SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
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DEPARTMENT OF ARTIFICIAL INTELIGENCE & MACHINE LEARNING

23AMT302- COMPUTER NETWORK AND SECURITY

UNIT 1 – Introduction and Application Layer

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The "Why" of Network Protocols

Standardised Rules

Protocols provide a common language. They ensure devices speak the same way.

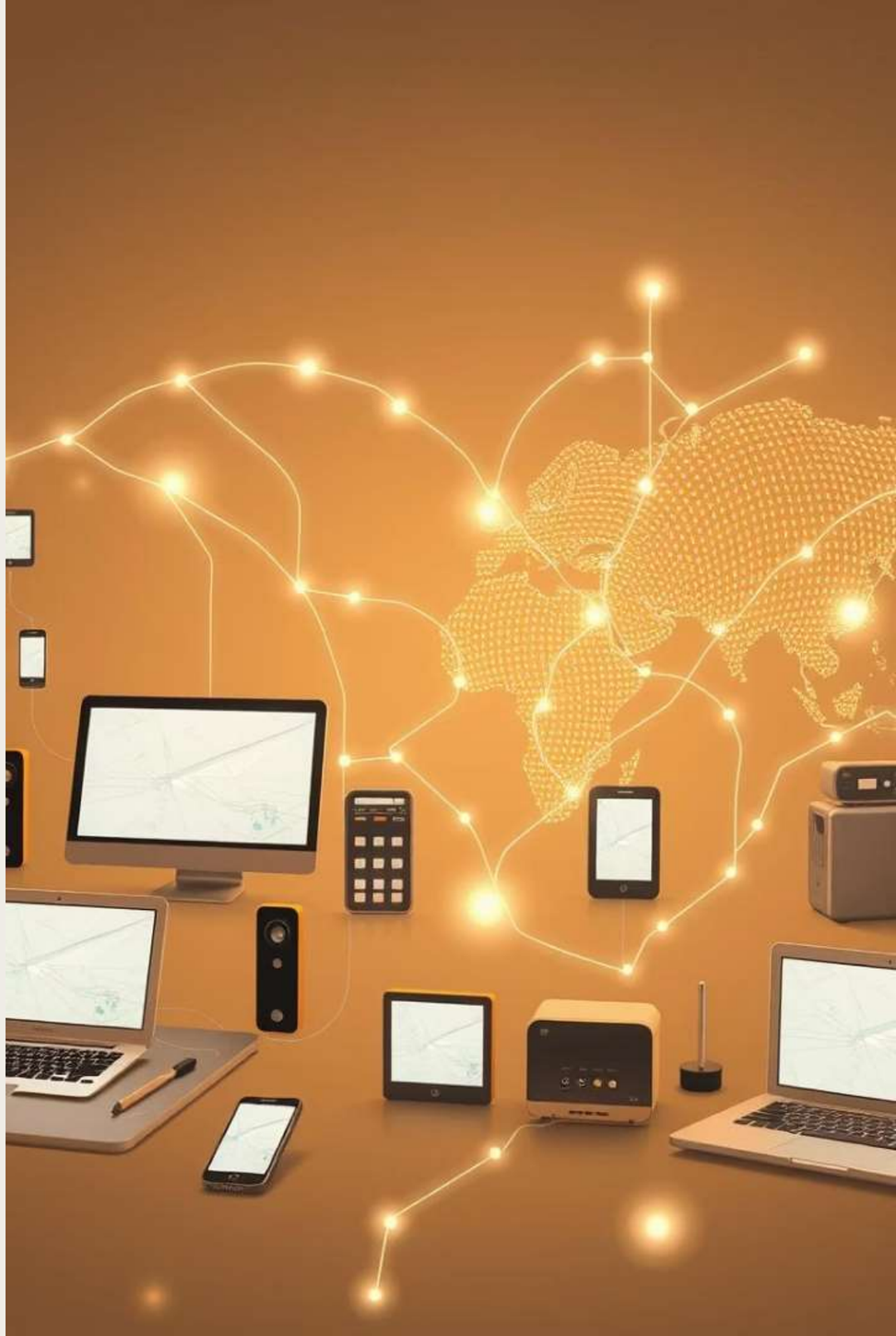
Ensures Compatibility

Diverse hardware and software connect seamlessly. This enables universal communication.

