scalability, and cost-efficiency compared to traditional WAN architectures.