

COMPUTER NETWORK CS 602 UNIT 5 DETAILRD

NOTES WITH DIAGRAM AND EASY EXPLANATION

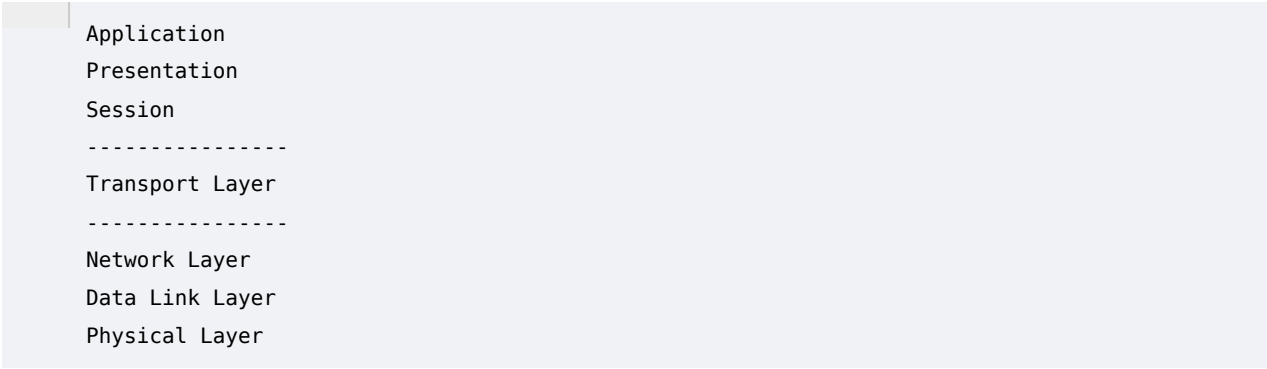
TOPIC 1:- Transport Layer

NEED, SERVICES PROVIDED AND DESIGN ISSUES

COMPLETE 14-MARK RGPV ANSWER

Introduction

OSI Model me Transport Layer 4th layer hoti hai.



```
Application
Presentation
Session
-----
Transport Layer
-----
Network Layer
Data Link Layer
Physical Layer
```

Transport Layer source process se destination process tak reliable communication provide karti hai.

What is Transport Layer?

DEFINITION

Transport Layer is responsible for process-to-process communication, reliability, flow control and error control between end systems.

SIMPLE DEFINITION

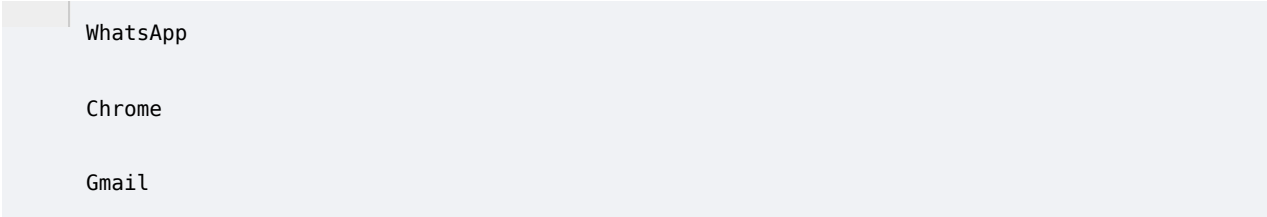
Network Layer computer tak data pahunchati hai.

Transport Layer computer ke andar correct application tak data pahunchati hai.

Example

Suppose:

Computer me:



```
WhatsApp
Chrome
Gmail
```

Teen applications chal rahi hain.

Ab data kis application ko dena hai?

Ye Transport Layer decide karti hai.

Need of Transport Layer

★★★★★ Important

1. PROCESS-TO-PROCESS COMMUNICATION

Computer se computer communication enough nahi hai.

Application se application communication chahiye.

EXAMPLE

Chrome

↓

Chrome

2. RELIABILITY

Lost packets recover karna.

3. FLOW CONTROL

Fast sender aur slow receiver ko manage karna.

4. ERROR CONTROL

Transmission errors detect karna.

5. MULTIPLEXING

Multiple applications ko support karna.

Services Provided by Transport Layer

1. Service Point Addressing

Port Numbers use karta hai.

EXAMPLE

HTTP → Port 80

HTTPS → Port 443

FTP → Port 21

2. Segmentation

Large data ko small segments me divide karta hai.

DIAGRAM

Large Data

↓

Segment 1

Segment 2

Segment 3

3. Reassembly

Destination par segments combine karta hai.

4. Flow Control

Sender speed control karta hai.

5. Error Control

Lost aur corrupted data detect karta hai.

6. Connection Control

Connection establish aur terminate karta hai.

Transport Layer Communication

Application

↓

Transport Layer

↓

Network Layer

↓

Internet

↓

Network Layer

↓

Transport Layer

↓

Application

Design Issues of Transport Layer

★★★★★ Important

1. Addressing

Applications identify karne ke liye Port Number use hote hain.

EXAMPLE

HTTP = 80

FTP = 21

SMTP = 25

2. Connection Establishment

Communication se pehle connection banana.

3. Connection Release

Communication ke baad connection close karna.

4. Flow Control

Receiver overload na ho.

5. Error Recovery

Lost packets dubara bhejna.

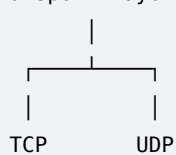
6. Congestion Control

Network traffic control karna.

Transport Layer Protocols

★★★★★ Most Important

Transport Layer



TCP

Transmission Control Protocol

- ✓ Reliable
 - ✓ Connection-Oriented
 - ✓ Error Control
 - ✓ Flow Control
-

UDP

User Datagram Protocol

- ✓ Fast

- ✓ Connectionless
- ✓ Low Overhead

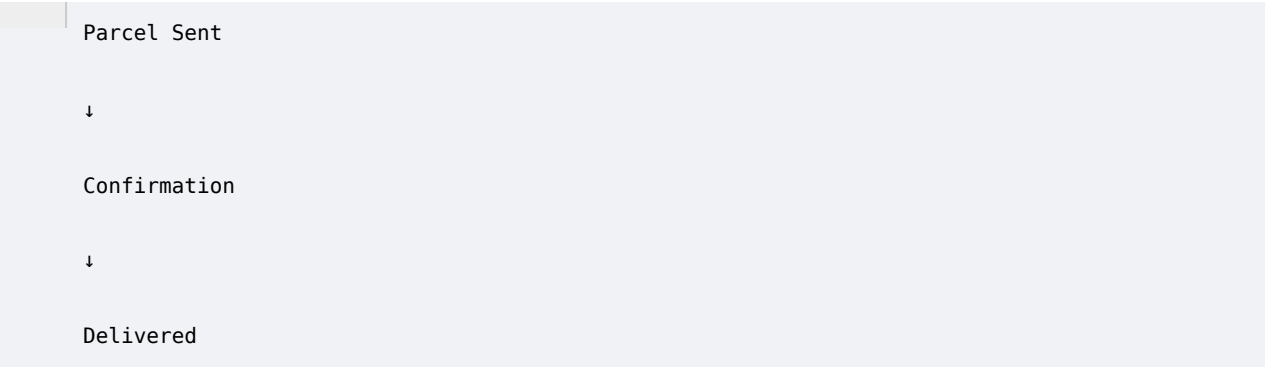
TCP vs UDP (Quick View)

TCP	UDP
Reliable	Unreliable
Connection Oriented	Connectionless
Slow	Fast
Large Header	Small Header
ACK Used	No ACK

Real-Life Example

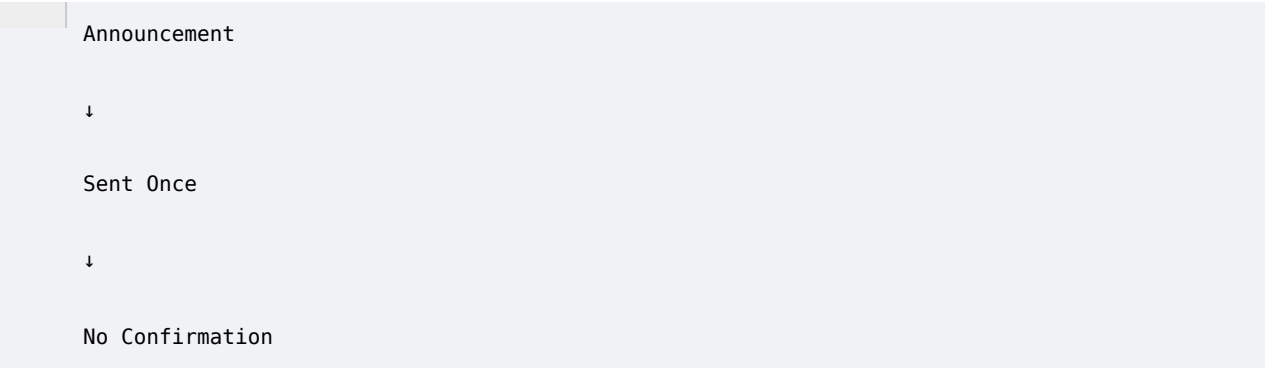
Courier Service

TCP



Reliable.

UDP



Fast.

Advantages of Transport Layer

- ✓ Reliable Communication
 - ✓ Error Detection
 - ✓ Flow Control
 - ✓ Multiplexing
 - ✓ End-to-End Delivery
-

Disadvantages

- ✗ Extra Overhead
 - ✗ Delay Due To Reliability
-

One Minute Revision

Transport Layer

↓

4th Layer

Functions

↓

Segmentation

Reassembly

Flow Control

Error Control

Multiplexing

Protocols

↓

TCP

UDP

Most Important

↓

TCP vs UDP

RGPV Examiner Keywords

Transport Layer
Process-to-Process Communication
Flow Control
Error Control
Port Number
Segmentation
Reassembly
TCP
UDP
Connection Management
Reliability

Most Expected Questions

7 MARKS

1. Define Transport Layer.
2. Explain functions of Transport Layer.
3. Explain services provided by Transport Layer.

14 MARKS

1. Explain Transport Layer with neat diagram.
2. Explain need and services of Transport Layer.
3. Explain design issues of Transport Layer.

PYQ PROBABILITY: ★★★★★

🔥 **Transport Layer + Functions + Services + Design Issues** frequently 7–14 marks me poocha jata hai aur TCP/UDP chapter ka foundation hai.

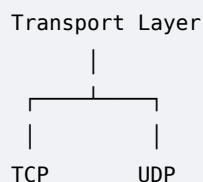
TOPIC 2:- UDP (User Datagram Protocol)

HEADER FORMAT, PER-SEGMENT CHECKSUM, CARRYING UNICAST/MULTICAST REAL-TIME TRAFFIC

COMPLETE 14-MARK RGPV ANSWER (4-5 PAGES)

Introduction

Transport Layer me do important protocols hote hain:



TCP reliable communication provide karta hai.

UDP speed provide karta hai.

Aaj ke modern applications jaise:

- Video Streaming
- Online Gaming

- Video Calling
- Live Broadcasting

UDP use karti hain.

What is UDP?

DEFINITION

UDP (User Datagram Protocol) is a connectionless transport layer protocol that provides fast communication without guaranteeing reliability.

SIMPLE DEFINITION

UDP data ko bina connection establish kiye directly send karta hai.

Full Form

UDP
↓
User Datagram Protocol

Why UDP Needed?

TCP reliable hai.

Lekin:

Reliability
↓
More Delay
↓
More Overhead

Real-time applications me speed zyada important hoti hai.

Isliye UDP use hota hai.

Features of UDP

★★★★★ Important

1. CONNECTIONLESS PROTOCOL

Connection establish nahi karta.

2. FAST COMMUNICATION

Low processing.

3. NO ACKNOWLEDGEMENT

ACK use nahi karta.

4. NO FLOW CONTROL

Sender directly transmit karta hai.

5. NO CONGESTION CONTROL

Traffic control nahi karta.

6. LOW OVERHEAD

Header bahut chhota hota hai.

UDP Working

STEP 1

Application data generate karti hai.

↓

STEP 2

UDP header add karta hai.

↓

STEP 3

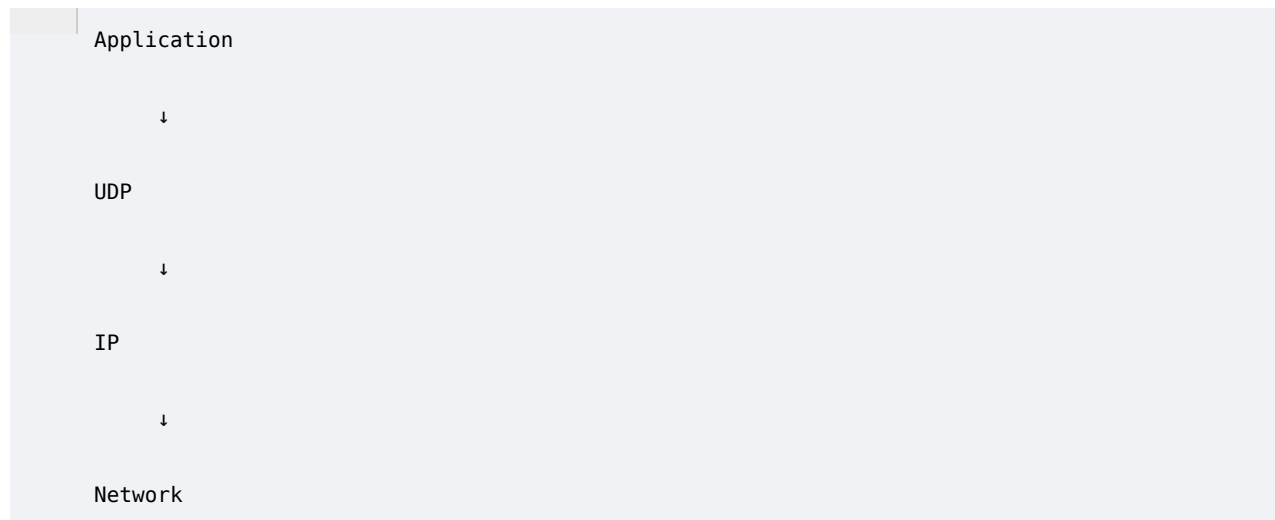
Datagram create hota hai.

↓

STEP 4

IP ko send kar diya jata hai.

Diagram



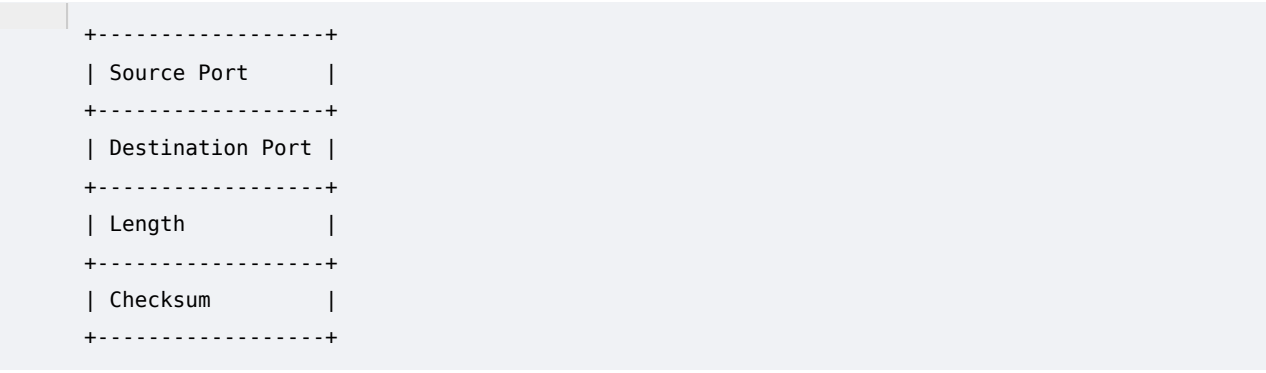
UDP Header Format

★★★★★ Most Important

UDP Header Size:

8 Bytes

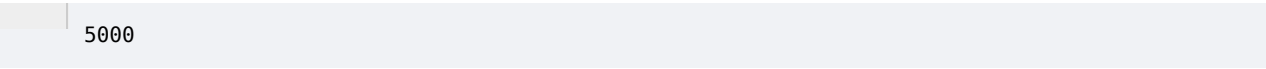
Structure



1. Source Port Number

Sender application identify karta hai.

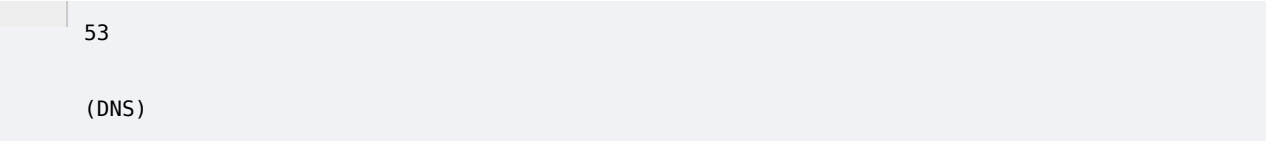
EXAMPLE



2. Destination Port Number

Receiver application identify karta hai.

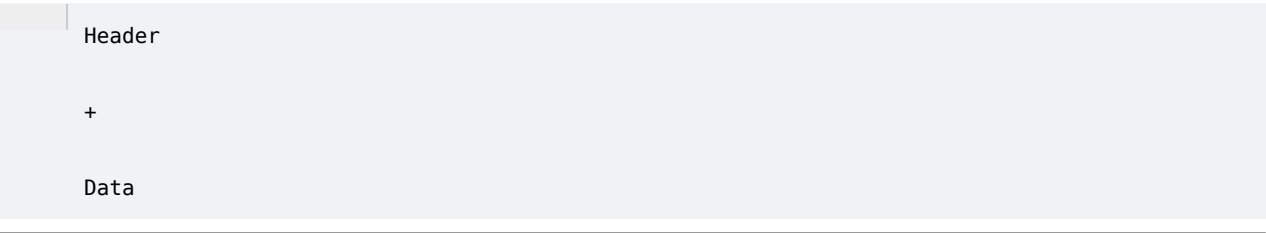
EXAMPLE



3. Length

UDP datagram ki total length.

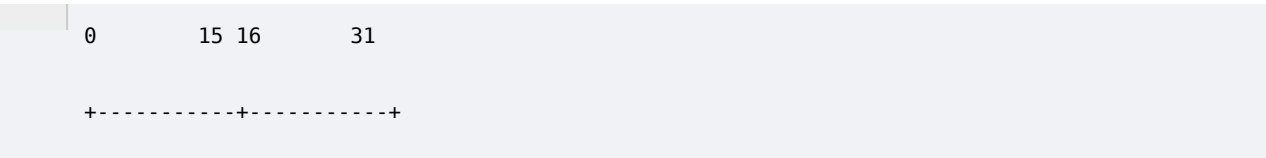
INCLUDES



4. Checksum

Error detection ke liye.

UDP Header Diagram



Source Port	
+-----+	+-----+
Destination Port	
+-----+	+-----+
Length	
+-----+	+-----+
Checksum	
+-----+	+-----+

Per-Segment Checksum

★★★★★ Important

Definition

Checksum ek error detection mechanism hai jo transmission ke dauran data corruption detect karta hai.

Purpose

Detect:

Bit Errors
Noise
Corruption

Working

STEP 1

Sender checksum calculate karta hai.

↓

STEP 2

Header me store karta hai.

↓

STEP 3

Receiver dubara calculate karta hai.

↓

STEP 4

Compare karta hai.

Flowchart

Data
↓
Checksum Calculate

↓

Transmit

↓

Receiver

↓

Verify Checksum

↓

Correct?

Example

Suppose:

Data

1010

1100

Checksum calculate hoga.

Receiver same calculation karega.

Agar mismatch:

Error Detected

Unicast Traffic

★★★★★ Important

Definition

One Sender → One Receiver communication.

Diagram

A

↓

B

Example

WhatsApp Message

One User

↓

One User

Advantages

- ✓ Simple
- ✓ Efficient

Multicast Traffic

★★★★★ Important

Definition

One Sender → Multiple Selected Receivers

Diagram

Sender

|

├─┘

A B C

Example

Live Cricket Streaming

Sirf viewers ko stream milegi.

Why UDP for Real-Time Traffic?

★★★★★ Most Important

Real-Time Applications:

Video Call

Live Streaming

VoIP

Online Games

In applications me:

Speed

>

Reliability

Example

Video Call

Agar ek frame miss ho jaye:

No Problem

Lekin delay nahi hona chahiye.