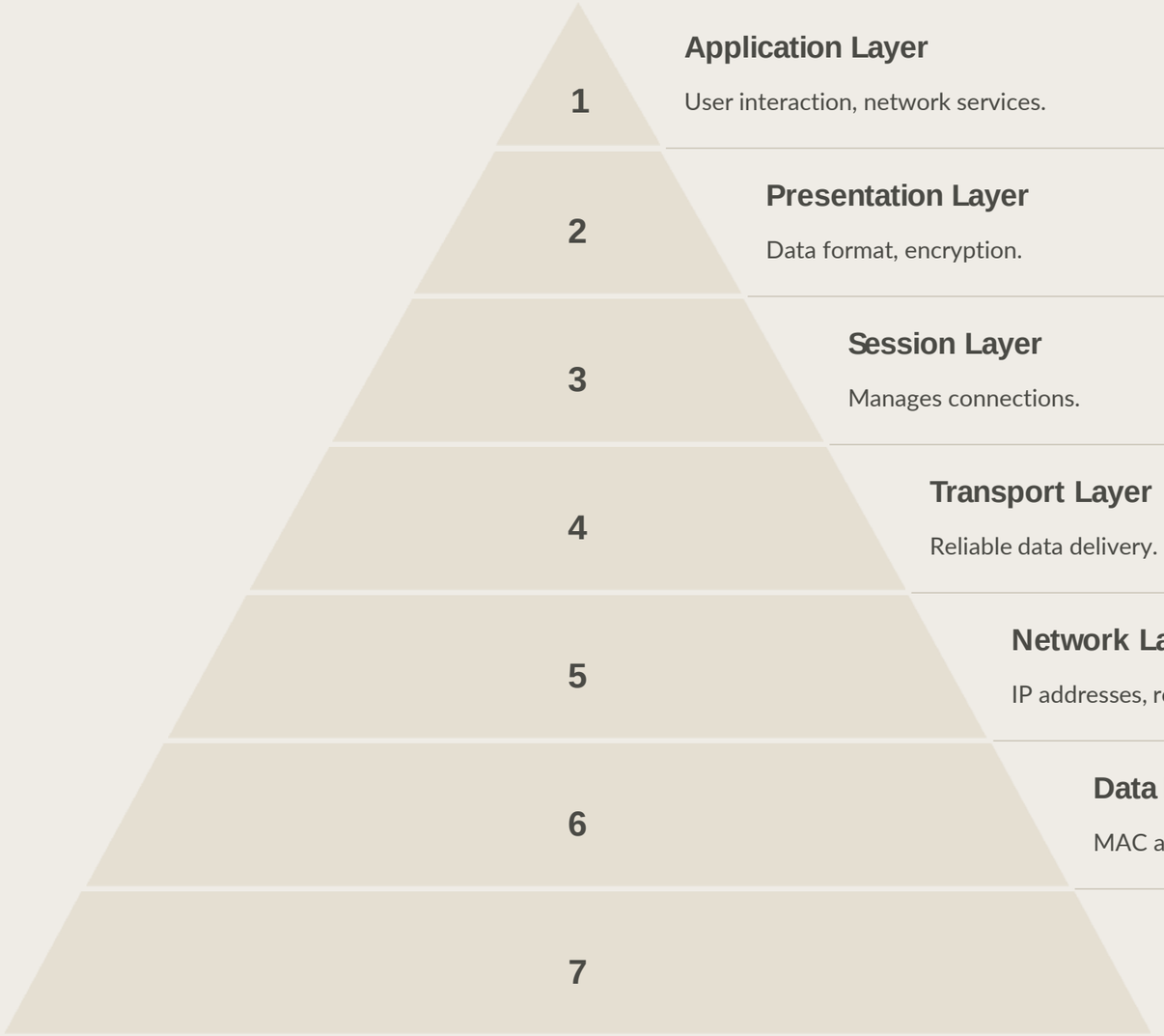
Efficient Data Transfer

Data moves reliably and quickly. This optimises network performance.

Network protocols are like a universal language. They allow all computers to understand each other.



The OSI Model: A Conceptual Framework



Application Layer

User interaction, network services.

