# UNIT-7

# Multimedia & Future Networking:

## ⊛. Multimedia Streaming Protocols:

We use term multimedia to refer to data that contains audio or video, and may include text. The phrase real-time multimedia refers to multimedia data that must be reproduced at exactly the same rate that it was captured. For example: a television news program that includes audio and video of an actual event.

### Stream Control Transmission Protocol (SCTP):

SCTP is a connection-oriented protocol in computer networks which provides a full-duplex association i.e, transmitting multiple streams of data between two end points at the same time that have established a connection in network. SCTP provides some of the features of both UDP and TCP: it is message-oriented like UDP and ensures reliable, in-sequence transport of messages like TCP. SCTP is also intended to make it eaiser to establish connection over wireless network and managing transmission of multimedia data.

### Features/Characteristics of SCTP:

i) Unicast with Multiple properties → It is a point-to-point protocol which can use different paths to reach end host.

ii) Reliable Transmission → It uses SACK and checksums to detect damaged, corrupted, discarded, duplicate and reordered data. It is similar to TCP but SCTP is more efficient when it comes to reordering of data.

iii) Message oriented → Each message can be framed and we can keep order of data stream and tabs on structure. For this, In TCP, we need a different layer of abstraction.

iv) Multi-homing → It can establish multiple connection paths between two end points and does not need to rely on IP layer for resilience.

## ⊛. Software-defined networking (SDN):

In order to understand SDN, we need to understand data plane and Control plane firstly.

**Data plane:** All the activities involving as well as resulting from data packets sent by the end user belong to this plane. This plane includes:

→ Forwarding of packets.
→ Segmentation and reassembly of data.
→ Replication of packets for multicasting.

**Control plane:** All activities necessary to perform data plane activities but do not involve end user data packets belong to this plane. In other words, this is the brain of the network. The activities of the control plane include:

→ Making routing tables.
→ Setting packet handling policies.

# In traditional network, each switch has its own data plane as well as a control plane. The control plane of various switches exchange topology information and hence construct a forwarding table which decides where an incoming ~~packet~~ data packet has to be forwarded via the data plane.

**SDN:** It is an approach via which we can take the control plane away from the switch and assign it to a centralised unit called the SDN controller. Hence, a network administrator can shape traffic via a centralised console without having to touch the individual switches. The data plane still resides in the switch and when a packet enters a switch, its forwarding activity is decided based on the entries of flow tables, which are pre-assigned by the controller. A flow table consists of match fields and instructions. The packet is first matched against the match fields of the flow table entries.

Then the instructions of the corresponding flow are executed. If a packet doesn't find a corresponding match in the flow table, the switch queries the controller which sends a new flow entry to the switch. The switch forwards or drops the packet based on this flow entry.

SDN Architecture: A typical SDN architecture consists of three layers.

i) Application Layer → It contains the typical network applications like intrusion detection, firewall and load balancing.

ii) Control Layer → It consists of the SDN controller which acts as the brain of the network. It also allows hardware abstraction to the applications written on top of it.

iii) Infrastructure Layer → This consists of physical switches which forms the data plane and carries out actual movement of data packets.

The Layers communicate via a set of interfaces called the northbound APIs (between application and control layer) and southbound APIs (between control and infrastructure layer).

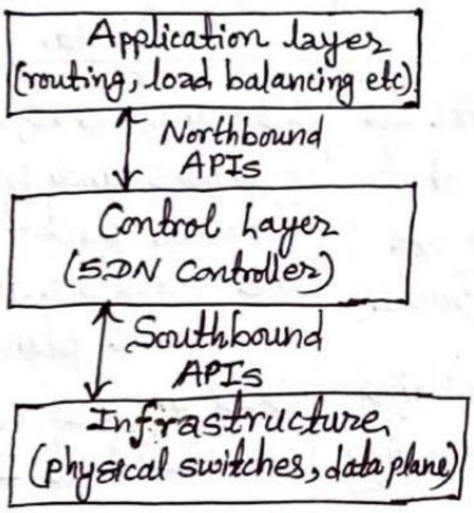


fig: SDN Architecture

Features of SDN:

i) Directly programmable → Network Control is directly programmable because it is decoupled from forwarding functions.