TCP vs UDP Example

TCP

Packet Lost

↓

Retransmission

↓

Delay

UDP

Packet Lost

↓

Ignore

↓

Continue Streaming

Applications of UDP

★★★★★ Important

DNS

Port 53

DHCP

Port 67/68

VOIP

Voice Calls

ONLINE GAMING

PUBG

Free Fire

COD

VIDEO STREAMING

YouTube Live

Hotstar

Netflix Live

VIDEO CONFERENCING

Zoom

Google Meet

Advantages of UDP

- ✓ Very Fast
 - ✓ Low Overhead
 - ✓ Small Header
 - ✓ Real-Time Friendly
 - ✓ Supports Multicast
-

Disadvantages of UDP

- ✗ No Reliability
 - ✗ No ACK
 - ✗ No Flow Control
 - ✗ No Congestion Control
-

TCP vs UDP

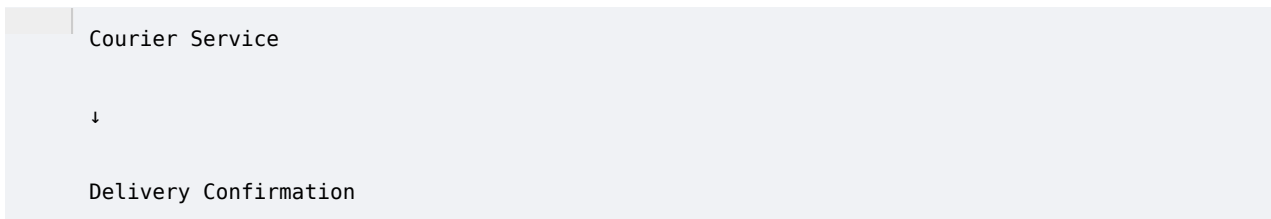
★★★★★ RGPV Favorite

Feature	TCP	UDP
Full Form	Transmission Control Protocol	User Datagram Protocol
Connection	Connection-Oriented	Connectionless
Reliability	High	Low
Speed	Slow	Fast

ACK	Yes	No
Flow Control	Yes	No
Congestion Control	Yes	No
Header Size	20–60 Bytes	8 Bytes
Applications	Email, HTTP	DNS, VoIP

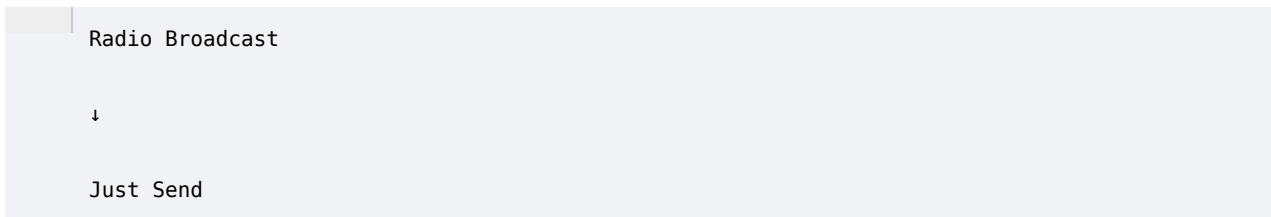
Real-Life Example

TCP



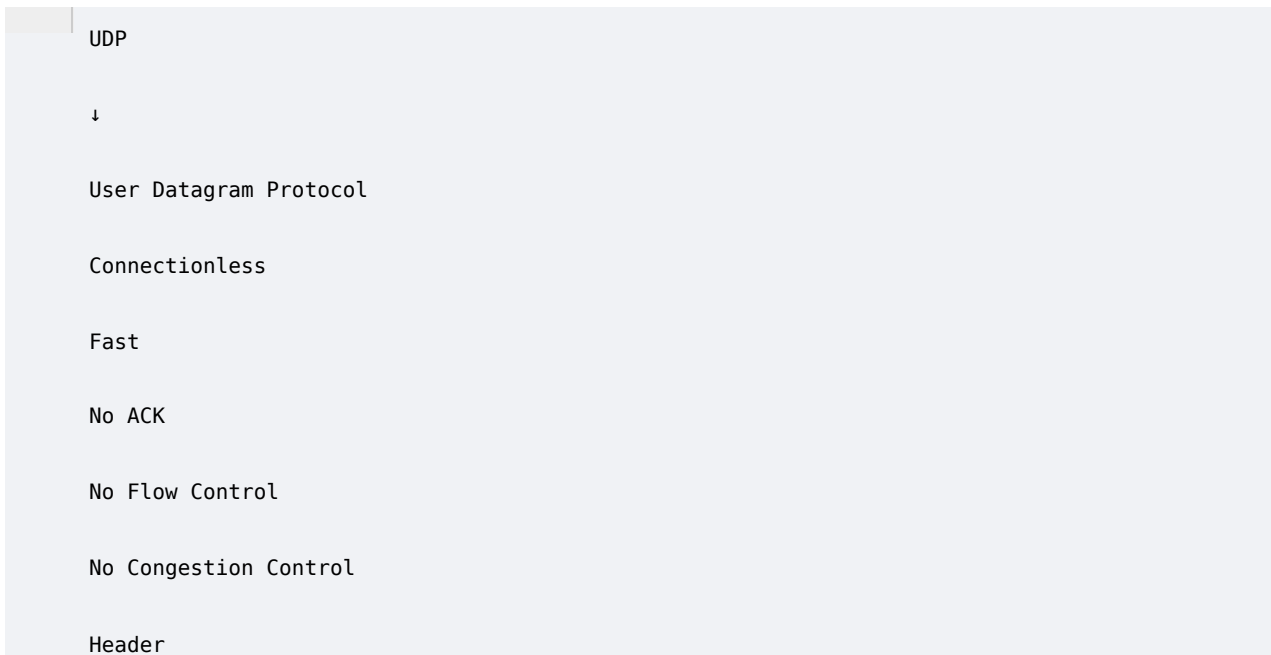
Reliable.

UDP



Fast.

One Minute Revision



↓

Source Port

Destination Port

Length

Checksum

Applications

↓

DNS

VoIP

Gaming

Streaming

Most Important

↓

UDP vs TCP

RGPV Examiner Keywords

UDP

User Datagram Protocol

Connectionless

Checksum

Source Port

Destination Port

Datagram

Unicast

Multicast

VoIP

DNS

Streaming

Real-Time Traffic

Most Expected Questions

7 MARKS

1. Define UDP.
2. Explain UDP Header Format.

3. Explain UDP Checksum.
4. Explain Unicast and Multicast Traffic.

14 MARKS

1. Explain UDP with Header Format.
2. Explain UDP Checksum Mechanism.
3. Explain carrying of real-time traffic using UDP.
4. Compare TCP and UDP.

PYQ PROBABILITY: ★★★★★

 **UDP Header Format, UDP vs TCP, and Real-Time Traffic using UDP** are among the most frequently asked questions in RGPV CN Unit-5.

TOPIC 3:- TCP (Transmission Control Protocol)

CONNECTION MANAGEMENT AND RELIABILITY OF DATA TRANSFER

COMPLETE 14-MARK RGPV ANSWER (5-6 PAGES)

Introduction

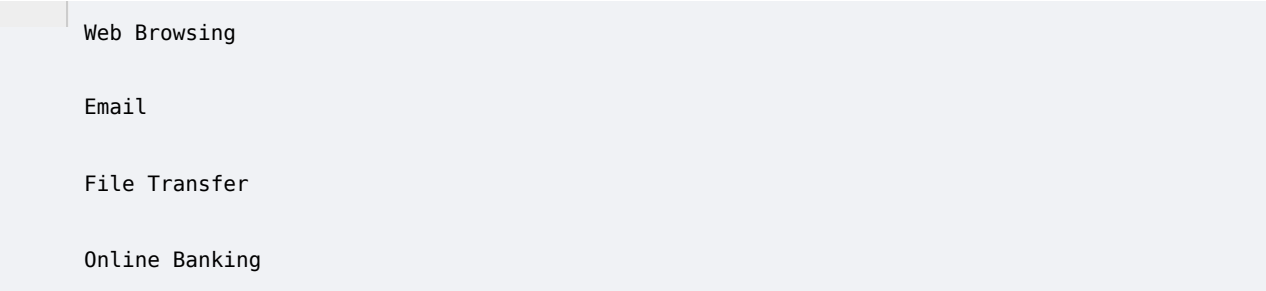
UDP fast hai lekin reliable nahi hai.

Agar kisi application ko:

- ✓ Reliable Communication
- ✓ Error-Free Delivery
- ✓ Ordered Data Transfer
- ✓ Flow Control

chahiye ho, to **TCP** use kiya jata hai.

Examples:



- Web Browsing
- Email
- File Transfer
- Online Banking

What is TCP?

DEFINITION

TCP (Transmission Control Protocol) is a connection-oriented and reliable transport layer protocol that ensures error-free delivery of data.

SIMPLE DEFINITION

TCP data ko safely aur correctly destination tak pahunchata hai.

Full Form

TCP



Transmission Control Protocol

Features of TCP

★★★★★ Most Important

1. CONNECTION-ORIENTED

Communication se pehle connection establish karta hai.

2. RELIABLE

Lost packets recover karta hai.

3. ERROR DETECTION

Errors detect karta hai.

4. FLOW CONTROL

Sender speed control karta hai.

5. CONGESTION CONTROL

Network traffic manage karta hai.

6. ORDERED DELIVERY

Data same sequence me deliver karta hai.

Why TCP Needed?

Suppose:

File Transfer

100 Packets

Agar 10 packets lost ho jaye:

File Corrupted

TCP ensure karta hai:

All Packets



Correct Order



No Data Loss

TCP Connection Management

★★★★★ Most Important

TCP communication 3 phases me hoti hai:

Connection Establishment

↓

Data Transfer

↓

Connection Termination

TCP Three-Way Handshake

★★★★★ Direct Exam Question

Connection establish karne ke liye TCP:

3-Way Handshake

use karta hai.

Step 1 : SYN

Client request bhejta hai.

Client
|
└ SYN →

Meaning:

Can We Communicate?

Step 2 : SYN + ACK

Server response bhejta hai.

Server
|
← SYN+ACK —

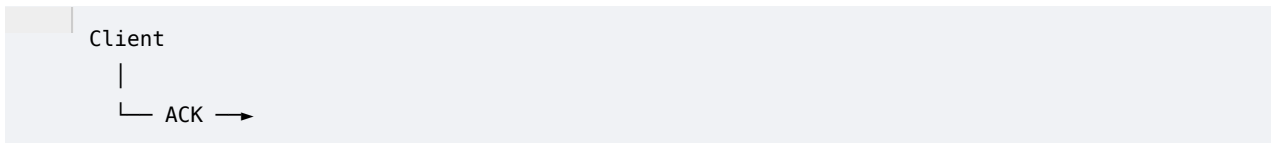
Meaning:

Yes

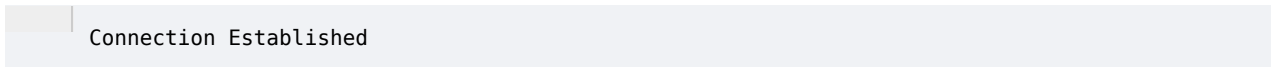
I Am Ready

Step 3 : ACK

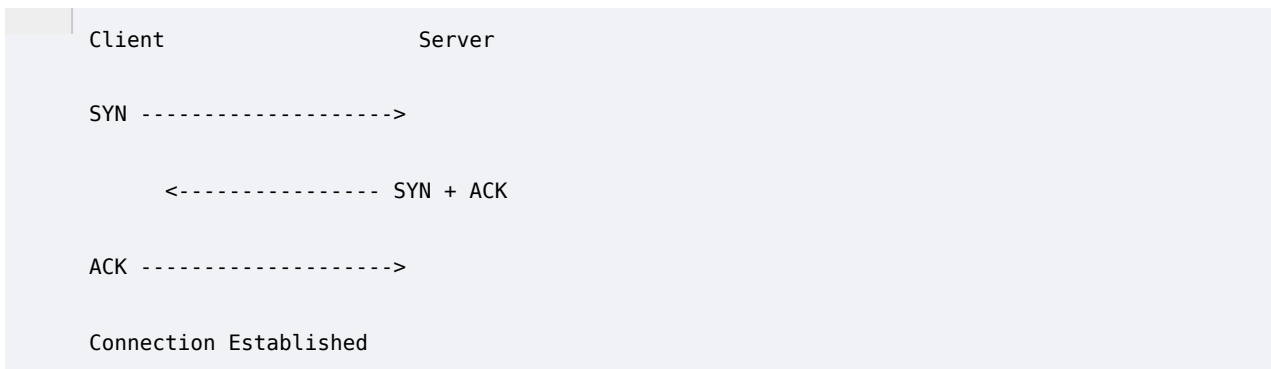
Client confirmation bhejta hai.



Meaning:



Three-Way Handshake Diagram

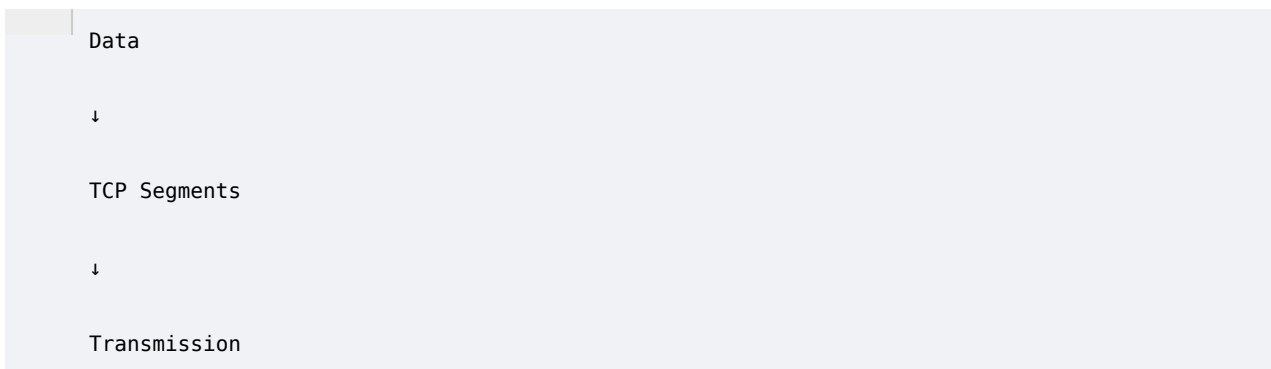


Advantages

- ✓ Reliable Connection
- ✓ Synchronization
- ✓ Error-Free Communication

Data Transfer Phase

Connection establish hone ke baad:



Reliability of Data Transfer

★★★★★ Very Important

TCP reliability provide karta hai.

How TCP Provides Reliability?

1. SEQUENCE NUMBERS
2. ACKNOWLEDGEMENTS
3. RETRANSMISSION
4. CHECKSUM
5. TIMERS

1. Sequence Number

Har segment ko unique sequence number milta hai.

Example:

Segment 1

Seq = 100

Segment 2

Seq = 200

Segment 3

Seq = 300

Purpose:

Correct Ordering

2. Acknowledgement

Receiver successful reception confirm karta hai.

Example

Sender

Segment 100

↓

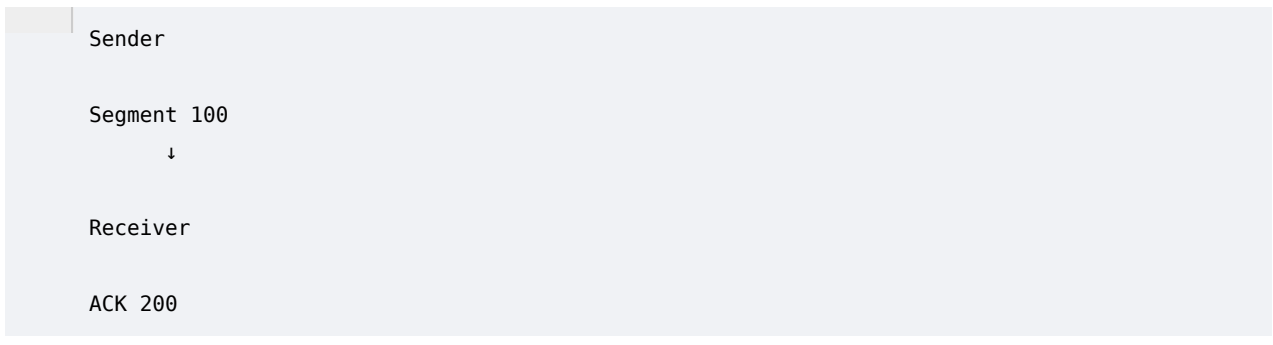
Receiver

ACK 200

Meaning:

Next Segment Expected = 200

Diagram



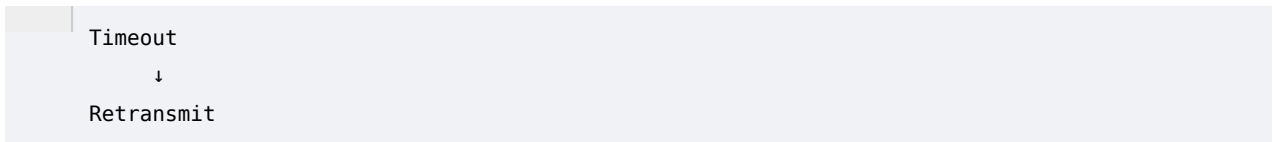
3. Retransmission

Packet lost ho jaye to dubara send kiya jata hai.

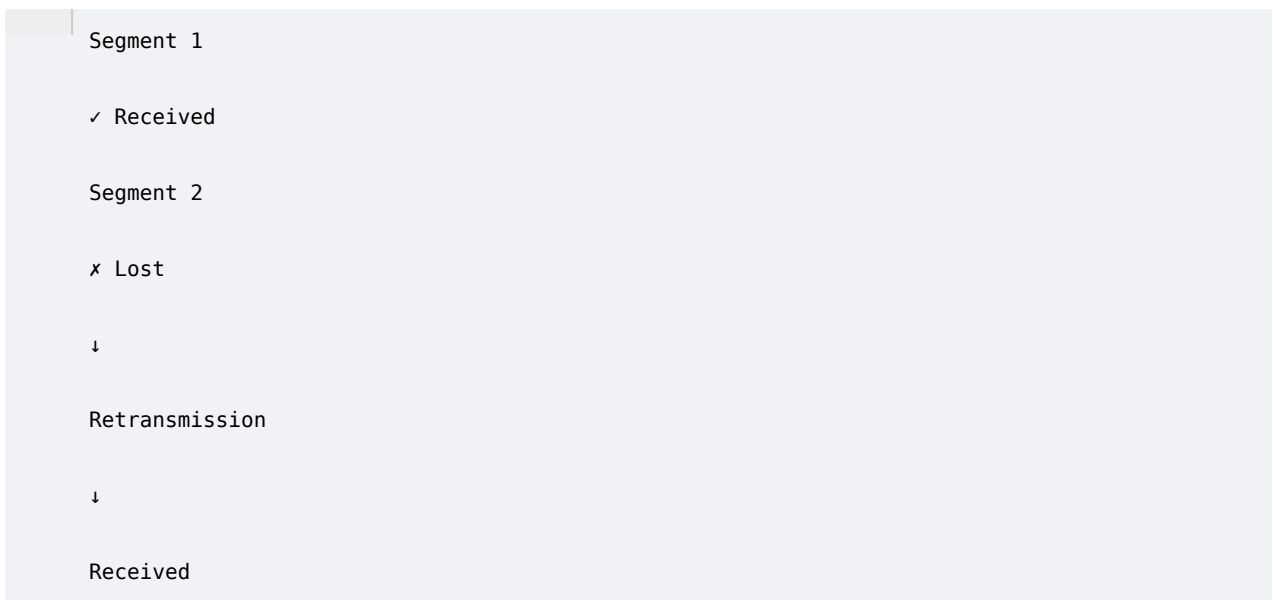
Example



TCP:



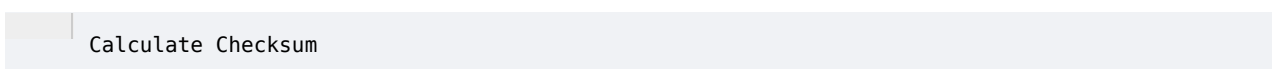
Diagram



4. Checksum

Error detection ke liye use hota hai.

Sender:



Receiver:

Verify Checksum

Agar mismatch:

Discard Segment

5. Timer

ACK receive hone ka wait karta hai.

Example

Segment Sent

↓

Timer Starts

↓

ACK Not Received

↓

Retransmit

TCP Reliable Communication Flow

Sender

↓

Sequence Number

↓

Transmit

↓

Receiver

↓

ACK

↓

Success

Connection Termination

Communication complete hone ke baad:

4-Way Handshake

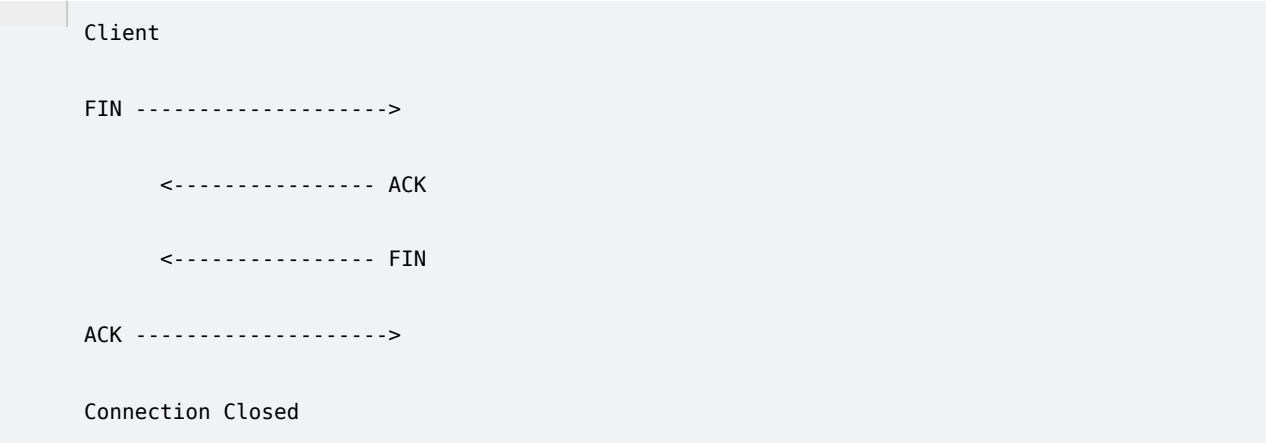
use hota hai.

