Module 11
CCNA -Automation and Programmability

1. Explain How Automation Impacts Network Management Compare Traditional network with Controller based networking.

Ans : **Automation in Network Management**

- It means using software and tools to perform tasks without needing human intervention. This can include configuring devices, monitoring performance, troubleshooting issues, and applying security updates.

Impact of Automation:

1. **Efficiency:** Tasks that used to take hours or days can now be done in minutes, freeing up IT staff to focus on more strategic work.
2. **Consistency:** Automated processes reduce the risk of human error, ensuring that configurations and updates are applied uniformly across the network.
3. **Speed:** Network changes can be implemented quickly, allowing organisations to adapt to new demands or issues faster.
4. **Proactive Management:** Automation can help detect and resolve problems before they impact users, improving overall reliability.

❖ **Traditional Networking:**

- **Manual Configuration:** Each device (like routers and switches) is configured individually. This can be time-consuming and some errors.
- **Static Control:** Changes often require manual updates to multiple devices, making it harder to adapt to new needs.
- **Limited Visibility:** Monitoring and managing the network can be complex, as data is siloed across different devices.

❖ **Controller-Based Networking (like SDN - Software-Defined Networking):**

- **Centralised Management:** A central controller manages the entire network, allowing for easier configuration and monitoring from one place.
- **Dynamic Control:** Changes can be made from the controller, automatically updating multiple devices at once. This makes adapting to changes much faster.
- **Enhanced Visibility:** A centralised approach provides better insights into network performance and traffic patterns, making troubleshooting easier.

2. Explain SDN

Ans : SDN full name is " **Software-defined network**".
SDN is an approach to networking that uses software-based controllers or application programming interfaces(APLs) to communicate with underlying hardware infrastructure and direct traffic on a network.

3. Explain DNA Centre

Ans : DNA's full name is " **Digital networking Architecture**".

- It is a Cisco GUI for managing all things in a Campus switch, wireless, IOT, etc. network ,now with tie-ins for SD-WAN.

4. Explain SD-Access and SD-WAN

Ans : Here we can say" **Cisco Software-Defined Access (SDA)"** and" **Software-Defined Wide Area Network (SD-WAN)"** are both Cisco technologies that enhance network security and agility.

- SD-Access : **SD-Access (Software-Defined Access)** is a technology that simplifies and automates how networks connect devices like computers, smartphones, and IoT devices. It allows network administrators to manage user access and security policies centrally, making it easier to control who can connect to the network and what resources they can use. Think of it like having a smart home system that automatically adjusts settings based on who is in the house.
- SD-WAN : **SD-WAN (Software-Defined Wide Area Network)**, is focused on connecting multiple locations—like different offices or branches—over the internet. It helps manage the traffic between these locations more efficiently and securely, often using multiple types of connections (like broadband, LTE, etc.) to ensure reliable performance. Imagine it as a GPS for data, choosing the best routes for information to travel, so everything runs smoothly.

5. Explain Virtualization

➢ Virtualization is a technology that transforms hardware into software. Virtualization allows you to run multiple OS as Virtual Machines on a single computer.

➢ We can use softwares like hyper-V ,Oracle VM Virtual box, VMware workstation etc.

6. Describe Characteristics of REST-based API

➔ A **REST-based API** (Representational State Transfer) is a way for different software systems to communicate over the internet, using simple, standard methods.
    - Here are the key characteristics of a REST API

➔ **1. Stateless**: Each request sent to the server contains all the information needed for the server to understand and respond. The server doesn't remember any past requests. Every request is treated as independent.

➔ **2.Client-Server Architecture**: In REST, the client (e.g., a web browser) and the server (where data is stored) are separate. This means the client and server can evolve independently, as long as the API is consistent.

➔ **3.Uniform Interface**: REST APIs follow a simple, consistent set of rules (like using HTTP methods) so that developers can easily understand how to interact with the API, regardless of the server or platform.

➔ **4. Resources**: In REST, everything is considered a "resource" (like a user, a post, a product, etc.), and each resource is identified by a unique URL (Uniform Resource Locator).

➔ **5.HTTP Methods**: REST APIs use standard HTTP methods to perform actions on resources :
    - **GET**: Retrieve data from the server (e.g., get information about a user).
    - **POST**: Create new resources (e.g., create a new user).
    - **PUT**: Update existing resources (e.g., update user information).
    - **DELETE**: Remove resources (e.g., delete a user).

➔ **6. Representation**: When you interact with a resource through a REST API, you usually get a **representation** of that resource (like JSON or XML).
For example, when you request data about a user, the server sends back a JSON object representing that user.

➔ **7.Cacheable**: Responses from the server can be marked as "cacheable" or "non-cacheable." If data is cacheable, it means that repeated requests for the same data can be served faster without contacting the server every time.

➔ **8. Layered System**: A REST API can be organised into layers, where each layer has a specific function (like security, caching, load balancing). The client doesn't need to know how many layers exist between them and the server.

7. Explain methods of Automation

➔ Automation refers to using technology to perform tasks without human intervention. It can make processes faster, more accurate, and reduce the need for manual work. Here are some common **methods of automation**

➔ **1. Script Automation**

- **What it is:** You write a script (a set of instructions) to tell a computer what to do automatically.
- **How it works:** For example, you can write a script to rename a bunch of files, move files to a folder, or even send emails on a schedule.
- **Where it's used:** This is used in programming or IT tasks to perform repetitive actions, like system backups, log file analysis, or software deployment.

➔ 2. Robotic Process Automation (RPA)

- **What it is**: RPA uses software robots (bots) to mimic human actions on a computer. These bots can interact with websites, applications, and systems just like a person would, but much faster.
- **How it works**: The bot can click buttons, fill in forms, or process data across systems. For example, if a company needs to extract data from invoices and input it into a database, a bot can do this job.
- **Where it's used**: Common in business processes like data entry, customer service, and order processing.

➔ 3.**Workflow Automation**

- **What it is:** Workflow automation manages a sequence of tasks in a process, automating the flow of work between different people or systems.
- **How it works**: When one task is completed, the system automatically triggers the next task. For example, after an employee submits a report, it might automatically get sent to a manager for approval, then to the finance department for processing.
- **Where it's used**: Often used in business environments to manage projects, approvals, document management, etc.

➔ 4. **Artificial Intelligence (AI) Automation**

- **What it is:** AI automation uses machine learning and intelligent algorithms to automate decision-making and problem-solving tasks.
- **How it works**: The system can learn from data patterns and make decisions without human input. For example, AI can be used to automatically sort customer service emails into categories or predict maintenance needs for machinery.

- **Where it's used**: AI-powered chatbots, predictive analytics, fraud detection, and personalised recommendations.