ii) AGILE → Abstracting control from forwarding lets administrators dynamically adjust network-wide traffic flow to meet changing needs.

iii) Centrally managed → Network intelligence is (logically) centralized in software-based SDN controllers that maintain a global view of the network, which appears to applications and policy engines as a single, logical switch.

iv) Programmatically configured → SDN lets network managers configure, manage, ~~and~~ secure and optimize network resources very quickly via dynamic, automated SDN programs, which they can write themselves because the programs do not depend on proprietary software.

v) Open Standards-Based and Vendor-Neutral → When implemented through open standards, SDN simplifies network design and operation because ~~instru~~ instructions are provided by SDN controllers instead of multiple, vendor-specific devices and protocols.

⊛. Differences between Control Plane and Data Plane:

| Control Plane | Data Plane. |
|---|---|
| i) Control plane refers to the all functions and processes that determine which path to use to send the packet or frame. | i) Data plane refers to all the functions and processes that forward packets/frames from one interface to another based on control plane logic. |
| ii) It is responsible for building and maintaining the IP routing table. | ii) It is responsible for forwarding ~~actul~~ actual IP packet. |
| iii) It takes care of how packets should be forwarded. | iii) It takes care for moving packets from source to destination. |
| iv) Control plane performs its task independently. | iv) Data plane performs its ~~tas~~ task on data plane. |
| v) It includes STP, ARP, RIP, DHCP etc. | v) It includes TTL, IP header, checksum etc. |

## ⊛ Network Function Virtualization (NFV):

NFV is a network architecture which aims to accelerate service deployment for network operators and reduce the cost by separating functions like firewall. It is a way to virtualize network services, such as routers, firewalls, and load balances, that have traditionally been run on computer hardware whose interface is controlled by proprieter and allows network services to be hosted on virtual machines. NFV allows various network operators to implement network policy without being taken care of where to place functions in network and how to route traffic through these functions.

NFV provides a new way to create, distribute and operate networking ~~devices~~. services. It allows network operators to manage and expand their network capabilities on demand using virtual software based applications. NFV is designed to combine and deliver the networking components needed to support an infrastructure totally independent from hardware.

### Benefits of NFV:

→ Reduce costs in purchasing network equipment via migration to software on standard servers.
→ Efficiencies in space, power and cooling.
→ Faster time to deployment.
→ Flexibility – ~~scale~~ elastic scale up and scale down capacity.
→ Access to broad independent software community, including open source.

## ⊛. Next Generation Network (NGN):

NGN refers to a packet-based network and it can be used for both telecommunication services as well as data and it supports mobility. It is able to make use of multiple broadband capabilities, especially Quality of Services (QoS) enabled transport technologies where the service-related functions are independent of the underlying transport-related technologies.

The main goal of NGN is to work as an replacement of Public Switched Telephone Network (PSTN) and Integrated ~~Digital~~ Services Digital Network (ISDN). The concept of this network will not only bring wide range of possibilities to introduce new and existing technologies in the field of information transmission and processing, but also many possibilities especially in the branch of network services.

## Features of NGN:

→ NGN works on Packet based transferring.

→ It supports a wide range of services, applications and mechanisms based on service building blocks.

→ It provide the advantage of general mobility.

→ It provides unrestricted access by users to different service providers.

→ It has Broadband capabilities with end-to-end QoS and transparency.

## Applications of NGN:

→ Voice Telephone services

→ Multimedia services.

→ Data services.

→ Push to talk over NGN

→ Content delivery services

→ Global mobility services.

## Advantages of NGN:

→ It generates additional revenue streams for new IP/Ethernet services.

→ It fulfills customers demand for high bandwidth, Ethernet/IP solutions.

→ It diminishes expertise in legacy.

→ It gives End of life/End of Service vendor notification.

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