Steps

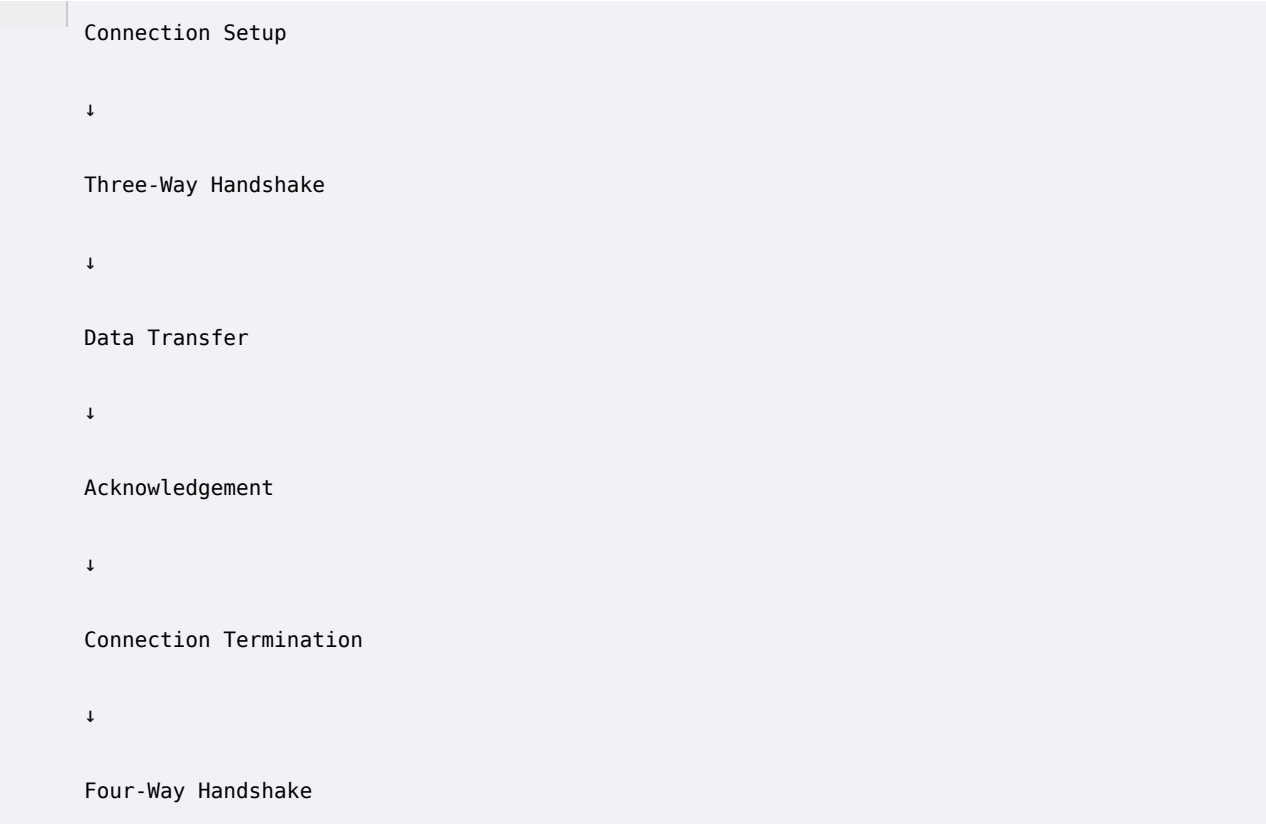
FIN

ACK
FIN
ACK

Diagram



TCP Communication Lifecycle



Applications of TCP

★★★★★ Important

HTTP
Web Browsing

HTTPS

Secure Websites

FTP
File Transfer

SMTP
Email

SSH
Remote Login

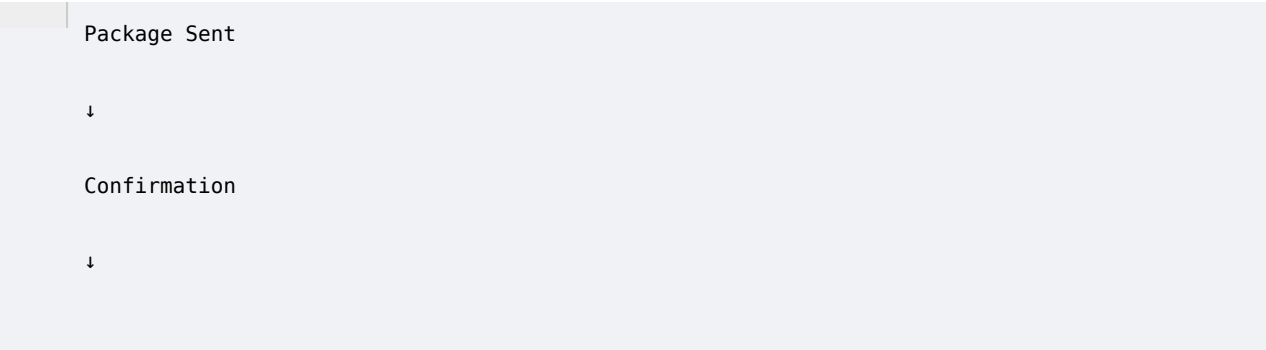
TCP vs UDP

★★★★★ RGPV Favorite

Feature	TCP	UDP
Connection	Connection -Oriented	Connection less
Reliability	High	Low
ACK	Yes	No
Flow Control	Yes	No
Congestion Control	Yes	No
Speed	Slow	Fast
Header	Large	Small
Example	HTTP, FTP	DNS, VoIP

Real-Life Example

TCP
Courier Service

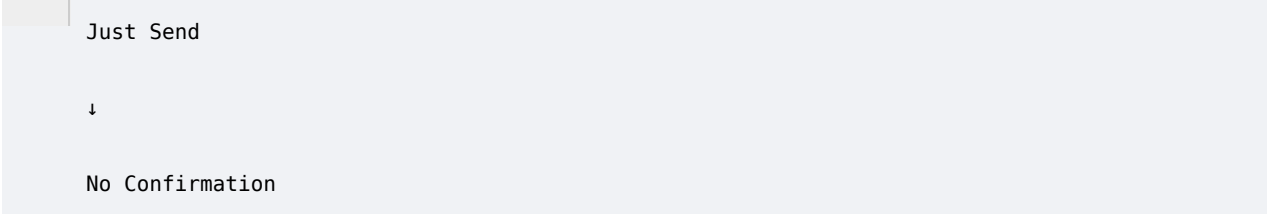


Delivery

Reliable.

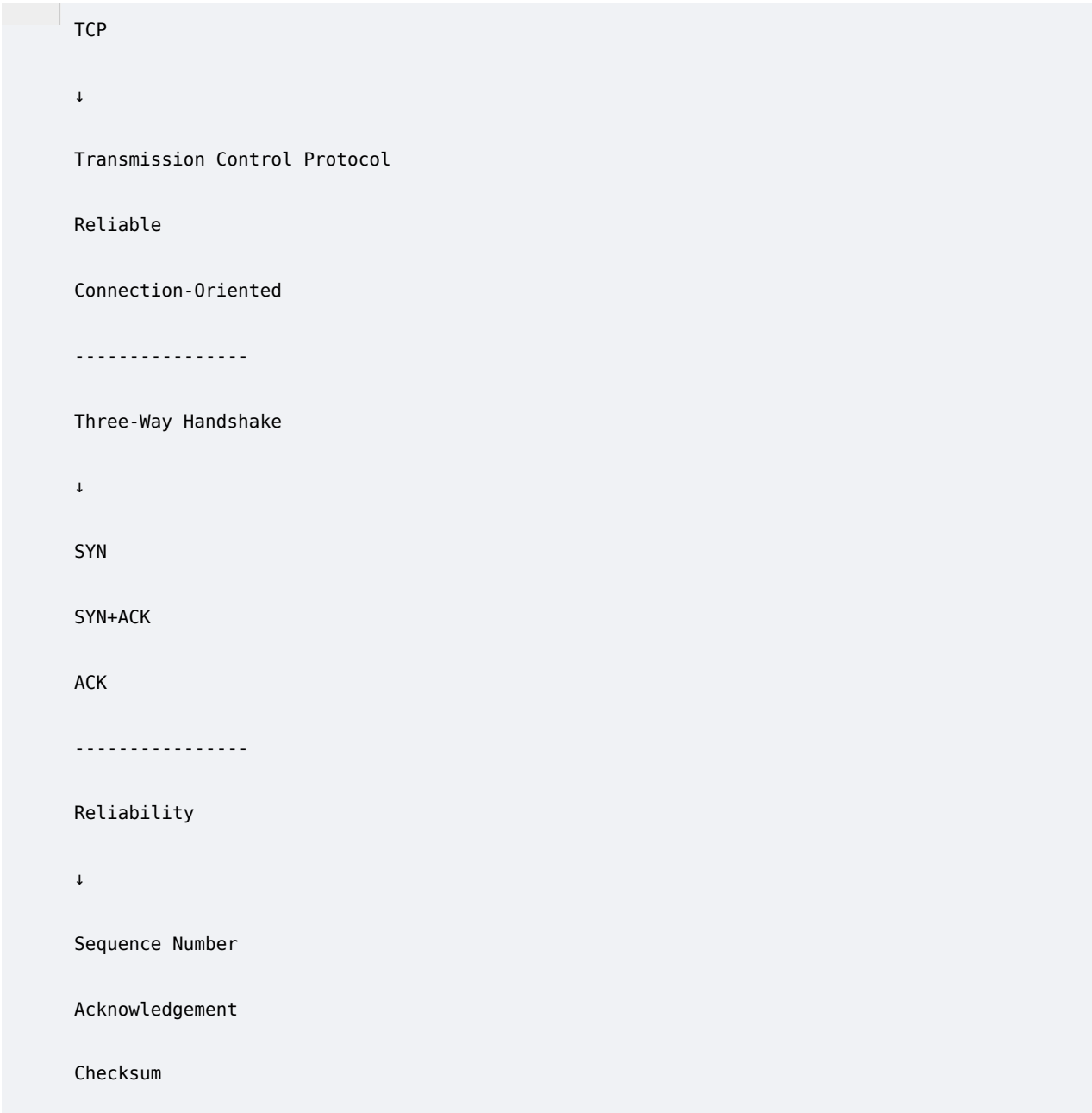
UDP

Radio Broadcast



Fast.

One Minute Revision



Timer

Retransmission

Connection Close

↓

FIN

ACK

FIN

ACK

RGPV Examiner Keywords

TCP

Transmission Control Protocol

Three-Way Handshake

Connection Management

Reliable Data Transfer

Sequence Number

Acknowledgement

Retransmission

Checksum

Timer

Flow Control

Connection Termination

Most Expected Questions

7 MARKS

1. Define TCP.
2. Explain TCP Connection Management.
3. Explain Three-Way Handshake.
4. Explain Reliability of Data Transfer.

14 MARKS

1. Explain TCP with neat diagram.
2. Explain Three-Way Handshake with diagram.
3. Explain reliability mechanisms of TCP.
4. Compare TCP and UDP.

PYQ PROBABILITY: ★★★★★

🔥 **Three-Way Handshake, TCP Reliability, and TCP vs UDP** are among the most repeated 14-mark questions in RGPV Computer Networks.

TOPIC 4:- TCP Flow Control and TCP Congestion Control

SLIDING WINDOW, SLOW START, CONGESTION AVOIDANCE, FAST RETRANSMIT AND FAST RECOVERY

COMPLETE 14-MARK RGPV ANSWER (6-7 PAGES)

Introduction

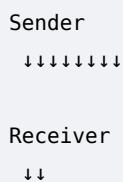
TCP reliable communication provide karta hai.

Lekin do major problems aa sakti hain:

PROBLEM 1

Receiver slow hai.

Sender fast hai.

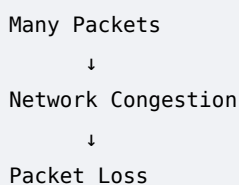


Result:

✗ Receiver Buffer Overflow

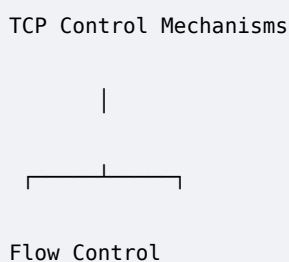
PROBLEM 2

Network me bahut traffic hai.



Solution

TCP provides:



TCP Flow Control

★★★★★ Most Important

Definition

TCP Flow Control is a mechanism that prevents a fast sender from overwhelming a slow receiver.

Simple Definition

Flow Control sender ki speed control karta hai.

Why Flow Control Needed?

Example:

Sender

100 Mbps

↓

Receiver

10 Mbps

Sender bahut fast hai.

Receiver slow hai.

Result:

Buffer Full

↓

Data Loss

Solution

Flow Control

Working Principle

TCP use karta hai:

Sliding Window Protocol

Sliding Window Concept

Suppose:

Window Size = 4

Sender ek time par:

Packet 1

Packet 2

Packet 3

Packet 4

bhej sakta hai.

Diagram

1 2 3 4 5 6 7

| ---Window--- |

After ACK

ACK Received

↓

Window Slides

1 2 3 4 5 6 7

| ---Window--- |

Receiver Advertised Window

Receiver batata hai:

Available Buffer Space

Example:

Window Size

=

5000 Bytes

Sender maximum:

5000 Bytes

hi bhejega.

Advantages of Flow Control

- ✓ Prevents Buffer Overflow
- ✓ Reliable Communication
- ✓ Efficient Data Transfer
- ✓ Better Performance

TCP Congestion Control

★★★★★ Very Important

Definition

TCP Congestion Control prevents excessive traffic from overloading the network.

What is Congestion?

Congestion tab hoti hai jab:

Incoming Traffic

>

Network Capacity

Example

1000 Packets

↓

Router Buffer

↓

Overflow

Result:

- ✗ Packet Loss
- ✗ Delay
- ✗ Retransmission

Congestion Control Techniques

TCP uses:

Slow Start

Congestion Avoidance

Fast Retransmit

Fast Recovery

Congestion Window (cwnd)

TCP ek variable maintain karta hai:

cwnd

Represents:

Maximum Data

Allowed In Network

Slow Start Algorithm

★★★★★ Direct Exam Question

Purpose

Initially network capacity unknown hoti hai.

TCP slowly transmission start karta hai.

Working

Initially:

cwnd = 1 MSS

(MSS = Maximum Segment Size)

Growth

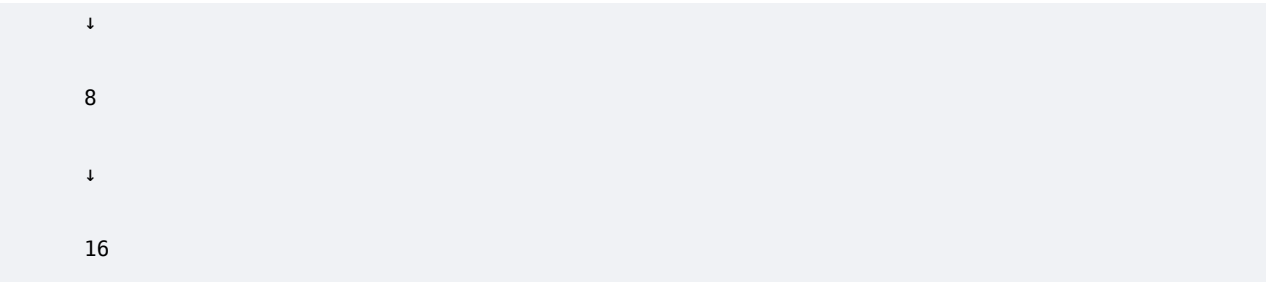
1

↓

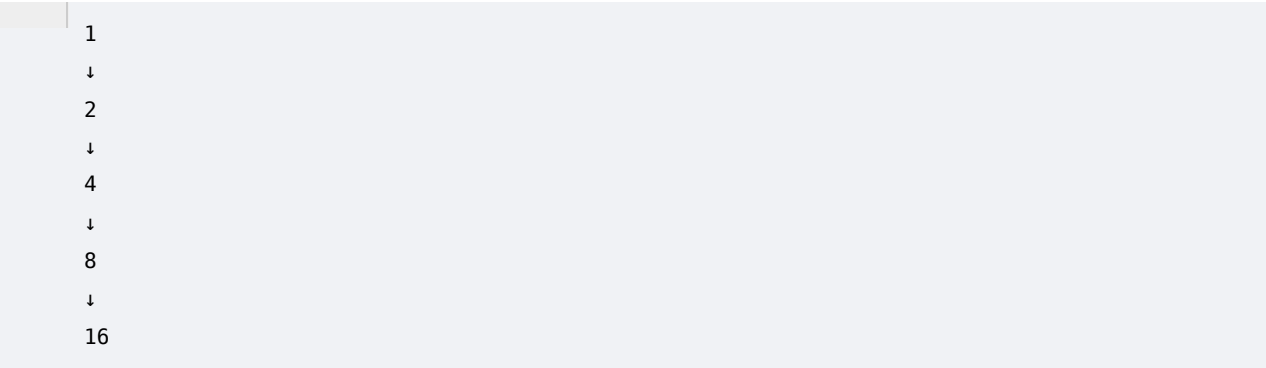
2

↓

4



Diagram



Exponential Growth

Advantage

- ✔ Quickly Finds Capacity

Disadvantage

- ✖ Sudden Congestion Possible

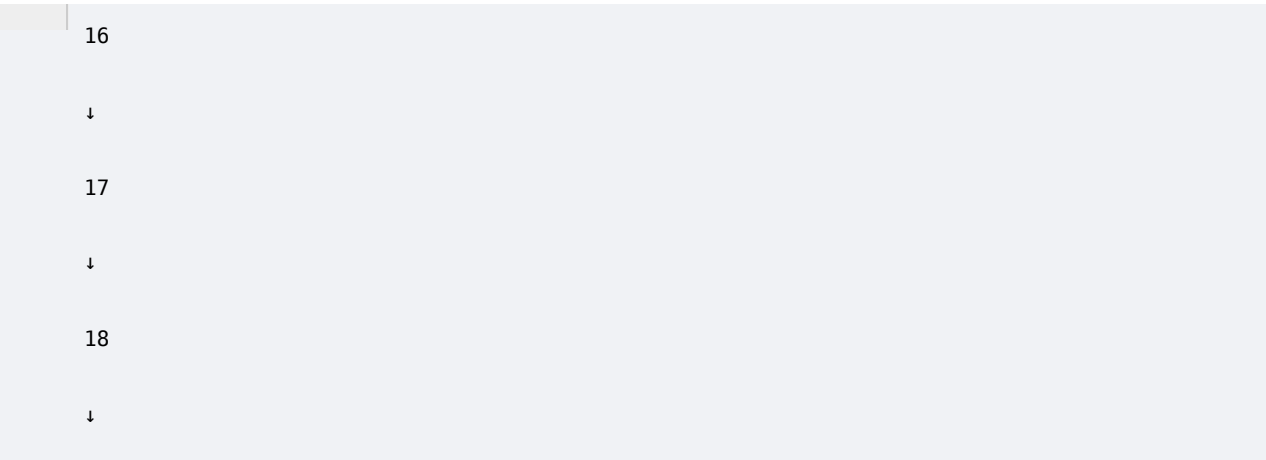
Congestion Avoidance

★★★★★ Important

Slow Start Threshold reach hone ke baad:

TCP slower growth use karta hai.

Growth Pattern



Linear Growth

Diagram

Slow Start

1 → 2 → 4 → 8 → 16

↓

Congestion Avoidance

16 → 17 → 18 → 19

Advantage

- ✓ Stable Performance
- ✓ Less Congestion

Fast Retransmit

★★★★★ Important

Normally:

Packet loss detect karne ke liye timeout wait hota hai.

TCP smarter method use karta hai.

Working

Receiver same ACK repeatedly bhejta hai.

