SOFTWARE DEFINED NETWORKING(SDN) CONTROLLER BASED-NETWORK

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AGENDA

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Introduction

Software Defined Networking (SDN) is a modern networking approach that separates the control plane from the data plane, making the network more flexible and programmable. In a controller-based SDN architecture, the centralized **SDN controller** acts as the brain of the network, managing flow rules and policies, while switches and routers simply forward packets. This centralized control provides a global view of the network, enabling easier management, automation, traffic optimization, and faster deployment of new services compared to traditional networks.

What is software defined networking (SDN)?

Control Plane Separation Separates the control plane (decision-making) from the data plane (traffic forwarding).Dynamic Programmability Enables programmable, software-based network management. Reliance on rigid hardware configurations. Centralized Control Provides centralized network control. Improves flexibility, automation, and network visibility.
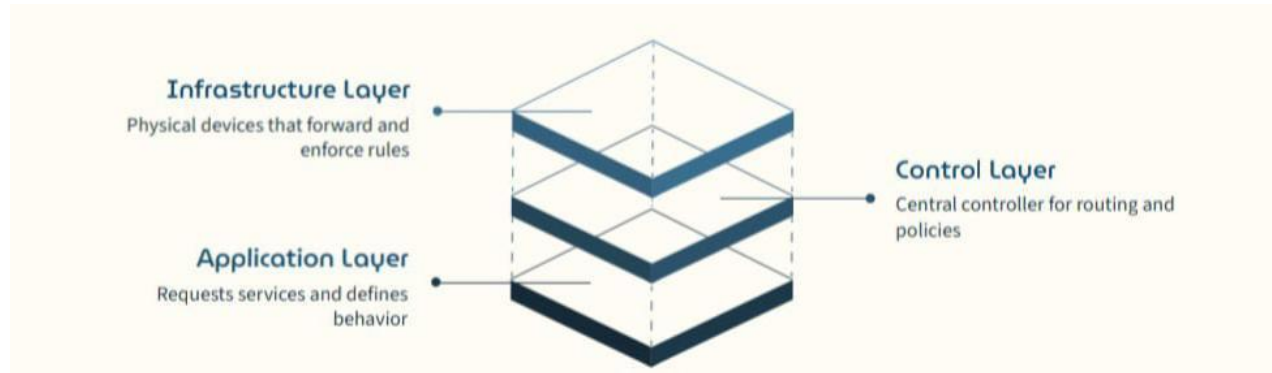
The SDN Controller

Brain of the Network Centralized:

- software that controls the whole network
- Orchestrates flow control & network policies
- Acts like the operating system of the network
- Dynamically manages traffic between devices
- Communicates with switches & routers using protocols
- (e.g., Open Flow)

SDN Architecture Layer

Infrastructure Layer
Physical devices that forward and enforce rules

Control Layer
Central controller for routing and policies

Application Layer
Requests services and defines behavior

- Application Layer:

Defines network behavior and requests services

- Control Layer:

Central controller for routing & policy decisions

- Infrastructure Layer

Physical/virtual devices that forward traffic

How to SDN controller communicates

- Northbound APIs

Let applications (e.g., firewalls, load balancers) talk to the SDN controller

- SDN Controller

 Translates application requests into instructions for network devices

- Southbound APIs

Use protocols (e.g., Open Flow) to communicate with and control network devices

⚡ Enables programmability and automation across the whole network

Keys benefits of SDN controller based network

- Simplified Management

  Centralized control simplifies configuration, deployment, and troubleshooting.

- Enhanced Security

Policy enforcement and segmentation strengthen security.

- Dynamic Flow Control

  Intelligent rerouting avoids congestion and boosts performance

- Vendor Neutrality

  Supports diverse hardware under one control platform.

Challenges & Consideration ⚠ Securing the Controller

As the "brain," the SDN controller is a critical point of failure. Strong security is essential.

- Integration Complexity:

Challenges with legacy hardware & multi-vendor environments

- Evolving Landscape: Continuous changes with SD-WAN, edge computing, etc.

- Talent Gap:

Shortage of skilled SDN professionals slows deployment & management

Future Direction of SDN Controllers

- Intent-Based Networking (IBN):

Greater automation with networks configured by business intents, enabling lifecycle management.

- AI/ML Integration:

 Predictive analytics & self-healing networks through AI/ML.

- Expanded Reach:

Beyond data centers into access networks & programmable pipelines, boosting overa intelligence.

Conclusions

The Power of SDN Controllers Transform traditional networks into agile, programmable platforms for the digital era. Provide centralized control, driving efficiency, security, and continuous innovation.
Future-proofing networks: Not just an upgrade, but essential for evolving digital demands.