Connection and Connection-less Oriented Services

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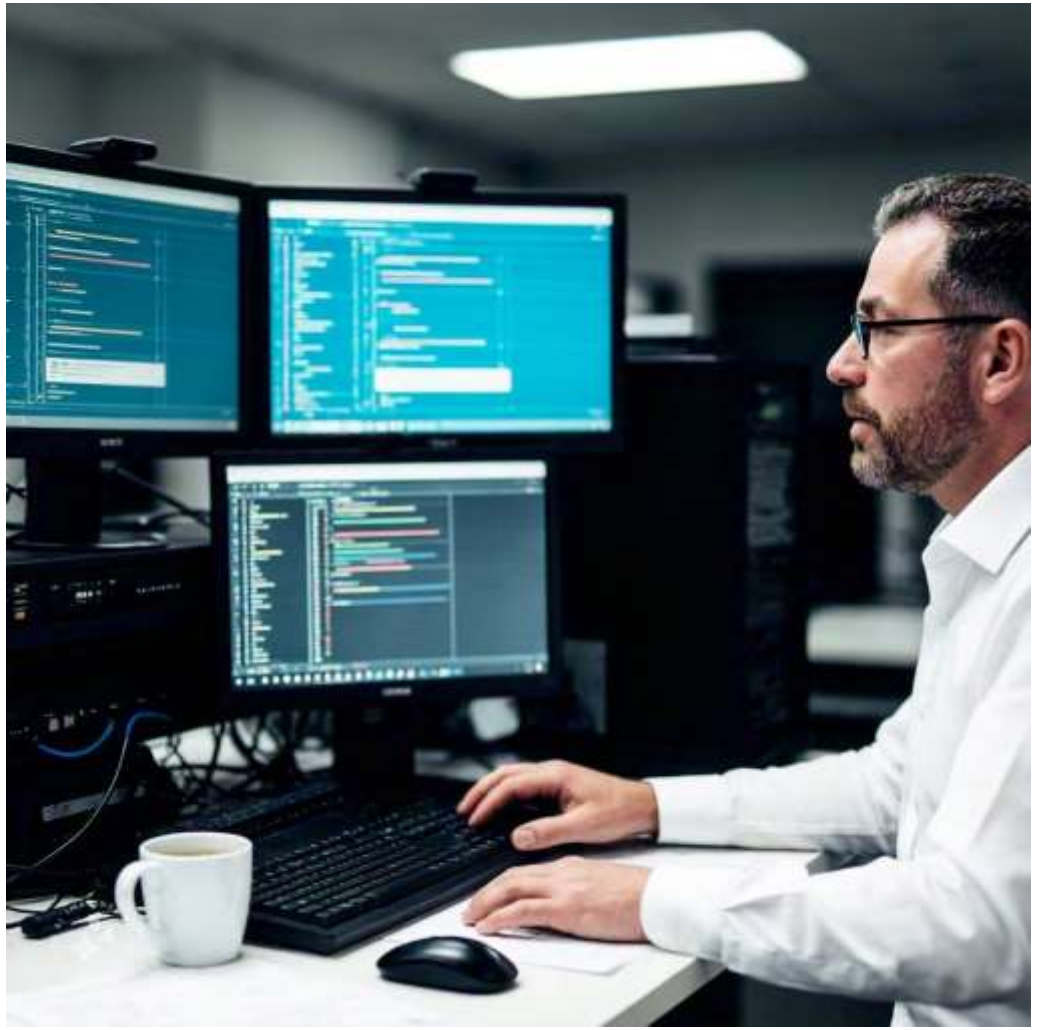
What is Connection-Oriented Service?

Definition: A communication method that establishes a session before data exchange, ensuring data integrity and order.

Characteristics:

- **Setup Required**: A connection is initiated, monitored, and closed.
- **Reliability:** Each packet is checked for successful delivery.
- **Ordered Delivery**: Packets arrive in sequence, providing a smooth data flow.

Example Protocol: TCP (Transmission Control Protocol) used in web browsing, email, and file transfers where reliability is critical



How Connection-Oriented Service Works

Three Phases:

- **Setup phase:** Handshake sequence ensures a stable link (e.g., TCP 3-way handshake involving SYN, SYN-ACK, and ACK packets)
- **Transfer phase**: Data is transmitted in sequence, with error-checking mechanisms for reliability.
- **Teardown phase:** The connection is closed after data exchange, freeing up network resources.