Example:

ACK 5

ACK 5

ACK 5

3 Duplicate ACKs

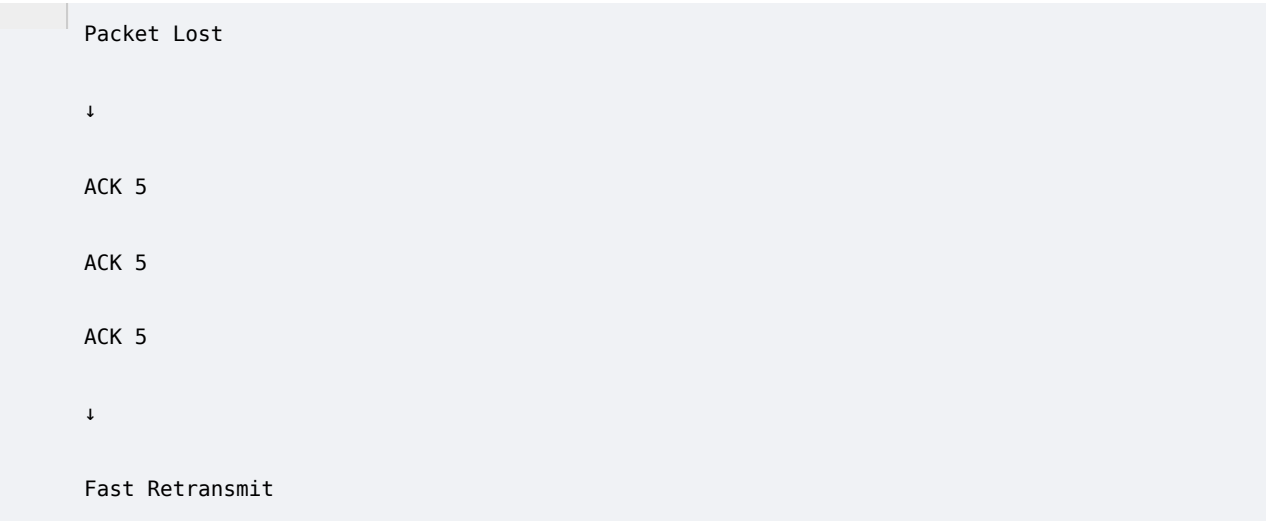
↓

Packet Loss Assume

↓

Retransmit Immediately

Diagram



Advantage

- ✓ No Timeout Waiting
- ✓ Faster Recovery

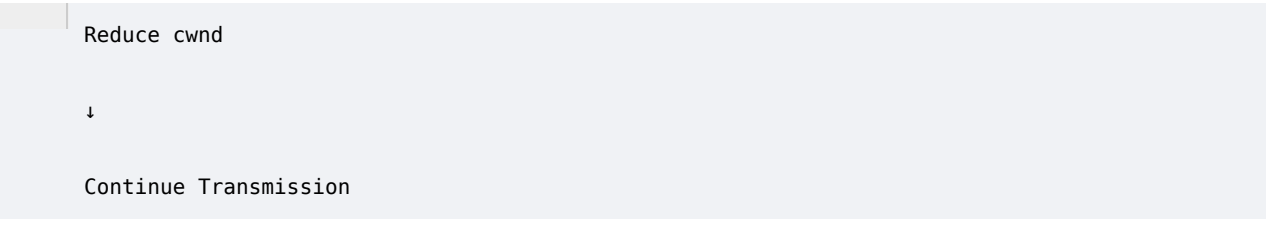
Fast Recovery

★★★★★ Important

Packet loss detect hone ke baad:

TCP transmission completely restart nahi karta.

Instead:



Working

STEP 1

Loss Detected

STEP 2

Threshold Update

STEP 3

Window Reduce

STEP 4

Continue Sending

Advantage

- ✓ Better Throughput
- ✓ Faster Recovery

TCP Congestion Control Flow



Slow Start vs Congestion Avoidance

Feature	Slow Start	Congestion Avoidance
Growth	Exponential	Linear
Speed	Fast	Slow
Purpose	Find Capacity	Maintain Stability

cwnd	Doubles	Increases Slowly
------	---------	------------------

Flow Control vs Congestion Control

★★★★★ RGPV Favorite

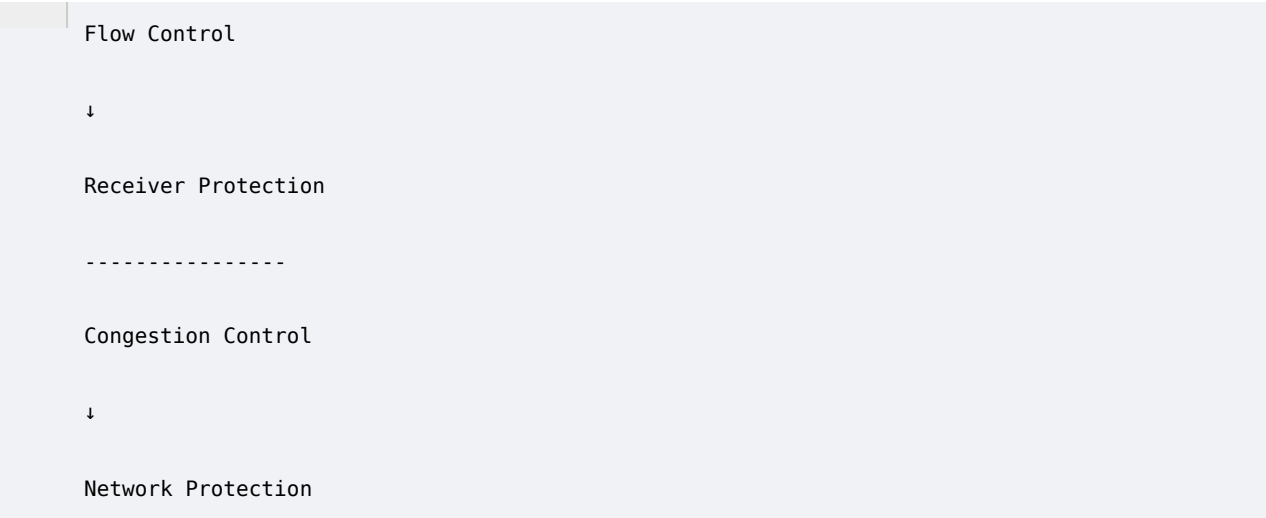
Feature	Flow Control	Congestion Control
Purpose	Protect Receiver	Protect Network
Problem	Buffer Overflow	Network Overload
Uses	Sliding Window	cwnd
Focus	Receiver	Network

Real-Life Example

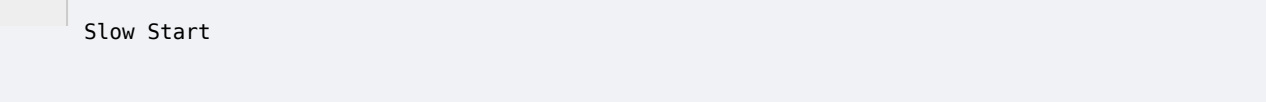
FLOW CONTROL
Teacher slowly notes dictate karta hai.
Student ki writing speed ke according.

CONGESTION CONTROL
Road par traffic zyada ho.
Traffic police vehicles control kare.

Memory Trick



TCP CONGESTION STEPS



↓

Congestion Avoidance

↓

Fast Retransmit

↓

Fast Recovery

Remember:

S C F F

One Minute Revision

TCP Flow Control

↓

Sliding Window

Receiver Buffer Protection

TCP Congestion Control

↓

Slow Start

Congestion Avoidance

Fast Retransmit

Fast Recovery

Most Important

↓

Sliding Window

Slow Start

RGPV Examiner Keywords

TCP Flow Control
Sliding Window
Receiver Window
Congestion Control
Congestion Window
Slow Start
Congestion Avoidance
Fast Retransmit
Fast Recovery
Duplicate ACK
Threshold

Most Expected Questions

7 MARKS

1. Explain TCP Flow Control.
2. Explain Sliding Window Protocol.
3. Explain Slow Start.
4. Explain Fast Retransmit.

14 MARKS

1. Explain TCP Flow Control with diagram.
2. Explain TCP Congestion Control with diagram.
3. Explain Slow Start and Congestion Avoidance.
4. Compare Flow Control and Congestion Control.

PYQ PROBABILITY: ★★★★★

 **Sliding Window, Slow Start, Congestion Avoidance, and Flow Control vs Congestion Control** are among the most repeated and highest-scoring questions in RGPV Unit-5.

TOPIC 5 :- TCP Header Format and TCP Timer

Management

COMPLETE 14-MARK RGPV ANSWER (5–6 PAGES)

Introduction

TCP reliable communication provide karta hai.

Reliability achieve karne ke liye TCP:

- ✓ Sequence Number

- ✓ Acknowledgement
- ✓ Flow Control
- ✓ Error Control
- ✓ Timers

use karta hai.

Ye saari information **TCP Header** me store hoti hai.

What is TCP Header?

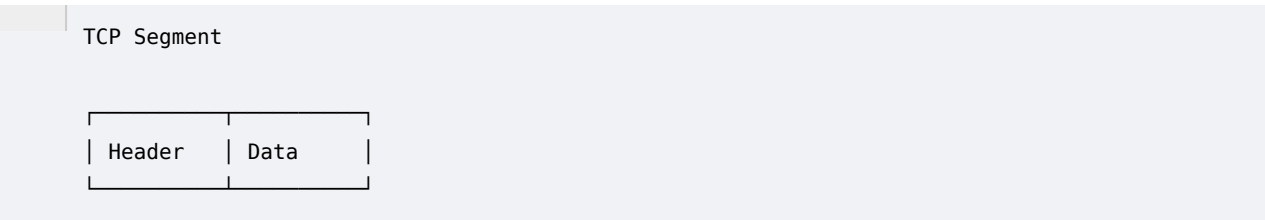
DEFINITION

TCP Header is the control information attached to every TCP segment that helps in reliable communication.

SIMPLE DEFINITION

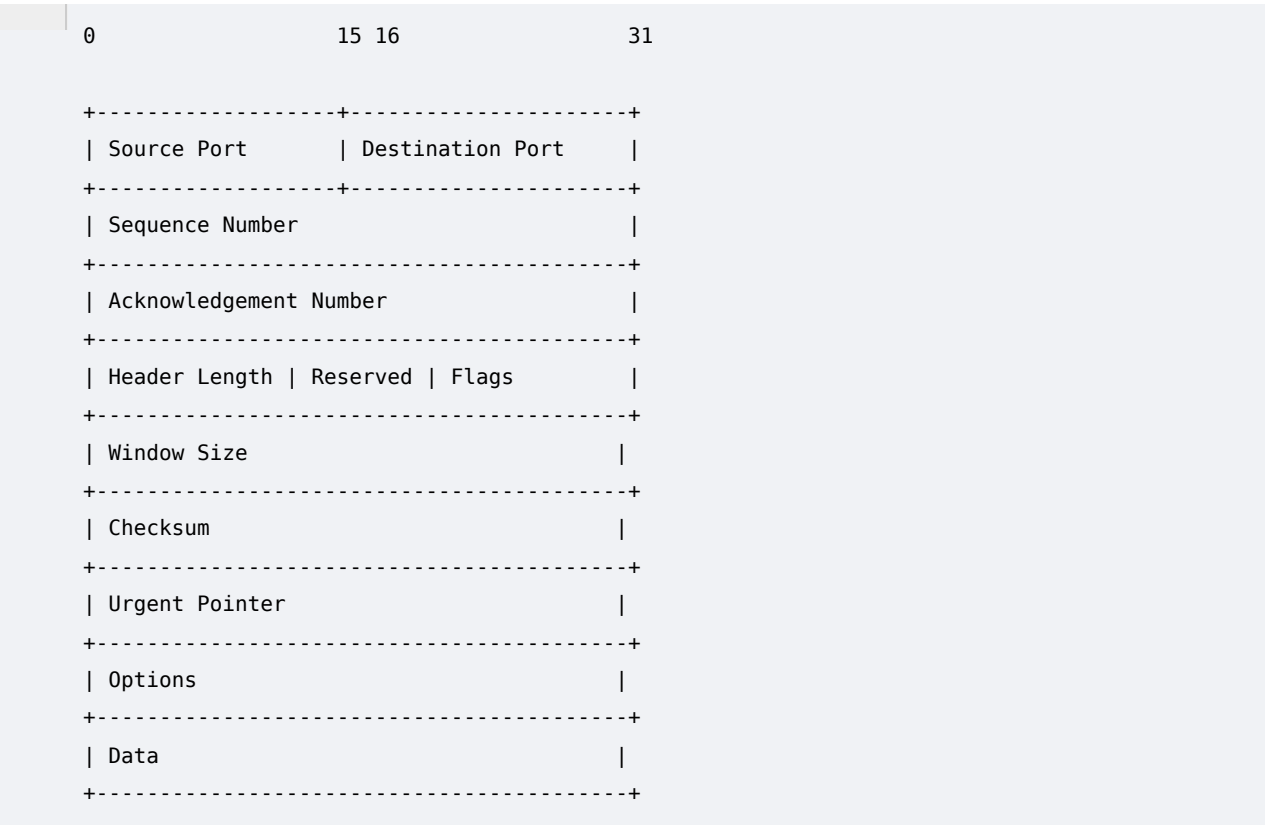
TCP Header sender aur receiver ke beech communication ko control karta hai.

TCP Segment Structure



TCP Header Format

★★★★★ Most Important



Important Fields of TCP Header

1. Source Port Number

Sender application identify karta hai.

EXAMPLE

Chrome
Port 5000

2. Destination Port Number

Receiver application identify karta hai.

EXAMPLE

HTTP
Port 80

3. Sequence Number

★★★★★ Very Important

Har segment ko unique number diya jata hai.

PURPOSE

Correct Ordering

EXAMPLE

Segment 1
Seq = 100
Segment 2
Seq = 200
Segment 3
Seq = 300

4. Acknowledgement Number

★★★★★ Very Important

Receiver batata hai next expected segment ka number.

EXAMPLE

ACK = 400

Meaning:

Segment 400 Expected

5. Header Length

TCP Header ka size batata hai.

MINIMUM

20 Bytes

MAXIMUM

60 Bytes

6. Flags

★★★★★ Important

TCP communication control karte hain.

Main TCP Flags

SYN

Connection establish karne ke liye.

ACK

Acknowledgement bhejne ke liye.

FIN

Connection close karne ke liye.

RST

Connection reset karne ke liye.

PSH

Data immediately application ko bhejna.

URG

Urgent data indicate karna.

Flag Example

SYN = 1

ACK = 0

7. Window Size

★★★★★ Important

Flow Control ke liye use hota hai.

EXAMPLE

Window Size

=

5000 Bytes

Sender ek baar me 5000 bytes bhej sakta hai.

8. Checksum

Error Detection ke liye.

PURPOSE

Corrupted Data Detect

9. Urgent Pointer

Urgent data ki position batata hai.

TCP Header Working

Sender

↓

Add Header

↓

Sequence Number

↓

ACK Number

↓

Transmit

↓

Receiver

↓

Verify

↓

ACK Send

TCP Timer Management

★★★★★ Most Important

Why Timers Needed?

Suppose:

Segment Sent

Lekin ACK nahi aaya.

Ab sender ko kaise pata chalega ki packet lost ho gaya?

SOLUTION

TCP Timers

Definition

TCP Timers are mechanisms used to control retransmission, connection management and reliability.

Types of TCP Timers

TCP Timers

|

├─ Retransmission Timer

├─ Persistence Timer

├─ Keepalive Timer

└─ Time-Wait Timer

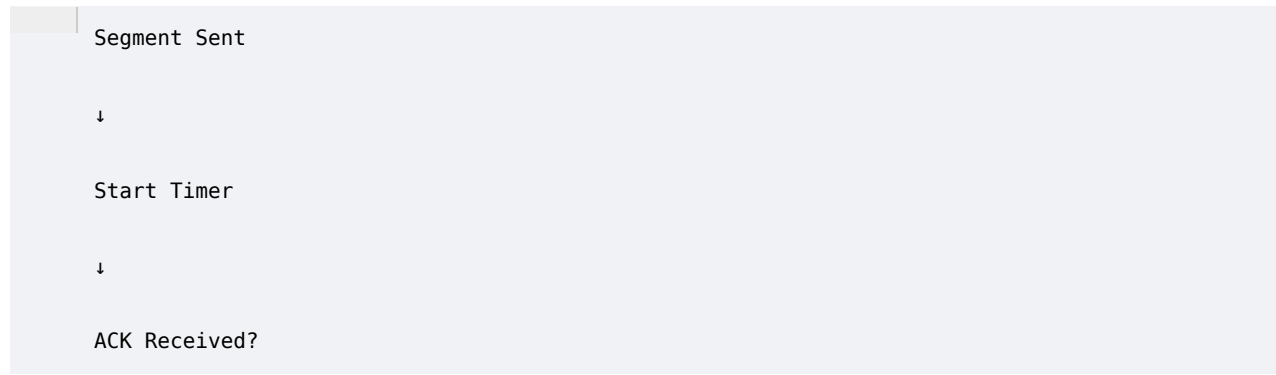
1. Retransmission Timer

★★★★★ Most Important

Purpose

Lost packets ko detect karna.

Working



YES

Stop Timer

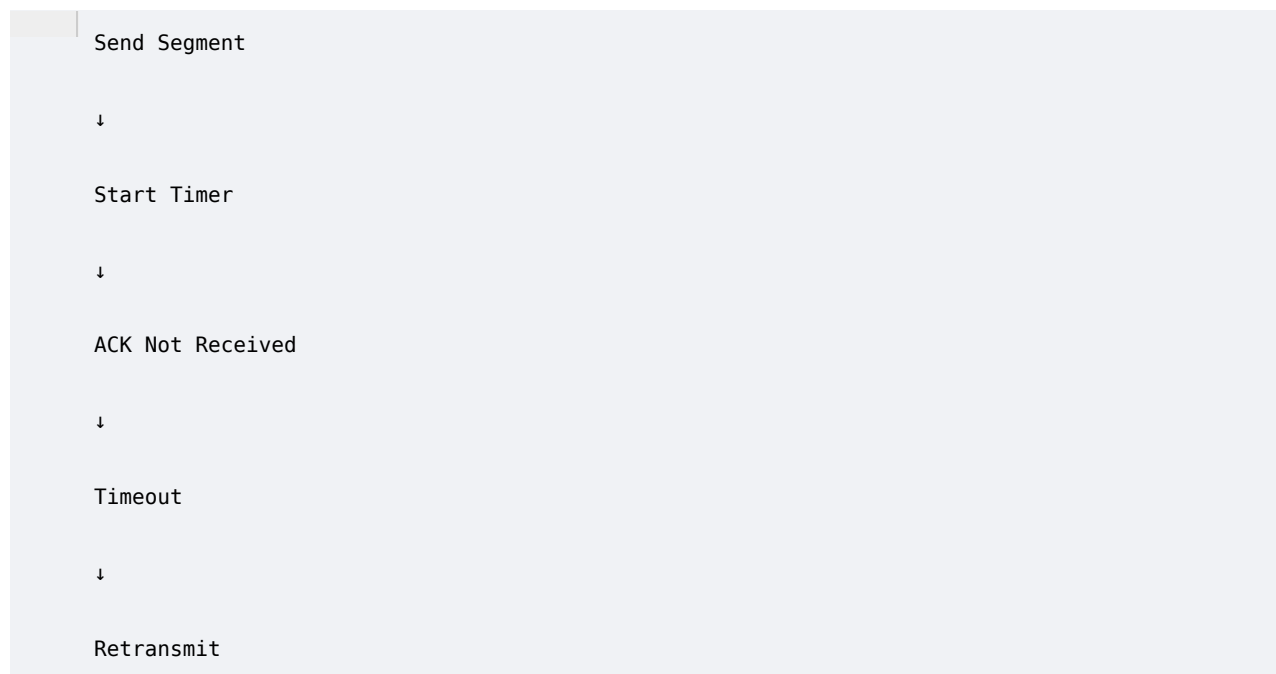
NO

Timer Expires

↓

Retransmit Segment

Diagram



Advantage

✓ Reliable Communication

2. Persistence Timer

★★★★★ Important

Purpose

Deadlock avoid karna.

Example

Receiver:

Window Size = 0

Sender waiting mode me chala gaya.

Persistence Timer periodically check karta hai:

Window Open Hua Ya Nahi

3. Keepalive Timer

★★★★★ Important

Purpose

Check karta hai connection still active hai ya nahi.

Working

Long time tak koi communication nahi hui.

↓

Keepalive Message bheja jata hai.

↓

Response mila?

YES

Connection Active

NO

Connection Closed

Example

SSH Connection

4. Time-Wait Timer

★★★★★ Important

Purpose

Connection close hone ke baad delayed packets ko handle karna.

Working

Connection terminate hone ke baad:

TIME_WAIT State

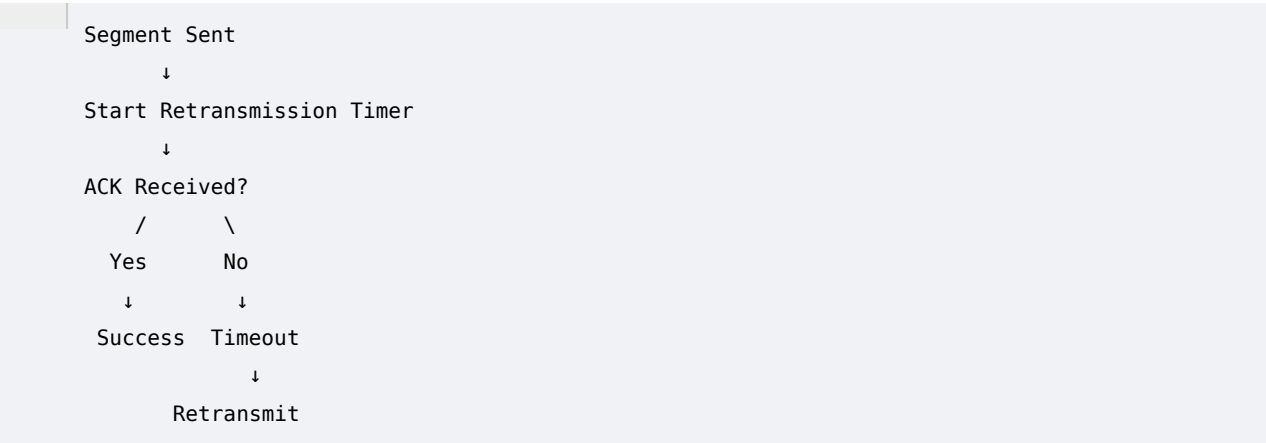
maintain hoti hai.

TYPICAL VALUE

2 × MSL

MSL = Maximum Segment Lifetime

TCP Timer Flowchart



TCP Header vs UDP Header

★★★★★ RGPV Favorite

Feature	TCP	UDP
Header Size	20–60 Bytes	8 Bytes
Sequence Number	Yes	No
ACK Number	Yes	No
Flow Control	Yes	No
Congestion Control	Yes	No
Reliability	High	Low

Real-Life Example

TCP HEADER

Courier Packet par:

Sender Address

Receiver Address

Tracking Number

Likha hota hai.

