# Transport Layer and QoS

DETAILED PRESENTATION ON TRANSPORT LAYER, TCP/UDP, CONGESTION CONTROL AND QOS

# Introduction to Transport Layer

- Fourth layer of OSI model
- End-to-end communication
- Reliable data transfer
- Error and flow control

# Position of Transport Layer in OSI

- Between Application and Network layer
- Provides logical communication
- Supports process communication

# Services of Transport Layer

- Addressing
- Multiplexing
- Error control
- Congestion control

# Process-to-Process Delivery

- Communication between processes
- Uses port numbers
- Multiple application support

# Port Numbers

- Well-known ports
- Registered ports
- Dynamic ports
- Examples: HTTP 80, DNS 53

# Multiplexing and Demultiplexing

- Combines multiple streams
- Delivers data to correct application
- Efficient communication

# Introduction to UDP

- Connectionless protocol
- Fast communication
- Low overhead

# Features of UDP

- No reliability
- No flow control
- Low latency
- Simple design

# UDP Header Format

- Source port
- Destination port
- Length
- Checksum

# Working of UDP

- Datagram creation
- Direct transmission
- No acknowledgments

# Applications of UDP

- DNS
- VoIP
- Online gaming
- Streaming

# Advantages and Disadvantages of UDP

- Advantages: Fast, Lightweight
- Disadvantages: Packet loss, No sequencing

# Introduction to TCP

- Connection-oriented
- Reliable communication
- Error recovery

# Features of TCP

- Reliability
- Flow control
- Congestion control
- Sequencing

# TCP Header Format

- Sequence number
- ACK number
- Window size
- Flags

# TCP Three-Way Handshake

- 1. SYN
- 2. SYN-ACK
- 3. ACK

# TCP Connection Termination

- 1. FIN
- 2. ACK
- 3. FIN
- 4. ACK

# TCP Flow Control

- Sliding window
- Prevents overflow
- Receiver buffer management

# TCP Error Control

- Checksum
- Retransmission
- Timeout management

# TCP vs UDP

- TCP reliable
- UDP faster
- TCP for web/email
- UDP for multimedia

# Introduction to Data Traffic

- Flow of packets
- Network load
- Traffic patterns

# Traffic Characteristics

- Bandwidth
- Delay
- Jitter
- Throughput

# Traffic Shaping

- Regulates traffic
- Leaky bucket
- Token bucket

# Network Congestion

- Load exceeds capacity
- Delays and packet loss

# Causes of Congestion

- High traffic
- Low bandwidth
- Slow routers

# Congestion Control Techniques

- Open-loop control
- Closed-loop control

# Open Loop Congestion Control

- Retransmission policy
- Window policy
- Admission policy

# Closed Loop Congestion Control

- Backpressure
- Choke packets
- Explicit signaling

# TCP Congestion Control

- Slow start
- Congestion avoidance
- Fast retransmit

# Slow Start Algorithm

- Small congestion window
- Exponential growth
- Threshold management

# Congestion Avoidance

- Linear growth
- Stability improvement

# Introduction to QoS

- Better network performance
- Multimedia support

# QoS Parameters

- Bandwidth
- Delay
- Jitter
- Packet loss

# QoS Techniques

- Traffic shaping
- Scheduling
- Priority queuing

# Integrated Services (IntServ)

- Resource reservation
- RSVP protocol
- Guaranteed service

# Advantages of IntServ

- Guaranteed QoS
- Reliable communication

# Limitations of IntServ

- Scalability issues
- Complex implementation

# Differentiated Services (DiffServ)

- Traffic classification
- Packet prioritization

# DiffServ Architecture

- Edge routers
- Core routers
- DSCP field

# QoS in Switched Networks

- VLAN prioritization
- Queue management

# Applications of QoS

- VoIP
- Video conferencing
- IPTV
- Cloud services

# Summary

- TCP reliable
- UDP faster
- QoS improves efficiency

# Conclusion

- Transport layer is essential
- QoS supports multimedia traffic

# References


- Forouzan Networking
- Tanenbaum Networks
- IEEE Resources