Advantages and Disadvantages Of Connection-Oriented Service

Advantages:

- **Reliability**: Ensures data is correctly transmitted and acknowledged.
- **Data Integrity:** Error-checking prevents corruption or data loss.
- **Consistency**: Data arrives in the correct order.

Disadvantages:

>Overhead: Connection setup and management consume resources.

> Speed: Connection setup can cause slight delays, unsuitable for low-latency needs.

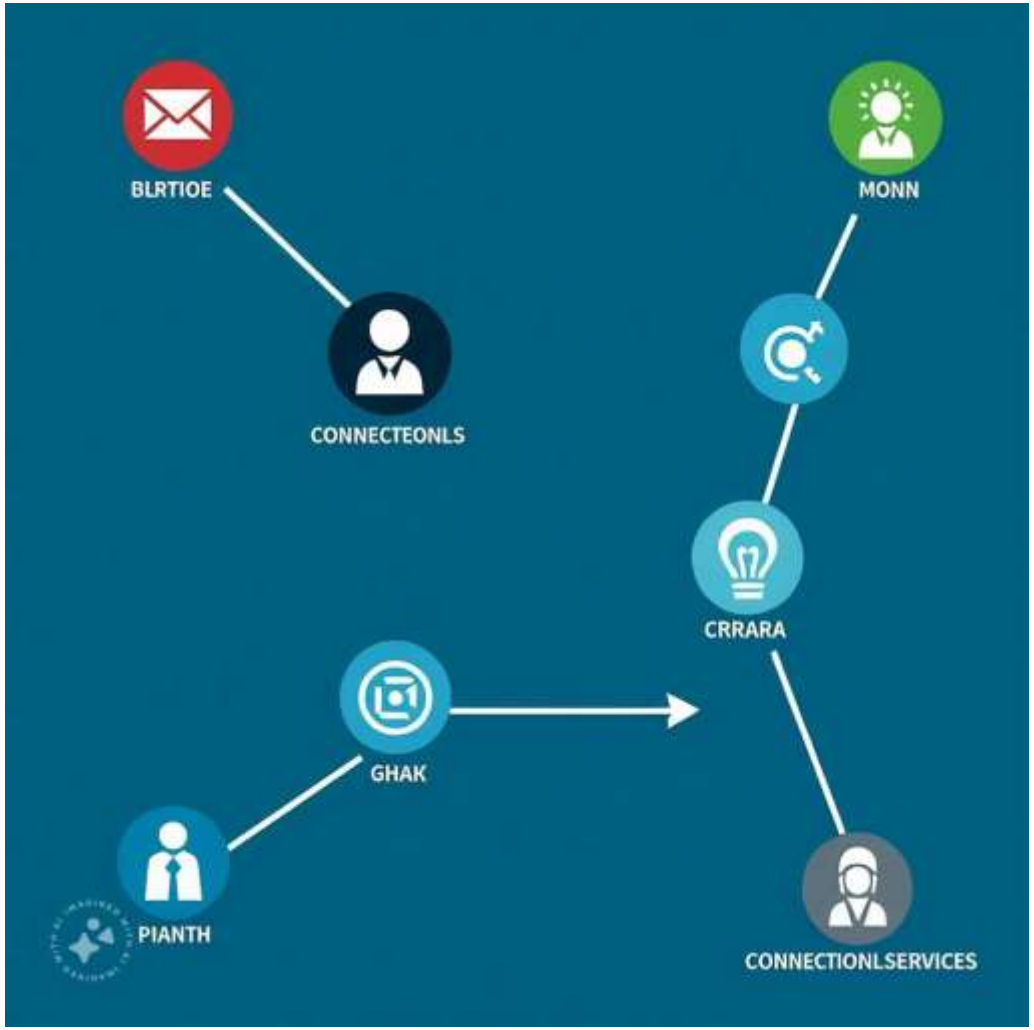
What is Connectionless Service?

Definition: A method where data is sent without prior connection, treating each packet independently.