TCP TIMER

Courier expected time me na pahuche:

Tracking Check

kiya jata hai.

Exactly TCP bhi yehi karta hai.

Memory Trick

TCP FLAGS

S A F R P U

↓

SYN

ACK

FIN

RST

PSH

URG

TCP TIMERS

R P K T

↓

Retransmission

Persistence

Keepalive

Time-Wait

One Minute Revision

TCP Header

↓

Source Port

Destination Port

Sequence Number

ACK Number

Flags

Window Size

Checksum

TCP Timers

↓

Retransmission Timer

Persistence Timer

Keepalive Timer

Time-Wait Timer

Most Important

↓

Sequence Number

ACK Number

Retransmission Timer

RGPV Examiner Keywords

TCP Header

Source Port

Destination Port

Sequence Number

Acknowledgement Number
Flags
Window Size
Checksum
Retransmission Timer
Persistence Timer
Keepalive Timer
Time-Wait Timer

Most Expected Questions

7 MARKS

1. Explain TCP Header Format.
2. Explain TCP Flags.
3. Explain TCP Timers.
4. Explain Retransmission Timer.

14 MARKS

1. Explain TCP Header Format with neat diagram.
2. Explain TCP Timer Management.
3. Explain Sequence Number and ACK Number.
4. Compare TCP and UDP Header.

PYQ PROBABILITY: ★★★★★

🔥 **TCP Header Format, TCP Flags, Sequence Number, ACK Number, and Retransmission Timer** regularly appear in RGPV exams.

TOPIC 6:- WWW and HTTP

WORLD WIDE WEB AND HYPERTEXT TRANSFER PROTOCOL

COMPLETE 14-MARK RGPV ANSWER (5-6 PAGES)

Introduction

Aaj hum roz:

- Google
- YouTube
- Facebook
- Instagram
- ChatGPT

use karte hain.

Ye sab **World Wide Web (WWW)** ka part hain.

Jab bhi browser kisi website ko open karta hai, ek protocol use hota hai:

HTTP
(HyperText Transfer Protocol)

WWW aur HTTP Application Layer ke sabse important topics hain.

What is WWW?

DEFINITION

World Wide Web (WWW) is a collection of interconnected web pages and resources accessible through the Internet.

SIMPLE DEFINITION

WWW internet par available websites aur web pages ka collection hai.

Example

www.google.com

www.youtube.com

www.rgpvnoteshub.in

Components of WWW

WWW

|

├─ Web Browser

├─ Web Server

├─ Web Pages

└─ HTTP

Web Browser

User side software.

EXAMPLES

Google Chrome

Microsoft Edge

Firefox

Safari

Web Server

Website store karta hai.

EXAMPLES

Apache

Nginx

IIS

Web Page

HTML document jo browser me display hota hai.

Working of WWW

STEP 1

User URL enter karta hai.

`www.rgpvnoteshub.in`

↓

STEP 2

Browser DNS se IP address obtain karta hai.

↓

STEP 3

HTTP Request server ko send hoti hai.

↓

STEP 4

Server Response bhejta hai.

↓

STEP 5

Browser webpage display karta hai.

WWW Architecture

User

↓

Browser

↓

HTTP Request

↓

Web Server

↓

HTTP Response

↓

Browser

↓

Web Page Display

What is HTTP?

★★★★★ Most Important

Definition

HTTP (HyperText Transfer Protocol) is an application layer protocol used for communication between web browsers and web servers.

Full Form

HTTP

↓

HyperText Transfer Protocol

Purpose

Browser aur server ke beech communication karna.

Example

Browser

↓

Request

↓

Server

↓

Response

Characteristics of HTTP

1. APPLICATION LAYER PROTOCOL

2. STATELESS PROTOCOL

Server previous request remember nahi karta.

3. CLIENT-SERVER MODEL

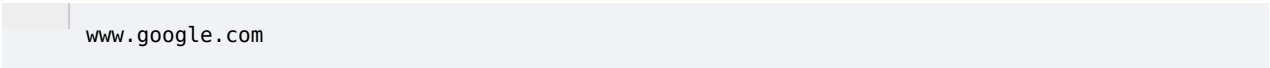
4. REQUEST-RESPONSE BASED

HTTP Working

★★★★★ Direct Exam Question

Step 1

User browser me URL enter karta hai.



www.google.com

Step 2

Browser HTTP Request send karta hai.

Step 3

Server request process karta hai.

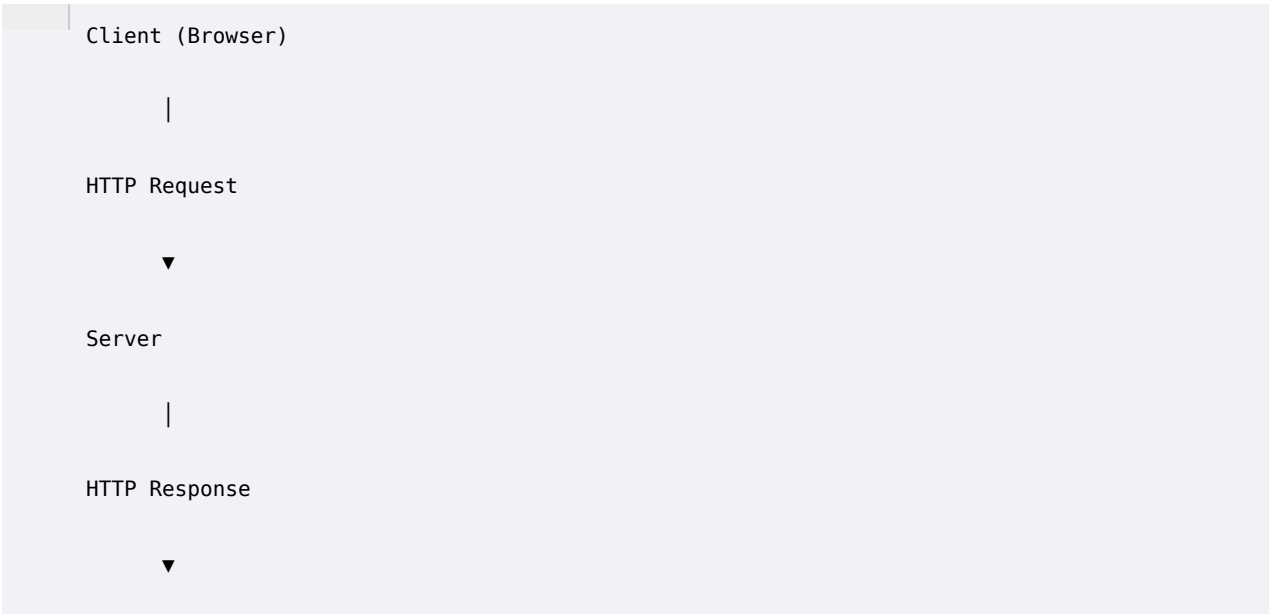
Step 4

HTTP Response send karta hai.

Step 5

Webpage display hota hai.

Diagram



Client (Browser)

|

HTTP Request

▼

Server

|

HTTP Response

▼

HTTP Request Message

Client se server ko bheja jata hai.

Structure

```
GET /index.html HTTP/1.1
```

```
Host: www.example.com
```

Main Components

REQUEST LINE

HEADERS

BODY

HTTP Response Message

Server se client ko bheja jata hai.

Example

```
HTTP/1.1 200 OK
```

Components

STATUS LINE

HEADERS

CONTENT

HTTP Methods

★★★★★ Most Important

1. GET Method

Data retrieve karne ke liye.

EXAMPLE

```
GET /notes.html
```

USE

Web page fetch karna.

2. POST Method

Data send karne ke liye.

EXAMPLE

Login Form

Username

Password

Use

Form Submission

3. PUT Method

Resource update karna.

4. DELETE Method

Resource remove karna.

HTTP Methods Table

Method	Purpose
GET	Read Data
POST	Send Data
PUT	Update Data
DELETE	Delete Data

HTTP Status Codes

★★★★★ Very Important

Server response status batata hai.

200 OK

Request successful.

200 OK

404 Not Found

Page exist nahi karta.

404 Not Found

500 Internal Server Error

Server problem.

500 Internal Server Error

301 Moved Permanently

Page permanently shifted.

Common Status Codes

Code	Meaning
200	Success
301	Redirect
400	Bad Request
401	Unauthoriz ed
403	Forbidden
404	Not Found
500	Server Error

HTTP vs HTTPS

★★★★★ Important

HTTP	HTTPS
Not Secure	Secure
No Encryption	Encryption
Port 80	Port 443
Less Secure	More Secure

Example

http://example.com

https://example.com

Secure website.

Real-Life Example

Suppose:

Restaurant

CUSTOMER

Order deta hai.

Request

KITCHEN

Food banati hai.

Processing

WAITER

Food laata hai.

Response

Exactly HTTP bhi aise hi kaam karta hai.

WWW vs HTTP

WWW	HTTP
Collection of Web Pages	Communication Protocol
Information System	Transfer Mechanism
Websites	Browser-Server Communication

Complete Flowchart

User Enters URL

↓

DNS Lookup

↓

HTTP Request

↓

Web Server

↓

Processing

↓

HTTP Response

↓

Web Page Display

Advantages of HTTP

- ✓ Simple
- ✓ Fast
- ✓ Widely Supported
- ✓ Platform Independent

Disadvantages

- ✗ Stateless
- ✗ Security Issues (HTTP)
- ✗ Additional Requests

One Minute Revision

WWW

↓

Collection of Websites

HTTP

↓

HyperText Transfer Protocol

Browser ↔ Server

Methods

↓

GET

POST

PUT

DELETE

Status Codes

↓

200 OK

404 Not Found

500 Error

Most Important

↓

HTTP Working

GET vs POST

Status Codes

RGPV Examiner Keywords

WWW

World Wide Web

HTTP

HyperText Transfer Protocol

Web Browser

Web Server

HTTP Request

HTTP Response

GET

POST

Status Code

200 OK

Most Expected Questions

7 MARKS

1. Define [WWW](#).
2. Explain HTTP.
3. Explain HTTP Methods.
4. Explain HTTP Status Codes.

14 MARKS

1. Explain WWW architecture with diagram.
2. Explain HTTP working with diagram.
3. Explain HTTP Request and Response messages.
4. Explain HTTP Methods and Status Codes.

PYQ PROBABILITY: ★★★★★

 **HTTP Working, HTTP Methods (GET & POST), HTTP Status Codes, and WWW Architecture** are among the most frequently asked RGPV Unit-5 questions.

TOPIC:-7 FTP and SSH

FILE TRANSFER PROTOCOL AND SECURE SHELL

COMPLETE 14-MARK RGPV ANSWER (4-5 PAGES)

Introduction

Computer Networks me kai baar hume:

- ✓ Files Transfer karni hoti hain
- ✓ Remote Computer Access karna hota hai

In dono tasks ke liye Application Layer par do important protocols use hote hain:

FTP

(File Transfer Protocol)

SSH

(Secure Shell)

FTP (File Transfer Protocol)

★★★★★ Most Important

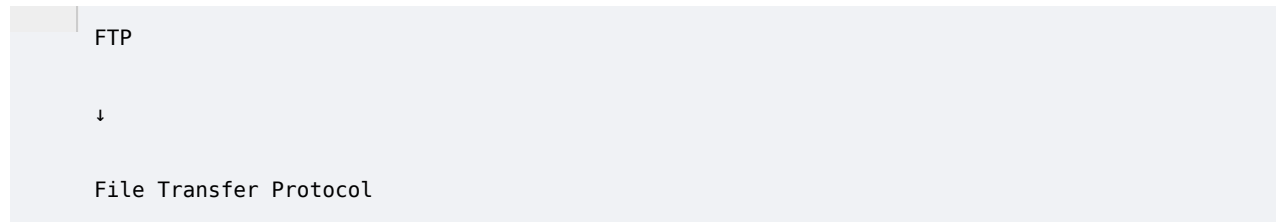
Definition

FTP (File Transfer Protocol) is an application layer protocol used for transferring files between a client and a server over a network.

Simple Definition

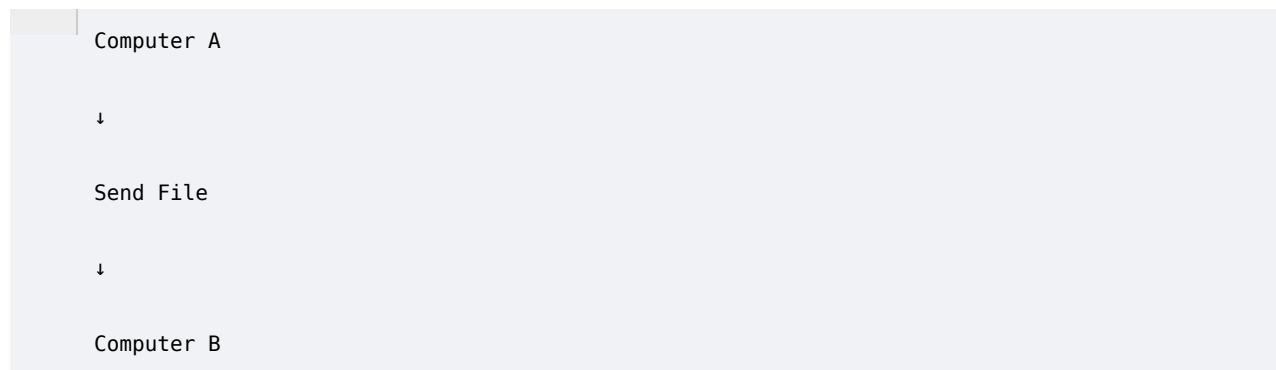
FTP ek protocol hai jo ek computer se dusre computer par files transfer karne ke liye use hota hai.

Full Form



Need of FTP

Suppose:

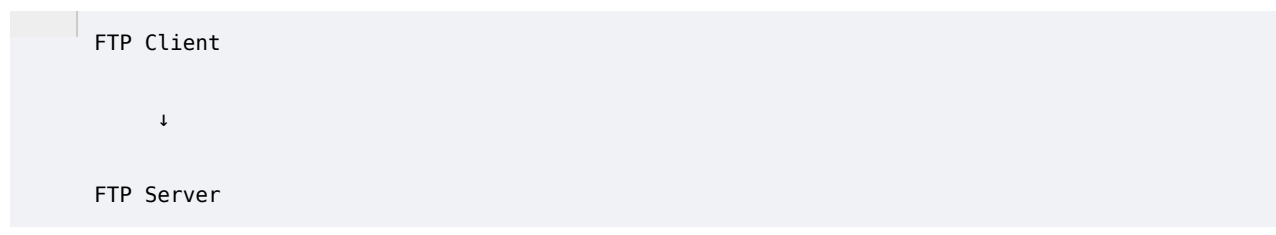


Normal communication se large files transfer karna difficult hota hai.

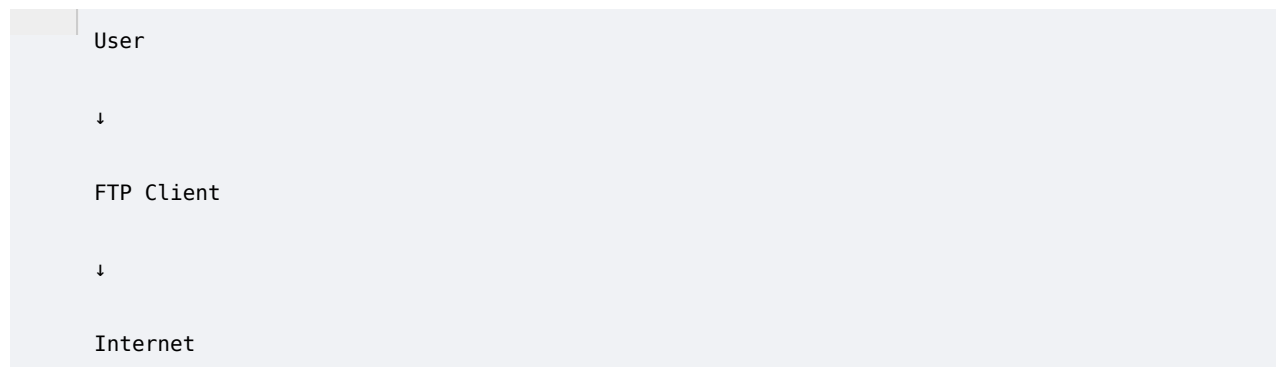
FTP file transfer ko easy banata hai.

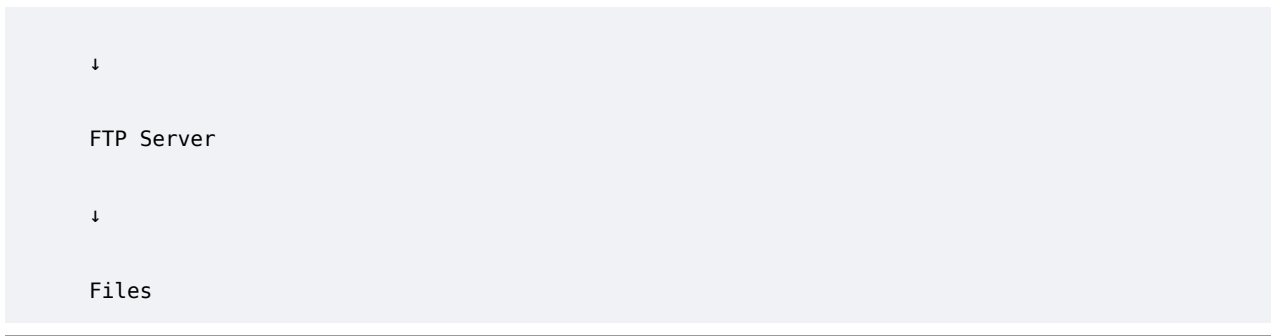
FTP Architecture

FTP Client aur FTP Server model par kaam karta hai.



Diagram





FTP Working

STEP 1

Client FTP Server se connection establish karta hai.

STEP 2

User login karta hai.

STEP 3

File Upload ya Download request bheji jati hai.

STEP 4

Server file transfer karta hai.

FTP Connections

★★★★★ Important

FTP do connections use karta hai.

1. Control Connection

Commands transfer karne ke liye.

PORT NUMBER

21

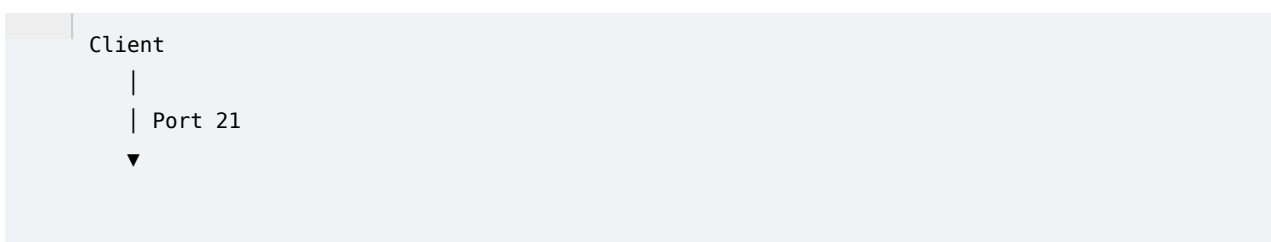
2. Data Connection

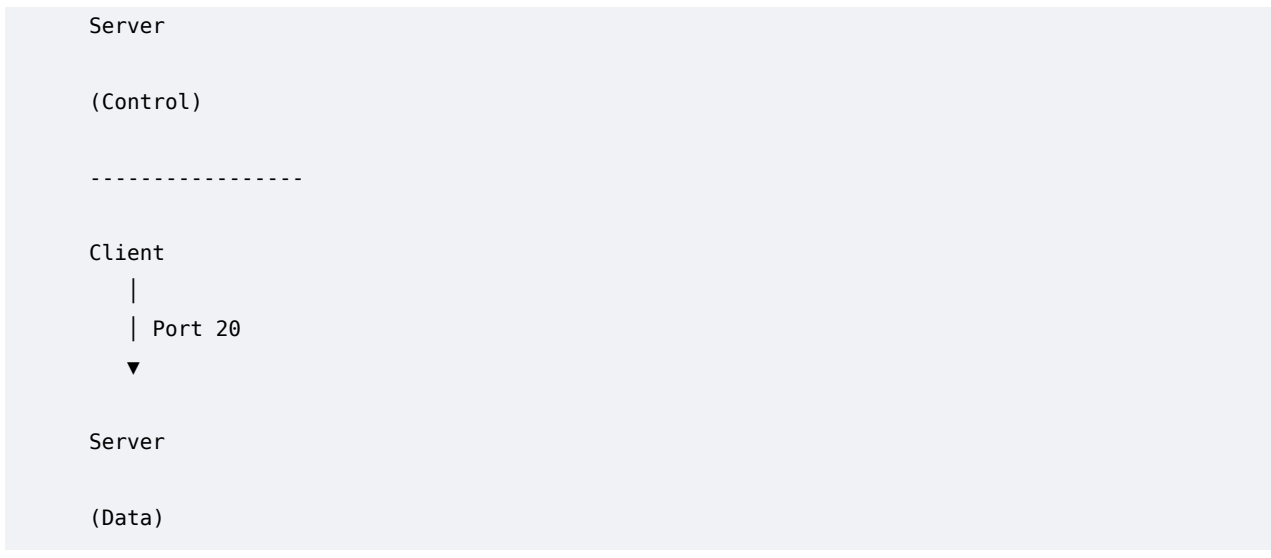
Actual file transfer ke liye.

PORT NUMBER

20

FTP Communication Diagram





FTP Operations

UPLOAD FILE

Client → Server

DOWNLOAD FILE

Server → Client

RENAME FILE

DELETE FILE

CREATE DIRECTORY

Advantages of FTP

- ✓ Fast File Transfer
- ✓ Supports Large Files
- ✓ Upload and Download
- ✓ Easy File Management

Disadvantages of FTP

- ✗ No Encryption
- ✗ Password Visible
- ✗ Less Secure

Applications of FTP

- Website Upload
- Software Distribution
- Data Backup
- File Sharing

SSH (Secure Shell)

★★★★★ Most Important

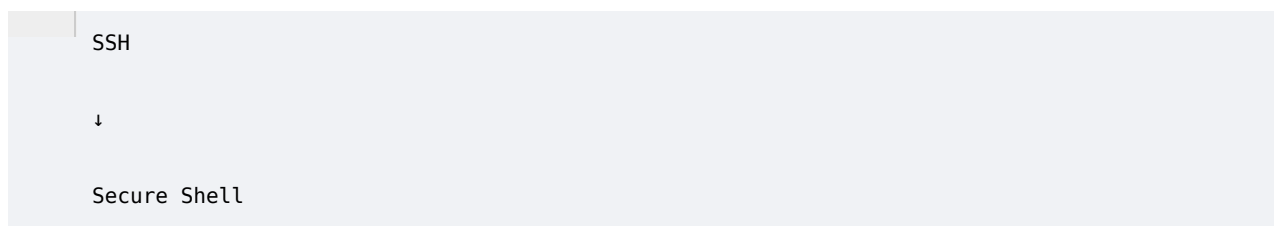
Definition

SSH (Secure Shell) is a secure network protocol used for remote login and secure communication between computers.

Simple Definition

SSH secure remote access provide karta hai.

Full Form



Why SSH Needed?

FTP aur Telnet secure nahi the.

Passwords plain text me send hote the.

SOLUTION

SSH

Main Features of SSH

1. ENCRYPTION

Data encrypt karta hai.

2. AUTHENTICATION

User verify karta hai.

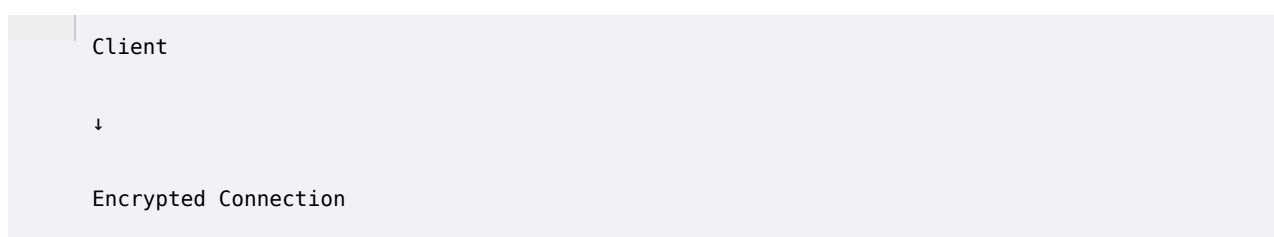
3. SECURE COMMUNICATION

Data secure transfer karta hai.

4. REMOTE ACCESS

Remote systems control kar sakte hain.

SSH Architecture





Server

Working of SSH

STEP 1

Client SSH Request bhejta hai.

STEP 2

Server identity verify karta hai.

STEP 3

Authentication hoti hai.

STEP 4

Encrypted session create hoti hai.

STEP 5

Commands execute hoti hain.

Diagram

SSH Client



Encrypted Tunnel



SSH Server

SSH Port Number

★★★★★ Important

22

SSH Authentication Methods

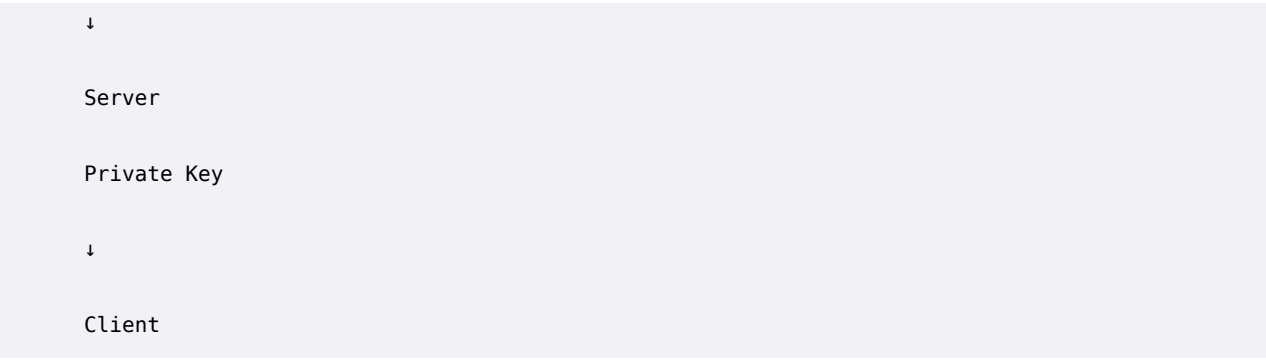
PASSWORD AUTHENTICATION

PUBLIC KEY AUTHENTICATION

★★★★★ Important

Public Key Authentication

Public Key



Applications of SSH

REMOTE SERVER MANAGEMENT

LINUX ADMINISTRATION

SECURE FILE TRANSFER

CLOUD SERVER ACCESS

Advantages of SSH

- ✓ Highly Secure
- ✓ Encrypted Communication
- ✓ Remote Administration
- ✓ Authentication Support

Disadvantages of SSH

- ✗ Slightly Slower
- ✗ Complex Setup

FTP vs SSH

★★★★★ RGPV Favorite Question

Feature	FTP	SSH
Full Form	File Transfer Protocol	Secure Shell
Purpose	File Transfer	Secure Remote Access
Security	No Encryption	Encryption
Port	21	22
Authentication	Basic	Strong
Password Security	Low	High

Remote Login	No	Yes
Reliability	Medium	High

Real-Life Example

FTP

Courier Service

	Parcel Transfer
--	-----------------

Focus:

	File Transfer
--	---------------

SSH

Bank Locker

	Secure Access
--	---------------

Focus:

	Security
--	----------

Memory Trick

FTP

	F
	↓
	Files

SSH

	S
	↓
	Security

PORTS

	FTP = 21
	SSH = 22

Remember:

	21 → FTP
--	----------

One Minute Revision

FTP

↓

File Transfer Protocol

Port 21

Upload

Download

SSH

↓

Secure Shell

Port 22

Encrypted

Remote Login

Most Important

↓

FTP vs SSH

Port Numbers

Security

RGPV Examiner Keywords

FTP

File Transfer Protocol

FTP Client

FTP Server

Port 20

Port 21

SSH
Secure Shell
Encryption
Authentication
Remote Login
Port 22
Secure Communication

Most Expected Questions

7 MARKS

1. Define FTP.
2. Explain SSH.
3. Explain FTP Architecture.
4. Differentiate FTP and SSH.

14 MARKS

1. Explain FTP with neat diagram.
2. Explain SSH with working.
3. Compare FTP and SSH.
4. Explain secure remote access using SSH.

PYQ PROBABILITY: ★★★★★



FTP vs SSH, FTP Architecture, and SSH Working are commonly asked in RGPV Unit-5.

TOPIC 8 :- Email, SMTP, MIME and IMAP

COMPLETE 14-MARK RGPV ANSWER (5–6 PAGES)

Introduction

Aaj Email duniya ka sabse popular communication method hai.

Examples:

Gmail
Outlook
Yahoo Mail

Email System ke proper working ke liye kuch protocols use hote hain:

SMTP
MIME
IMAP

Ye Application Layer ke important protocols hain.

What is Email?

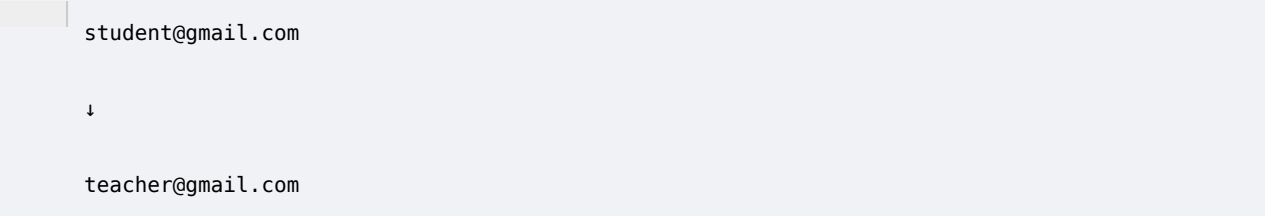
DEFINITION

Email (Electronic Mail) is a method of exchanging digital messages over computer networks.

SIMPLE DEFINITION

Internet ke through message bhejne aur receive karne ki service ko Email kehte hain.

Example



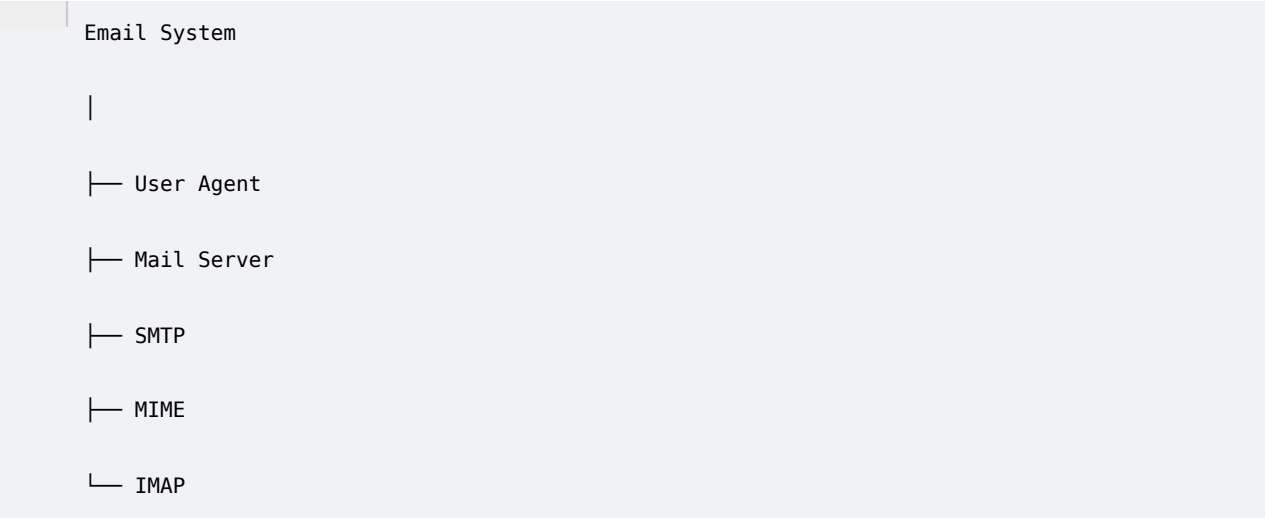
```
graph TD; A[student@gmail.com] --> B[teacher@gmail.com]
```

student@gmail.com

↓

teacher@gmail.com

Components of Email System



```
graph TD; A[Email System] --- B[User Agent]; A --- C[Mail Server]; A --- D[SMTP]; A --- E[MIME]; A --- F[IMAP]
```

Email System

|

├─ User Agent

├─ Mail Server

├─ SMTP

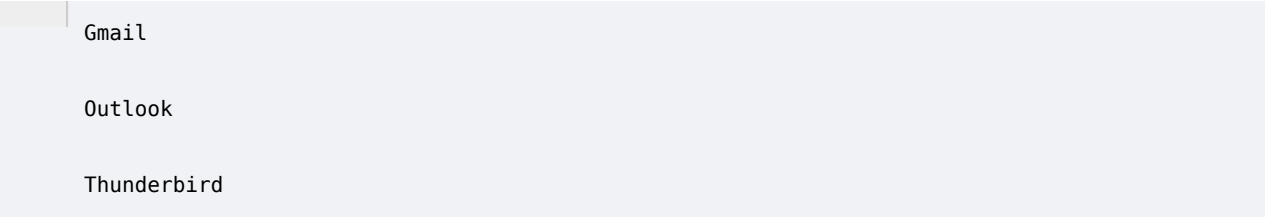
├─ MIME

└─ IMAP

User Agent

User interface provide karta hai.

EXAMPLES



Gmail

Outlook

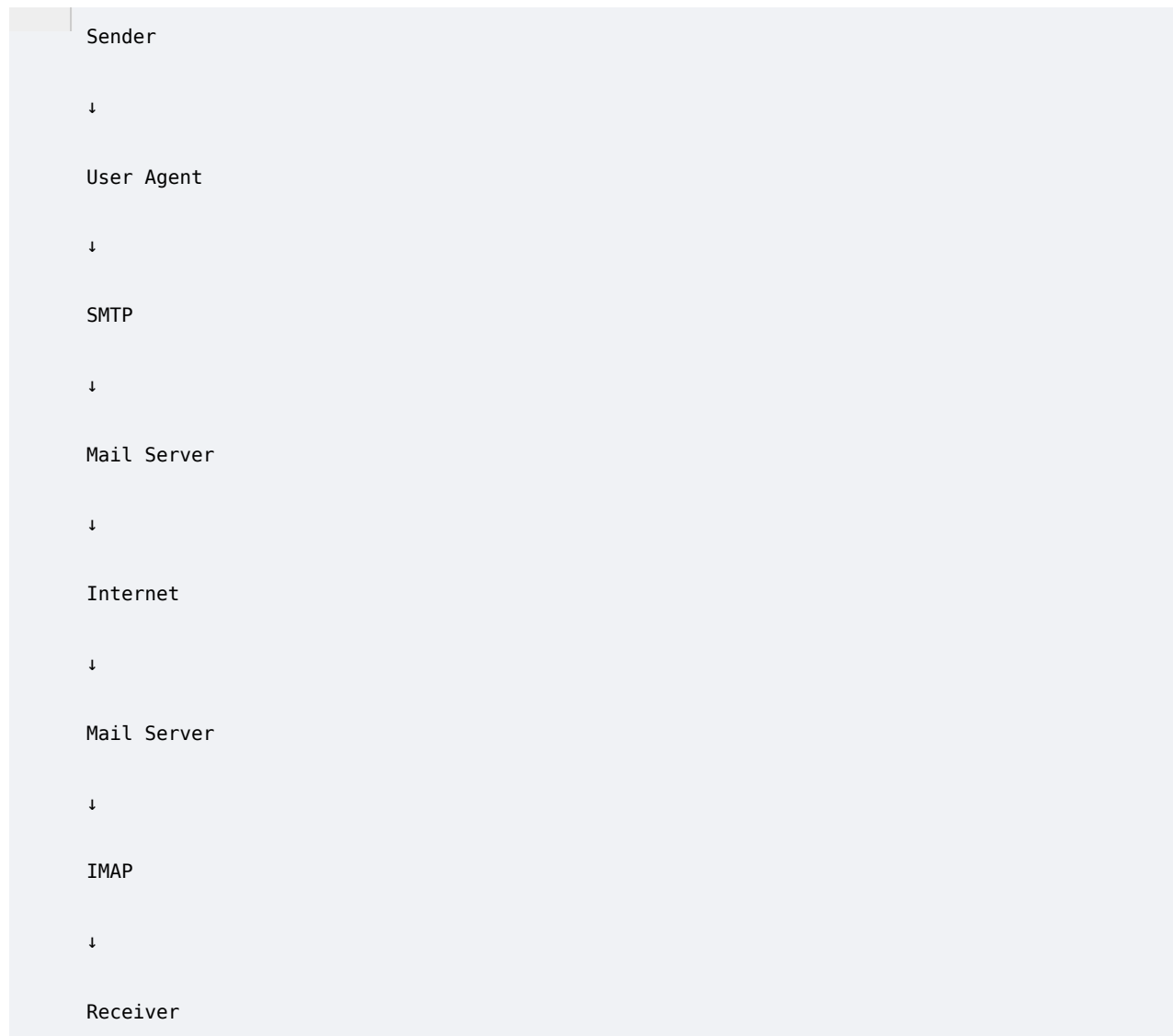
Thunderbird

Mail Server

Emails store aur manage karta hai.

Email Architecture

★★★★★ Most Important



Email Working

STEP 1

Sender email compose karta hai.

STEP 2

SMTP mail server ko email bhejta hai.

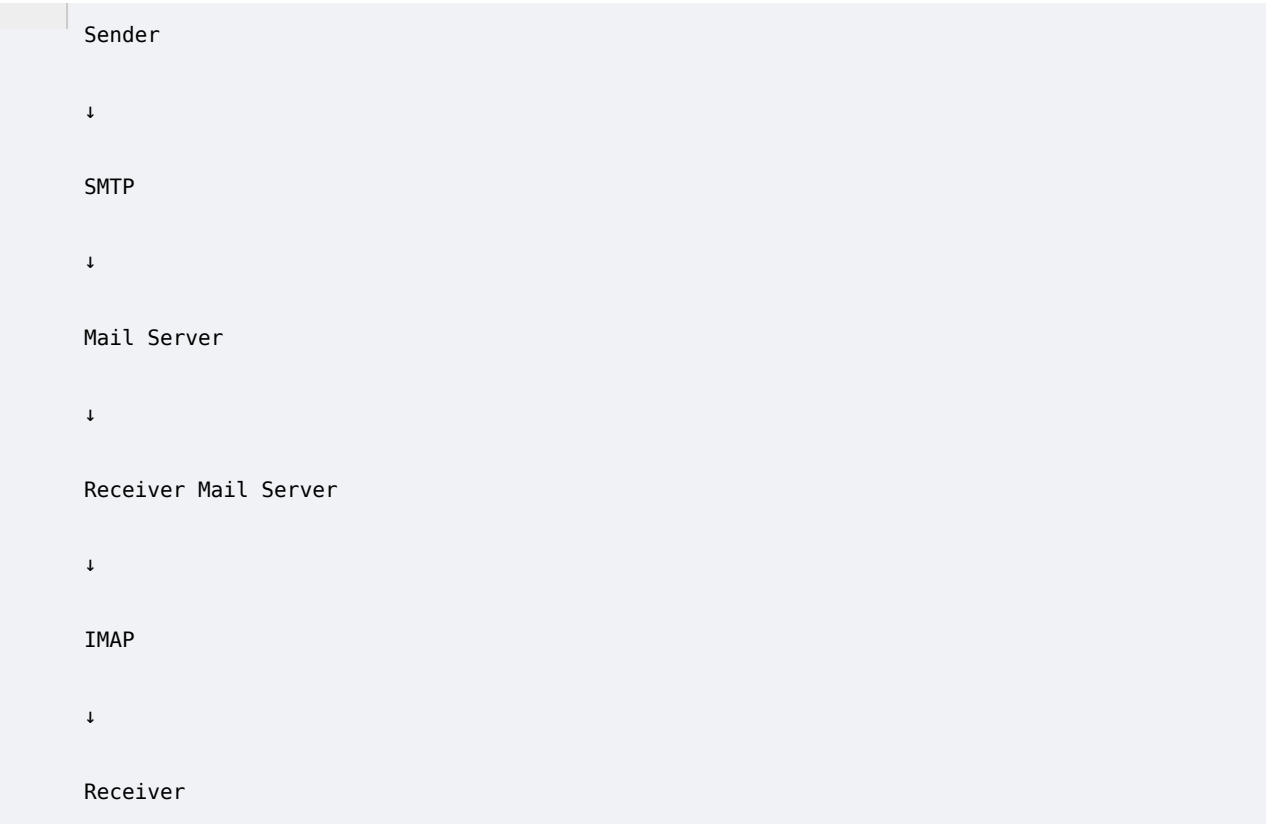
STEP 3

Mail server email destination server ko transfer karta hai.

STEP 4

Receiver IMAP ke through email access karta hai.

Diagram



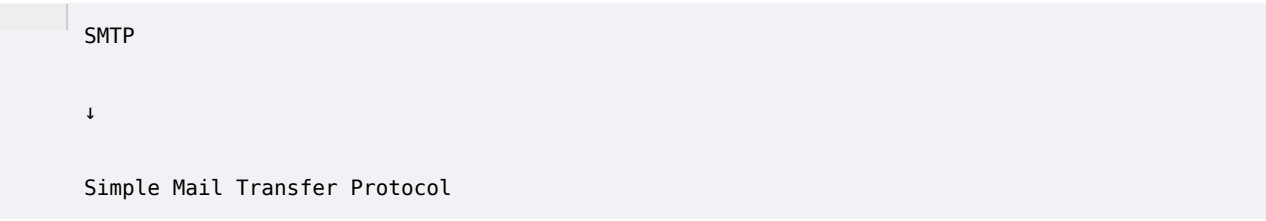
SMTP (Simple Mail Transfer Protocol)

★★★★★ Most Important

Definition

SMTP is an application layer protocol used for sending emails over the Internet.

Full Form



Purpose

Email send karna.

SMTP Port Numbers

25
587
465

SMTP Working

STEP 1

Sender mail create karta hai.

STEP 2

SMTP server ko transfer karta hai.