Characteristics:

- **No Setup or Termination:** Faster, with lower resource requirements.
- **Independent Packets:** Each packet can take different routes.
- **Unreliable Delivery:** No guarantees for delivery or order.

Example Protocol: UDP (User Datagram Protocol), commonly used in real-time applications like video calls and online gaming where speed is prioritized.



Advantages and Disadvantages of Connectionless Oriented Service

Advantages:

- **Efficiency**: No setup phase; data is sent immediately, reducing delay.
- **Low Overhead**: Fewer resources are needed compared to connection-oriented services.

Disadvantages:

- **Lack of Reliability**: Packets may get lost or arrive out of order.
- **No Error Checking**: Data integrity is not guaranteed, making it less suitable for applications requiring accuracy.

Comparison: Connection-oriented vs. Connectionless-Oriented

Connection-Oriented

- High reliability, ensures delivery.
- Needs session setup
- Maintains packet ordering
- Example :TCP

Connection-less Oriented

- Low reliability, guarantees delivery.
- No need of setup, direct sending.
- Packets are independent
- Example : UDP

Modern Technologies Based on Connection-Oriented Services

- **TCP/IP Stack:**

  Integral for reliable communication on the internet; handles data correction and ordering.

- **VoIP (Voice over IP):**

  Voice packets sent over internet; relies on TCP for consistent quality in settings that require high reliability.

- **Streaming Services:**

  Uses TCP to ensure quality in scenarios where users value reliability over low latency (e.g., Netflix, YouTube).

Modern Technologies Based on Connectionless Services

- **IoT (Internet of Things):**

  IoT devices often use UDP for fast communication due to minimal setup and overhead, particularly in sensors that require real-time responses.

- **DNS (Domain Name System):**

  Quick lookup of IP addresses uses UDP, as reliability can be managed by retrying requests.

- **Real-Time Gaming**:

  UDP is favored for multiplayer gaming to reduce latency, allowing rapid transmission with lower delay.

Emerging Technologies Utilizing Hybrid Approaches

QUIC Protocol:

- Developed by Google to improve web performance.
- Combines TCP reliability with UDP's low-latency features, providing faster data exchange while ensuring security and order.

5G Networks:

- Uses both connection-oriented and connectionless services to prioritize speed and reliability as needed.
- Optimizes network resources for diverse applications like streaming, IoT, and mobile internet.

HTTP/3:

- Built on QUIC to provide faster, more secure internet connections by utilizing UDP with reliability features.

QUIC PROTCOL

5G NETWORKS

HTTP/3

Future of Connection-Oriented and Connectionless Services

- **AI and Machine Learning Integration**:

  AI and ML optimize protocol selection based on data needs, predicting whether connection-oriented or connectionless protocols are more efficient.

- **Adaptive Protocols:**

  Future networks may use intelligent routing systems that can dynamically switch between TCP and UDP, depending on data traffic and network conditions.

- **Edge Computing:**

  Pushes data processing closer to the data source; UDP is frequently used for quicker, real-time data transmission in distributed networks, enhancing IoT and mobile applications.

SUMMARY

- **Connection-Oriented Service**: Reliable, ordered, but resource-intensive.
- **Connectionless Service**: Fast, minimal overhead, but no guarantee of reliability.
- Technologies use each type based on their requirements for speed, reliability, and efficiency.

QUIZ TIME

SCAN THE QR CODE TO JOIN THE QUIZ

RULES

- The winner will picked on the basis of correct answer and timing.
- Total of 10 questions, 1 point for each question.
- Winner will get goodie from our side.
- There will only be 1 winner.

QUESTIONS

1. What is the primary characteristic of connection-oriented services?
2. Which protocol is commonly used in connection-oriented services?
3. What is a significant disadvantage of connection-oriented services?
4. Which phase in a connection-oriented service involves a handshake sequence?
5. What distinguishes connectionless services from connection-oriented ones?

QUESTIONS

6. Which protocol is primarily used in connectionless services?
7. What is a common application of UDP?
8. What is the QUIC protocol known for?
9. Which emerging technology uses both connection-oriented and connectionless services?
10. What future development in networking integrates AI and ML?

RESULTS..!