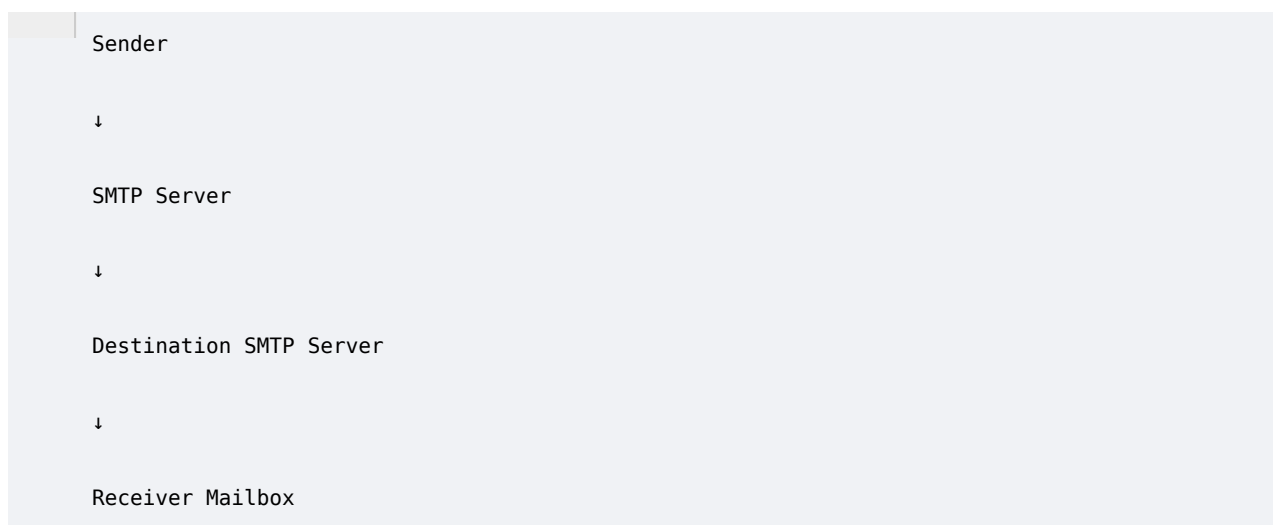
STEP 3

Server destination mail server ko bhejta hai.

STEP 4

Receiver server email store karta hai.

SMTP Communication



Advantages of SMTP

- ✓ Fast Email Delivery
 - ✓ Standard Protocol
 - ✓ Reliable
-

Disadvantages

- ✗ Only Sending
 - ✗ No Attachment Support Directly
-

MIME (Multipurpose Internet Mail Extensions)

★★★★★ Very Important

Problem with SMTP

SMTP originally sirf text support karta tha.

Cannot send:

Images

Videos

PDF Files

Documents

Solution

MIME

Definition

MIME is an extension of SMTP that allows emails to carry multimedia content and attachments.

Full Form

MIME

↓

Multipurpose Internet Mail Extensions

Purpose

Email attachments support karna.

MIME Supports

- ✓ Images
 - ✓ Audio
 - ✓ Video
 - ✓ PDF
 - ✓ Documents
-

MIME Working

Attachment ko:

Binary Data

↓

ASCII Format

↓

Email

convert karta hai.

MIME Header Example

Content-Type
Content-Encoding
Content-Disposition

Advantages

- ✓ Multimedia Support
 - ✓ Attachment Support
 - ✓ Multiple Content Types
-

IMAP (Internet Message Access Protocol)

★★★★★ Most Important

Definition

IMAP is an email retrieval protocol used to access and manage emails stored on a mail server.

Full Form

IMAP
↓
Internet Message Access Protocol

Purpose

Email receive aur manage karna.

Port Numbers

143
993 (Secure)

IMAP Working

STEP 1

Receiver mail server connect karta hai.

STEP 2

Emails server par hi stored rehti hain.

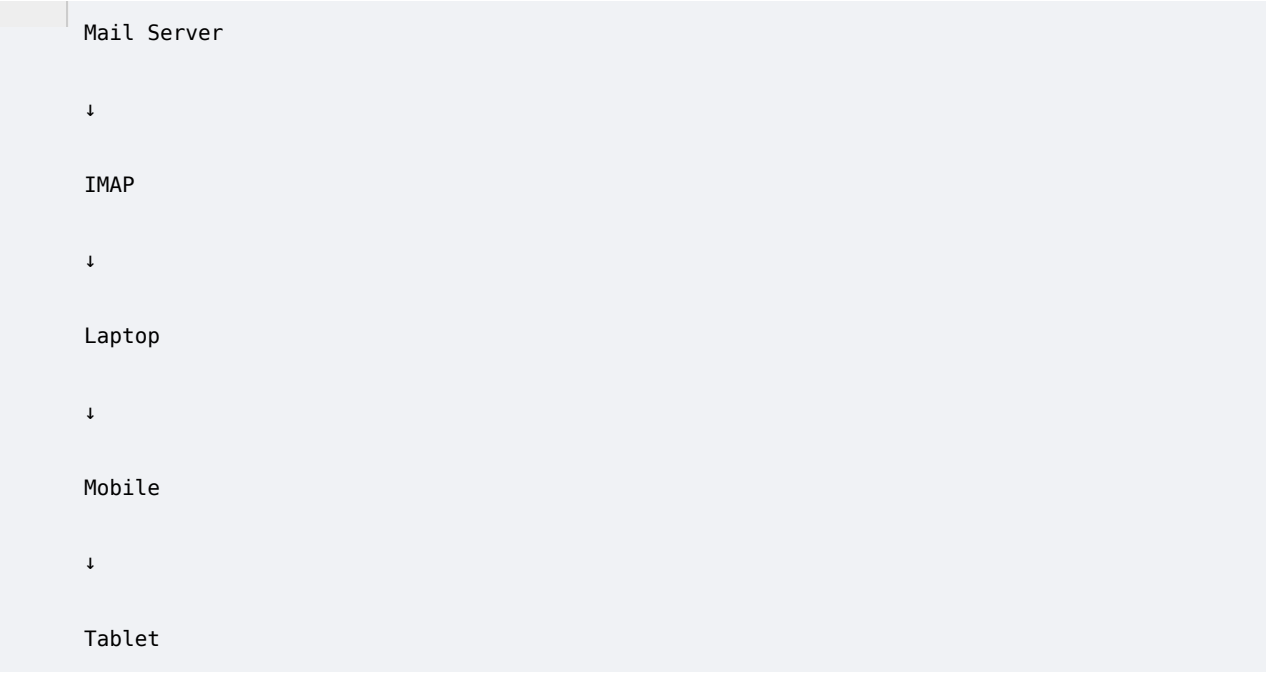
STEP 3

User emails access karta hai.

STEP 4

Multiple devices synchronize hote hain.

Diagram



Advantages of IMAP

- ✔ Emails server par stored
- ✔ Multi-device synchronization
- ✔ Better Email Management
- ✔ Folder Support

Disadvantages

- ✘ Internet Required
- ✘ More Storage Usage

SMTP vs IMAP

★★★★★ RGPV Favorite

Feature	SMTP	IMAP
Full Form	Simple Mail Transfer Protocol	Internet Message Access Protocol

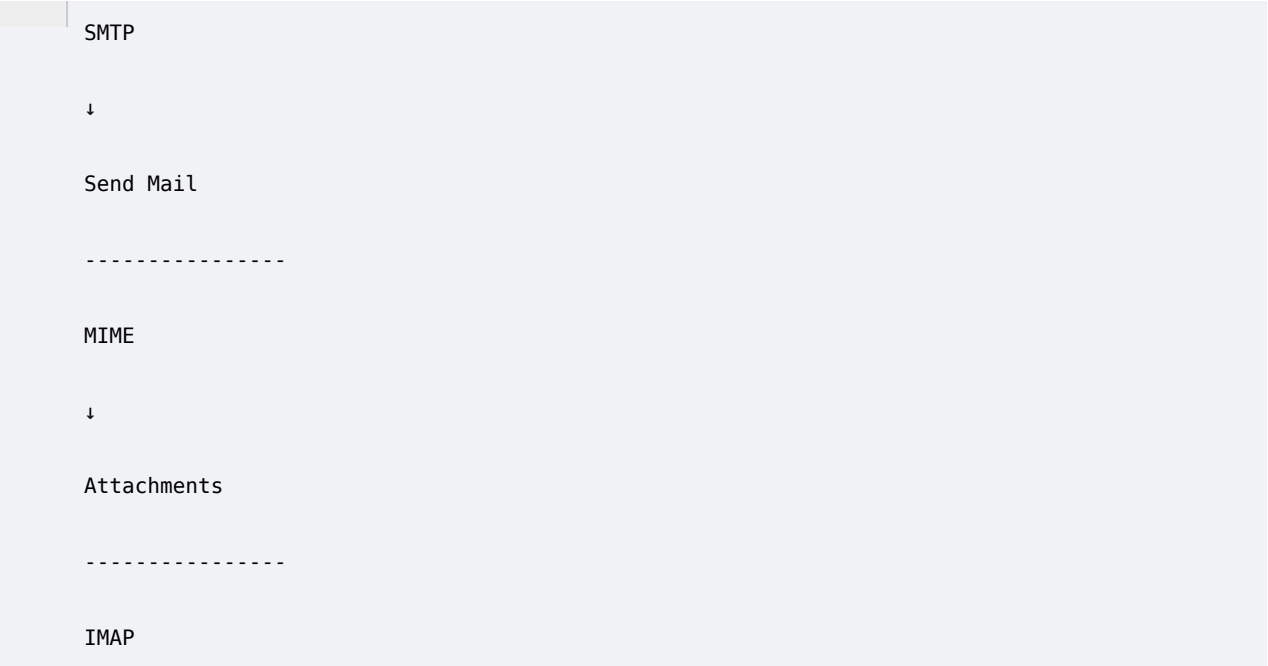
Purpose	Sending Email	Receiving Email
Direction	Outgoing Mail	Incoming Mail
Port	25, 587	143, 993
Mail Storage	No	Yes
Synchroniz ation	No	Yes

POP3 vs IMAP

★★★★★ Important

Feature	POP3	IMAP
Mail Storage	Local Device	Server
Synchronization	No	Yes
Multiple Devices	Poor	Excellent
Access	Single Device	Multiple Devices

Email Protocol Summary



↓

Receive Mail

Real-Life Example

Suppose Courier Service.

SMTP

Courier Sending

MIME

Parcel with Attachments

IMAP

Parcel Receiving

Memory Trick

SMTP

↓

Send

MIME

↓

Media

IMAP

↓

Inbox

Remember:

S → Send

M → Media

I → Inbox

One Minute Revision

Email

↓

Electronic Mail

SMTP

↓

Send Email

Port 25

MIME

↓

Attachments

Images

PDF

Video

IMAP

↓

Receive Email

Port 143

Most Important

↓

SMTP vs IMAP

Email
SMTP
Simple Mail Transfer Protocol
MIME
Multipurpose Internet Mail Extensions
IMAP
Internet Message Access Protocol
Mail Server
Attachment
Email Retrieval
Port 25
Port 143

Most Expected Questions

7 MARKS

1. Define SMTP.
2. Explain MIME.
3. Explain IMAP.
4. Explain Email Architecture.

14 MARKS

1. Explain Email System with diagram.
2. Explain SMTP with working.
3. Explain MIME with advantages.
4. Compare SMTP and IMAP.
5. Explain Email architecture using SMTP, MIME and IMAP.

PYQ PROBABILITY: ★★★★★

🔥 **SMTP, MIME, IMAP, Email Architecture, and SMTP vs IMAP** are among the most repeated Unit-5 questions in RGPV Computer Networks.

TOPIC 9:- DNS (Domain Name System)

DNS ARCHITECTURE, WORKING, DNS RECORDS AND NAME RESOLUTION PROCESS

COMPLETE 14-MARK RGPV ANSWER (5-6 PAGES)

Introduction

Hum websites ko naam se access karte hain:

www.google.com

www.youtube.com

www.rgpvnoteshub.in

Lekin computers names nahi samajhte.

Computers sirf:

IP Address

samajhte hain.

Example:

142.250.195.14

Ab question hai:

www.google.com

↓

142.250.195.14

Kaise Convert Hota Hai?

Answer:

DNS

What is DNS?

DEFINITION

DNS (Domain Name System) is a distributed naming system that translates domain names into IP addresses.

SIMPLE DEFINITION

DNS Internet ka Phone Book hai.

Ye website name ko IP address me convert karta hai.

Full Form

DNS

↓

Domain Name System

Why DNS Needed?

Imagine agar Google open karne ke liye yaad rakhna pade:

142.250.195.14

Bahut difficult hoga.

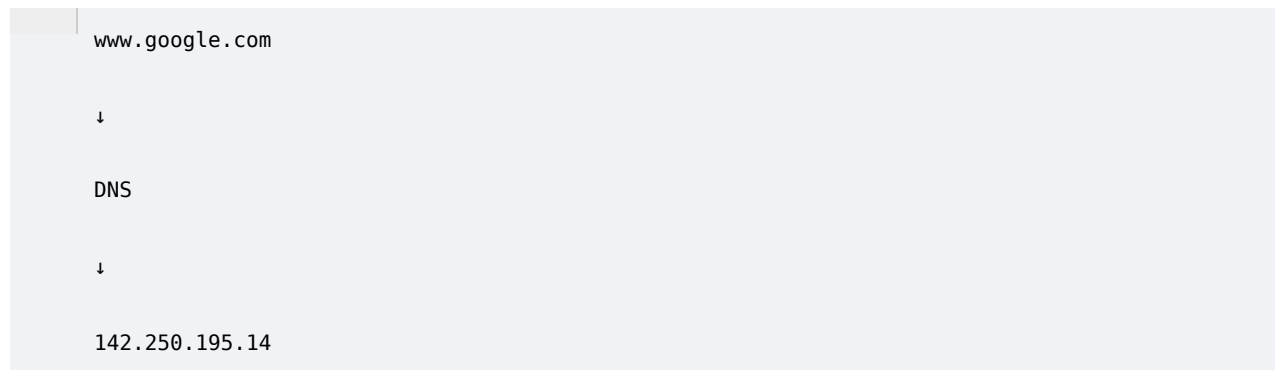
Instead:

www.google.com

Use karte hain.

DNS automatically IP find kar deta hai.

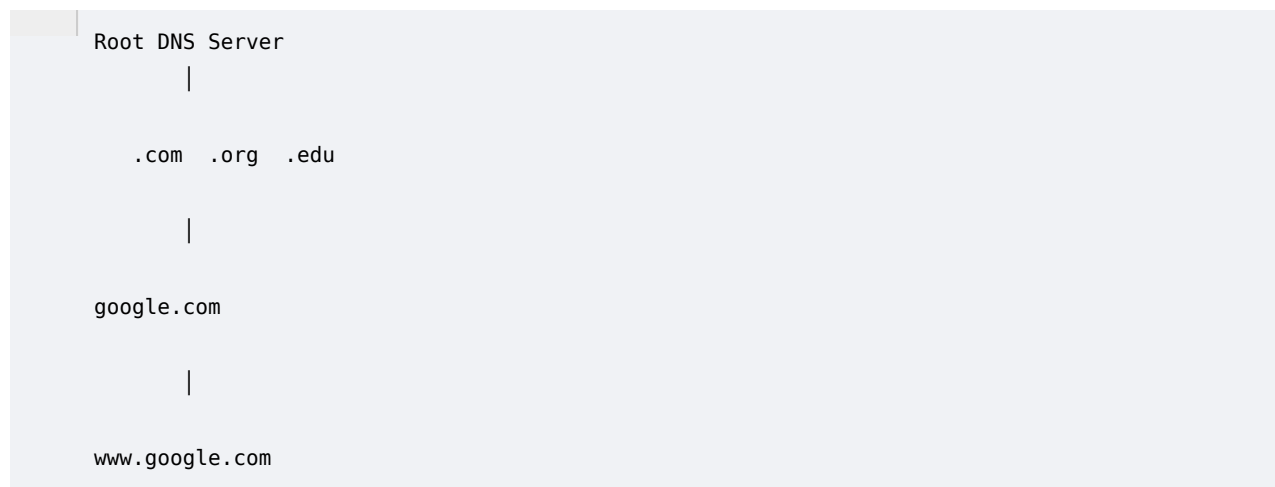
Example



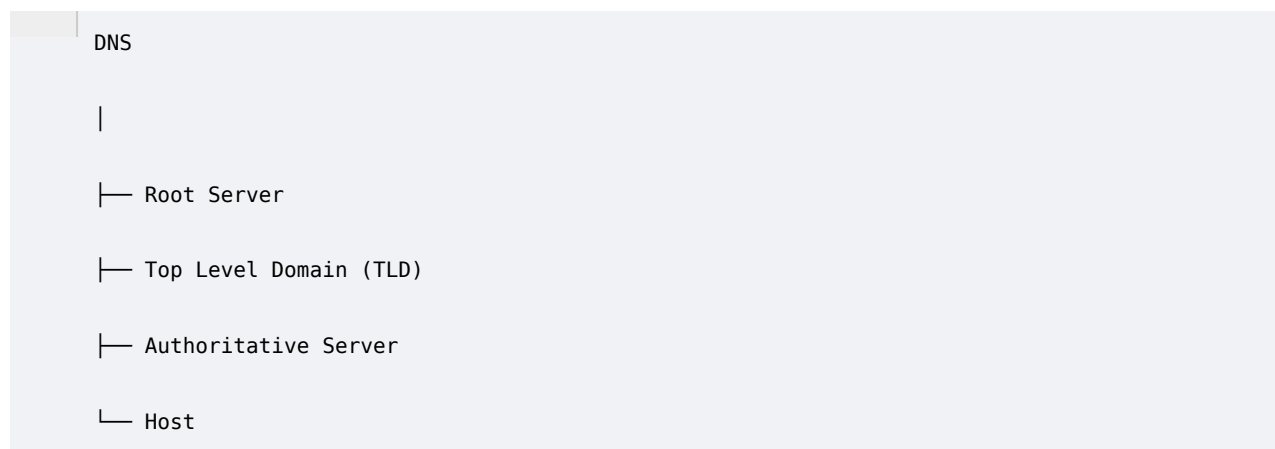
DNS Architecture

★★★★★ Most Important

DNS hierarchical structure follow karta hai.



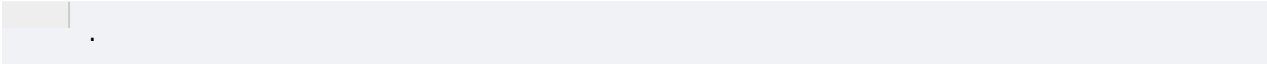
DNS Hierarchy



1. Root DNS Server

Hierarchy ka top level.

Example

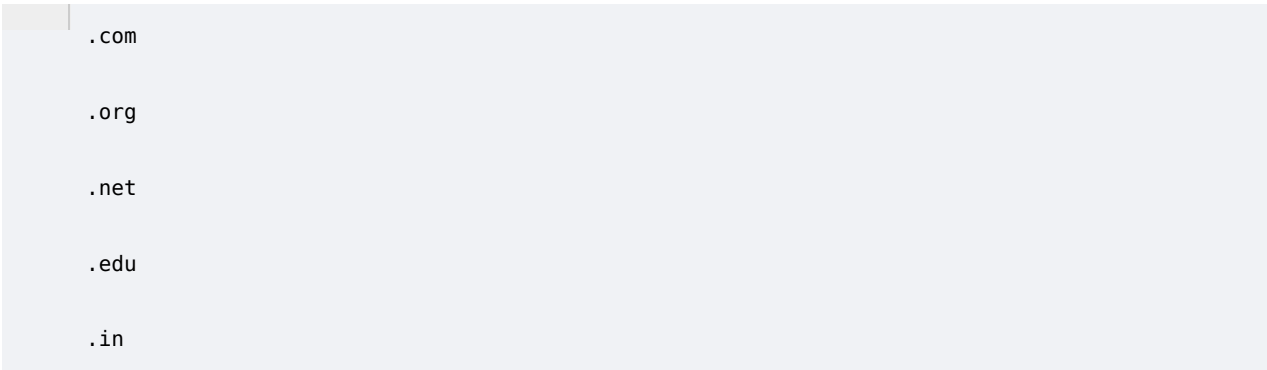


.

(Dot)

2. Top Level Domain (TLD)

Examples:



.com

.org

.net

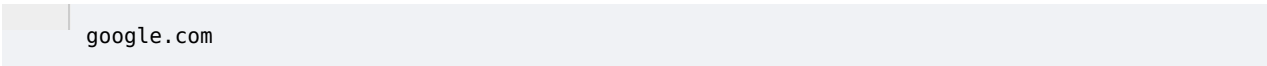
.edu

.in

3. Authoritative DNS Server

Actual domain ki information store karta hai.

Example

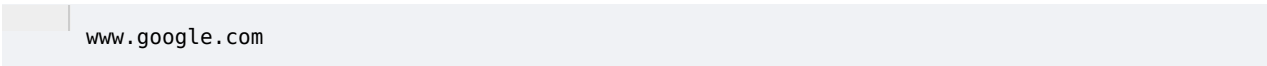


google.com

DNS Working

★★★★★ Direct Exam Question

Suppose user enters:



www.google.com

Step 1

Browser DNS Query generate karta hai.

Step 2

Query Local DNS Resolver ko bheji jati hai.

Step 3

Resolver Root DNS Server se poochta hai.

Step 4

Root Server TLD Server ka address deta hai.

Step 5

TLD Server Authoritative Server ka address deta hai.

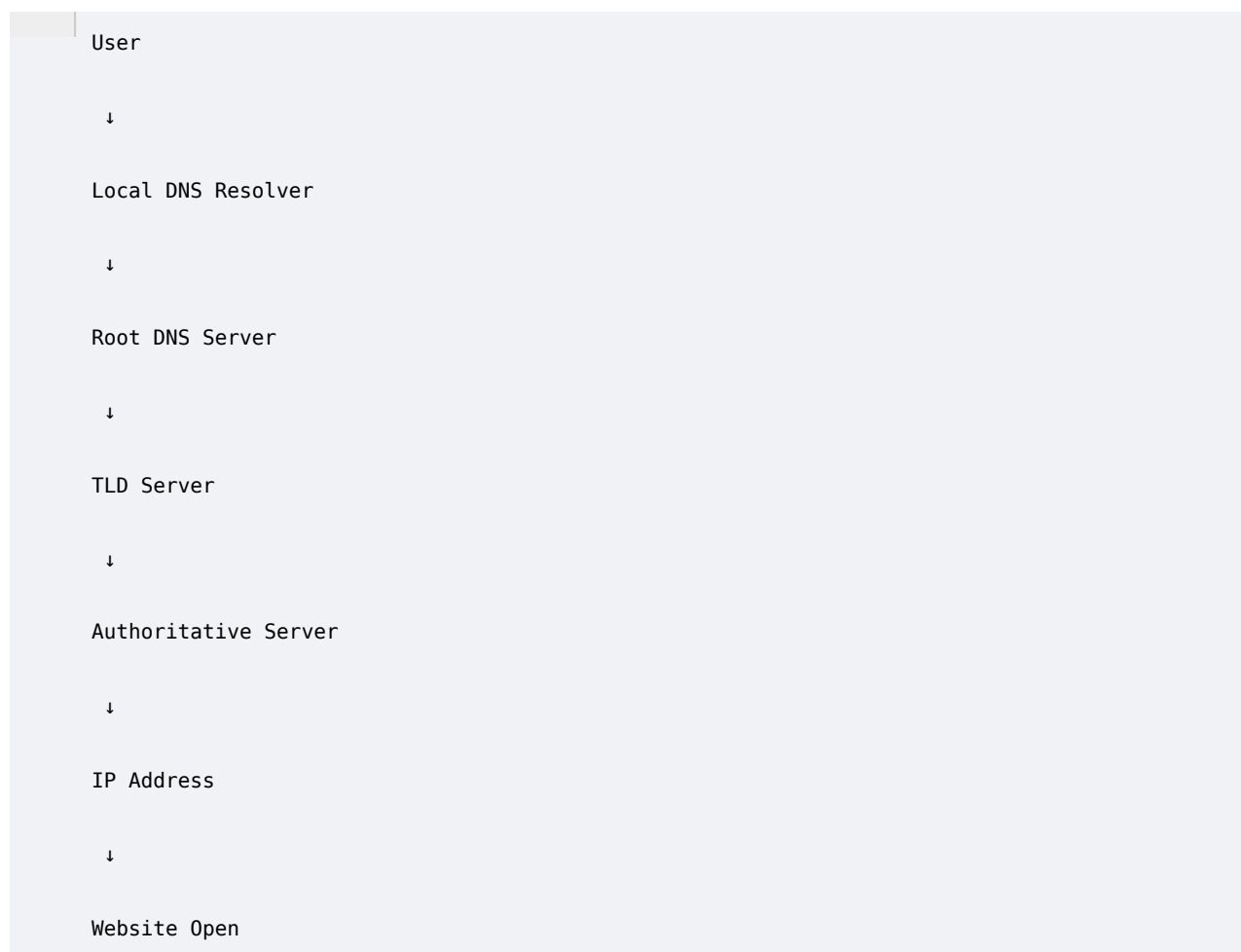
Step 6

Authoritative Server IP Address return karta hai.

Step 7

Browser website open karta hai.

DNS Resolution Diagram



DNS Name Resolution

DEFINITION

The process of converting a domain name into an IP address is called Name Resolution.

Example

www.youtube.com

↓

DNS Query

↓

IP Address

↓

Website Access

Types of DNS Queries

★★★★★ Important

1. Recursive Query

DNS server complete answer provide karta hai.

Diagram

Client

↓

DNS

↓

Final IP

2. Iterative Query

DNS server next server ka address provide karta hai.

Diagram

Client

↓

Root

↓

TLD

↓

Authoritative

↓

IP

DNS Records

★★★★★ Most Important

DNS database me records store hote hain.

1. A Record

Domain → IPv4 Address

EXAMPLE

google.com

↓

142.250.195.14

2. AAAA Record

Domain → IPv6 Address

EXAMPLE

google.com

↓

IPv6 Address

3. CNAME Record

Alias Name create karta hai.

EXAMPLE

www.example.com

↓

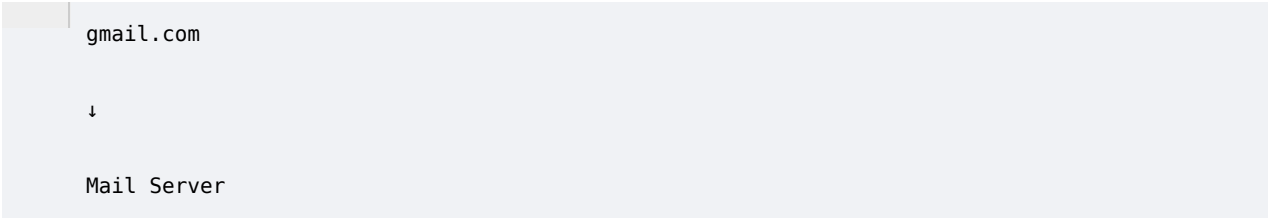
example.com

4. MX Record

★★★★★ Important

Mail Server information.

EXAMPLE



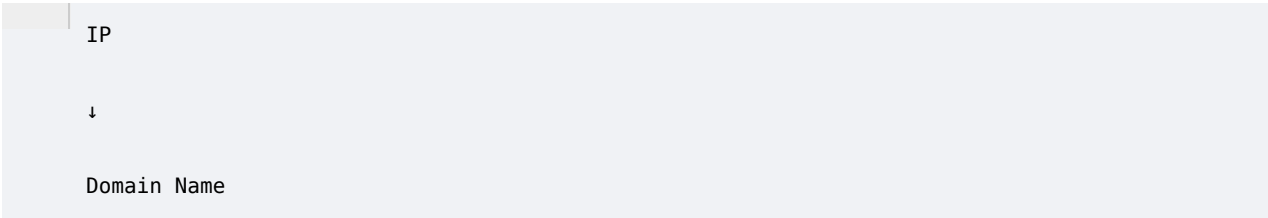
5. NS Record

Name Server information.

6. PTR Record

Reverse Lookup.

EXAMPLE



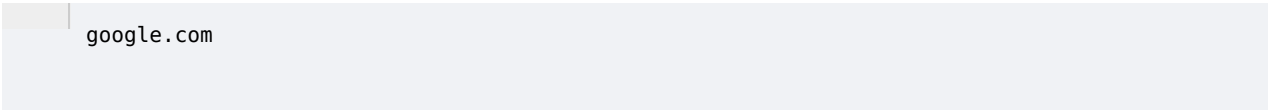
DNS Record Summary

Record	Purpose
A	IPv4 Address
AAAA	IPv6 Address
MX	Mail Server
CNAME	Alias Name
NS	Name Server
PTR	Reverse Lookup

Forward Lookup

Domain Name → IP Address

EXAMPLE



↓

142.250.195.14

Reverse Lookup

IP Address → Domain Name

EXAMPLE

142.250.195.14

↓

google.com

Advantages of DNS

- ✓ Easy Website Access
- ✓ Human Friendly
- ✓ Scalable
- ✓ Distributed System
- ✓ Faster Browsing

Disadvantages

- ✗ DNS Attacks Possible
- ✗ Cache Poisoning
- ✗ Dependency on DNS Servers

DNS Cache

★★★★★ Important

Frequently used DNS entries temporarily store ki jati hain.

Example

Pehli baar:

google.com

↓

DNS Lookup

Dusri baar:

Cache

↓

Faster Access

Real-Life Example

Suppose tumhare phone me contacts save hain.

Instead of remembering:

9876543210

Tum simply:

Rahul

search karte ho.

Exactly DNS:

google.com

↓

IP Address

convert karta hai.

DNS Flowchart

User Types URL

↓

DNS Query

↓

Root Server

↓

TLD Server

↓

Authoritative Server

↓

IP Address

↓

Website Open

Memory Trick

DNS RECORDS

A

AAAA

CNAME

MX

NS

PTR

Remember:

A A C M N P

MX

M

↓

Mail

CNAME

C

↓

Copy Name

(Alias)

One Minute Revision

DNS

↓

Domain Name System

Purpose

↓

Name → IP

Hierarchy

↓

Root

TLD

Authoritative

Records

↓

A

AAAA

MX

CNAME

NS

PTR

Most Important

↓

DNS Working

MX Record

A Record

Name Resolution

DNS
Domain Name System
Name Resolution
DNS Query
Root Server
TLD Server
Authoritative Server
A Record
MX Record
CNAME
DNS Cache
Recursive Query
Iterative Query

Most Expected Questions

7 MARKS

1. Define DNS.
2. Explain DNS Architecture.
3. Explain DNS Records.
4. Explain Name Resolution.

14 MARKS

1. Explain DNS with neat diagram.
2. Explain DNS Architecture and Working.
3. Explain DNS Records in detail.
4. Explain Name Resolution Process.

PYQ PROBABILITY: ★★★★★

🔥 DNS Architecture, DNS Working, DNS Records, and Name Resolution Process are among the most repeated 14-mark questions in RGPV Computer Networks.

TOPIC 10:- SNMP (Simple Network Management Protocol)

NETWORK MANAGEMENT, SNMP ARCHITECTURE, COMPONENTS, WORKING AND MIB
COMPLETE 14-MARK RGPV ANSWER (4-5 PAGES)

Introduction

Aaj ke modern networks me hundreds ya thousands of devices connected hote hain.

Example:

Routers

Switches

Servers

Computers

Printers

Network Administrator ko continuously monitor karna padta hai:

- ✓ Device Status
- ✓ Traffic Load
- ✓ Errors
- ✓ Performance

Is purpose ke liye **SNMP** use kiya jata hai.

What is SNMP?

DEFINITION

SNMP (Simple Network Management Protocol) is an application layer protocol used to monitor and manage network devices.

SIMPLE DEFINITION

SNMP ek protocol hai jo network devices ki monitoring aur management ke liye use hota hai.

Full Form

SNMP

↓

Simple Network Management Protocol

Why SNMP Needed?

Suppose company network me:

100 Routers

50 Switches

20 Servers

Agar koi device fail ho jaye to manually check karna difficult hoga.

SOLUTION

SNMP

Monitor

Manage
Control

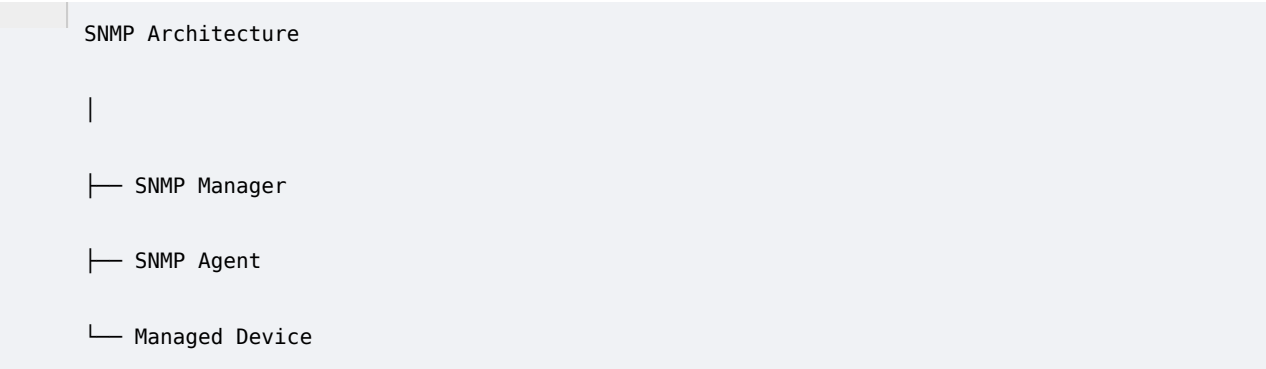
Functions of SNMP

1. NETWORK MONITORING
2. PERFORMANCE ANALYSIS
3. FAULT DETECTION
4. DEVICE CONFIGURATION
5. NETWORK MANAGEMENT

SNMP Architecture

★★★★★ Most Important

SNMP Architecture me mainly 3 components hote hain.



Diagram



Components of SNMP

1. SNMP Manager

★★★★★ Important

Definition

Manager monitoring software hota hai jo network devices ko control karta hai.

Functions

- ✓ Collect Information
 - ✓ Monitor Devices
 - ✓ Generate Reports
 - ✓ Manage Network
-

EXAMPLE

Network Management Station (NMS)

2. SNMP Agent

★★★★★ Important

Definition

Agent software hota hai jo managed device par run karta hai.

Functions

- ✓ Collect Device Information
 - ✓ Send Information to Manager
 - ✓ Receive Commands
-

EXAMPLE

Router me installed SNMP Agent

3. Managed Device

Definition

Network devices jo monitor kiye jate hain.

EXAMPLES

Router

Switch

Server

Printer

Working of SNMP

★★★★★ Direct Exam Question

Step 1

Manager information request karta hai.

Step 2

Agent request receive karta hai.

Step 3

Agent device information collect karta hai.

Step 4

Agent response bhejta hai.

Step 5

Manager network status display karta hai.

Flowchart

SNMP Manager



Request



SNMP Agent



Collect Data



Response



Manager Display

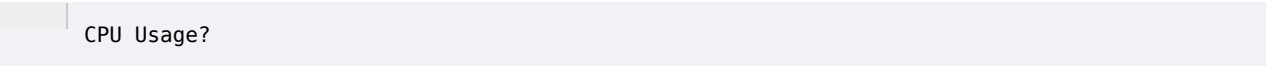
SNMP Operations

★★★★★ Important

1. GET

Information retrieve karna.

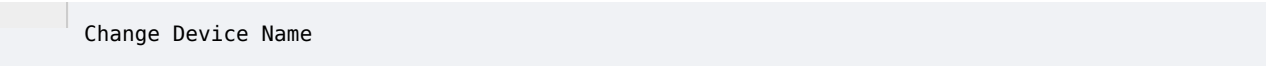
EXAMPLE



2. SET

Configuration change karna.

EXAMPLE



3. GET-NEXT

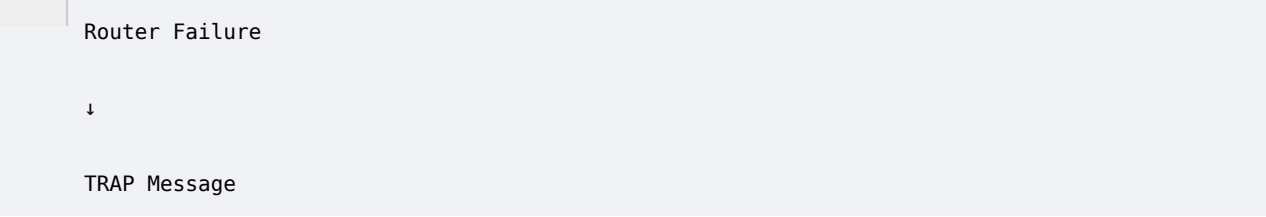
Next object information retrieve karna.

4. TRAP

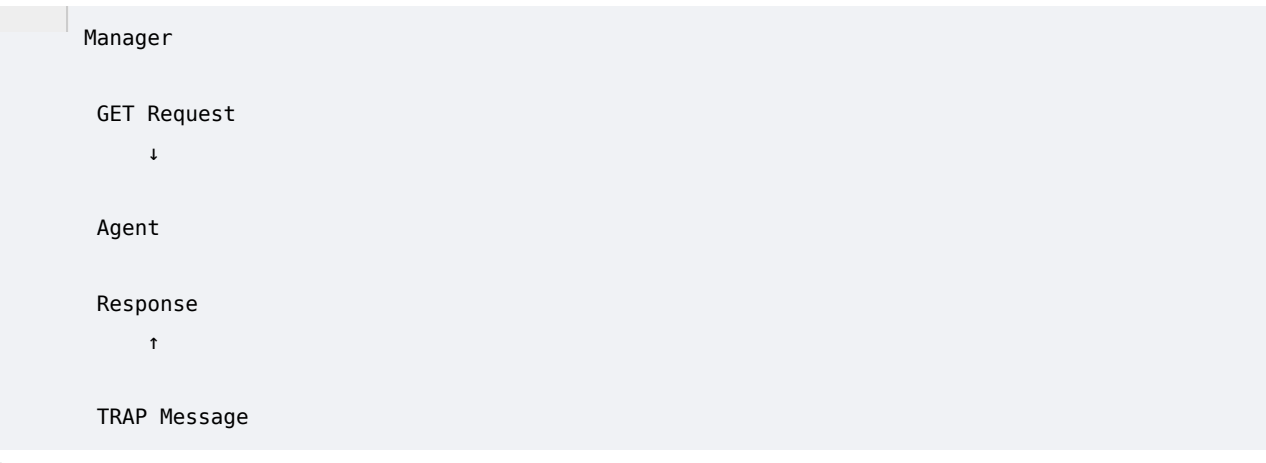
★★★★★ Most Important

Agent automatically alert bhejta hai.

EXAMPLE



SNMP Communication Diagram



MIB (Management Information Base)

★★★★★ Direct Question

Definition

MIB is a database that stores information about managed network devices.

SIMPLE DEFINITION

MIB network devices ki information store karne wali database hai.

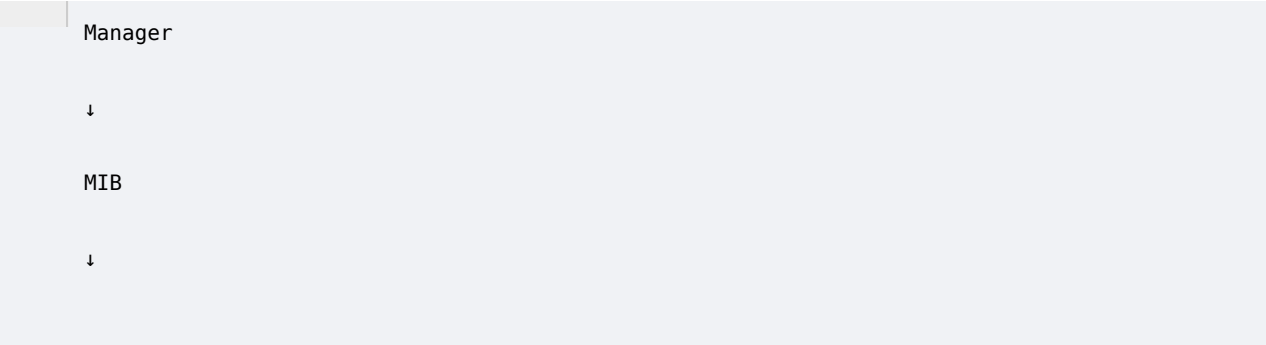
Information Stored in MIB

CPU Usage
Memory Usage
Bandwidth
Device Status
Errors

MIB Structure

MIB
├─ System
├─ Interface
├─ IP
├─ TCP
└─ UDP

Diagram



SNMP Versions

SNMPv1

First Version

SNMPv2

Improved Performance

SNMPv3

★★★★★ Important

Most Secure Version

FEATURES

- ✓ Authentication
- ✓ Encryption
- ✓ Security

Advantages of SNMP

- ✓ Easy Monitoring
- ✓ Centralized Management
- ✓ Fault Detection
- ✓ Performance Analysis
- ✓ Scalable

Disadvantages of SNMP

- ✗ Security Issues in Old Versions
- ✗ Configuration Complexity
- ✗ Additional Traffic

Applications of SNMP

NETWORK MONITORING

SERVER MANAGEMENT

DATA CENTER MONITORING

PERFORMANCE ANALYSIS

FAULT DETECTION

Real-Life Example

Suppose school me CCTV monitoring room hai.

CCTV CAMERAS

Managed Devices

CAMERA OPERATOR

SNMP Manager

CAMERA SOFTWARE

SNMP Agent

Operator sab cameras monitor kar sakta hai.
Exactly SNMP bhi network devices ko monitor karta hai.

SNMP vs DNS

Feature	SNMP	DNS
Purpose	Network Management	Name Resolution
Layer	Application	Application
Function	Monitoring	Domain → IP
Main Component	Manager & Agent	DNS Server

One Minute Revision

SNMP

↓

Simple Network Management Protocol

Purpose

↓

Monitor Network Devices

Components

↓

Manager

Agent

Managed Device

Operations

↓

GET

SET

GET-NEXT

TRAP

MIB

↓

Management Information Base

Stores Device Information

Most Important

↓

SNMP Architecture

TRAP

MIB

RGPV Examiner Keywords

SNMP

Simple Network Management Protocol

Network Management

SNMP Manager

SNMP Agent
Managed Device
GET
SET
TRAP
MIB
Monitoring
Fault Detection
SNMPv3

Most Expected Questions

7 MARKS

1. Define SNMP.
 2. Explain SNMP Architecture.
 3. What is MIB?
 4. Explain SNMP Operations.
-

14 MARKS

1. Explain SNMP with neat diagram.
 2. Explain SNMP Architecture and Working.
 3. Explain MIB and SNMP Operations.
 4. Explain Network Management using SNMP.
-

PYQ PROBABILITY: ★★★★★

 **SNMP Architecture, MIB, GET/SET/TRAP Operations, and SNMP Manager vs Agent** are the most important exam questions.