Presentation Layer

Data format, encryption.

Session Layer

Manages connections.

Transport Layer

Reliable data delivery.

Network Layer

IP addresses, routing.

Data Link Layer

MAC addresses, frames.

Physical Layer

Cables, electrical signals.

The Open Systems Interconnection Model is an ISO standard. It defines seven distinct layers for network communication. This model provides a universal guide for protocol development, promoting interoperability.

OSI Layers 1-4: Data Transmission Foundations

Layer 1: Physical

Cables, electrical signals, bits. This includes Ethernet cables and Fibre Optic.

Layer 2: Data Link

MAC addresses, frames, error detection. Examples are Ethernet and Wi-Fi.

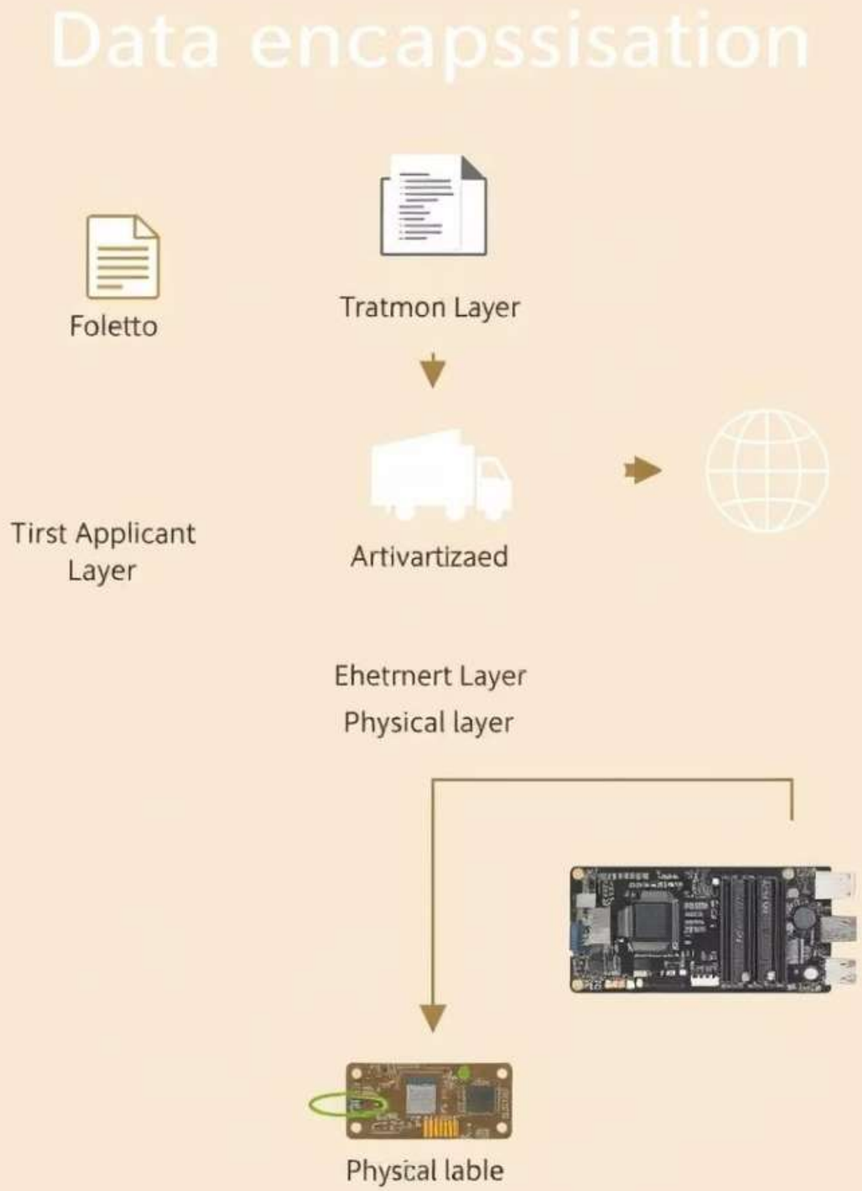
Layer 3: Network

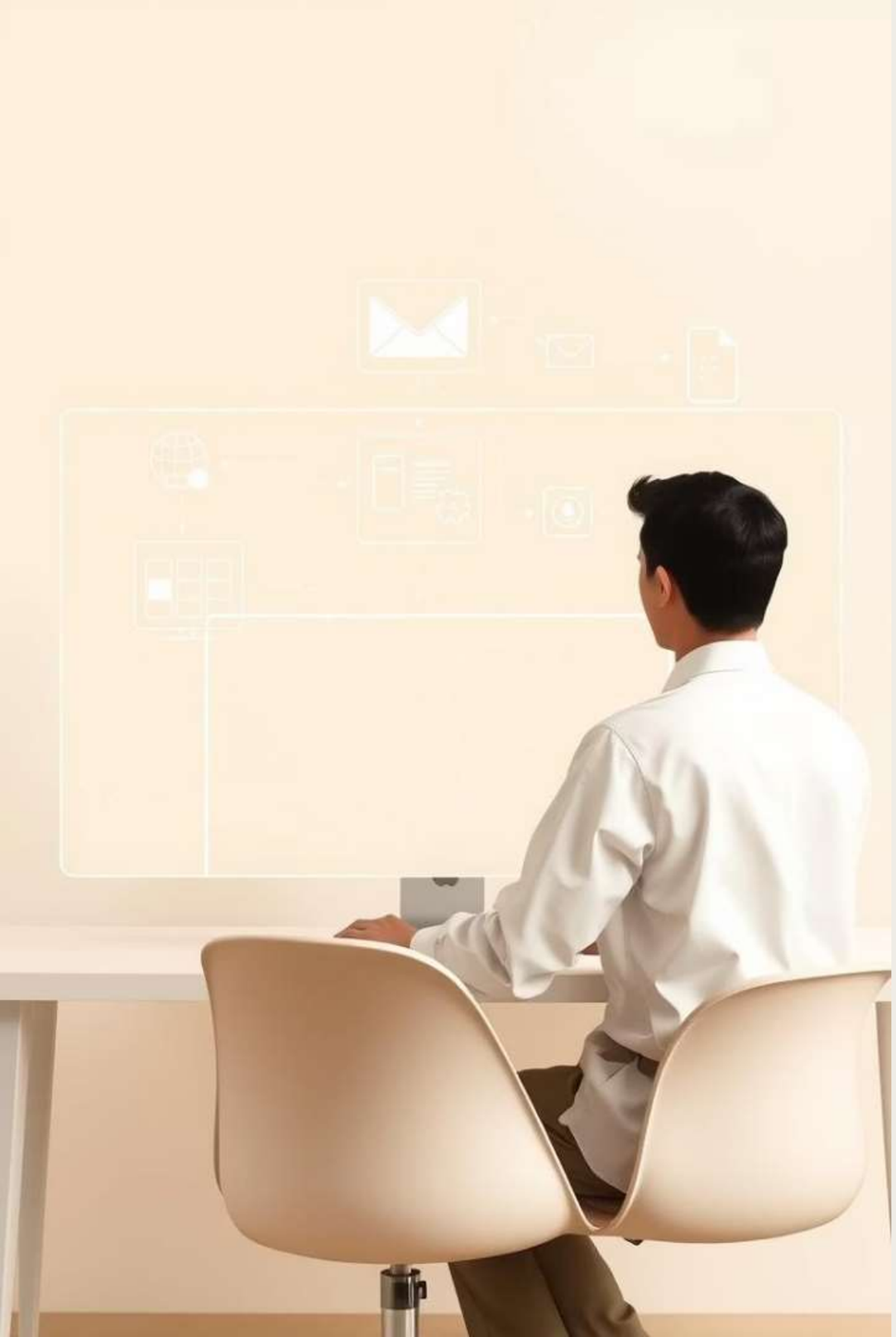
IP addresses, routing, packets. This includes IP and ICMP protocols.

Layer 4: Transport

Segments, TCP/UDP, reliable delivery. Examples are TCP, UDP, and port numbers.

These lower layers are crucial for the physical transmission and initial handling of data. They manage addressing, routing, and reliable delivery across the network.





OSI Layers 5-7: Application Support

Layer 5: Session

Manages connections and dialogue control. Examples include NetBIOS and Sockets.

Layer 6: Presentation

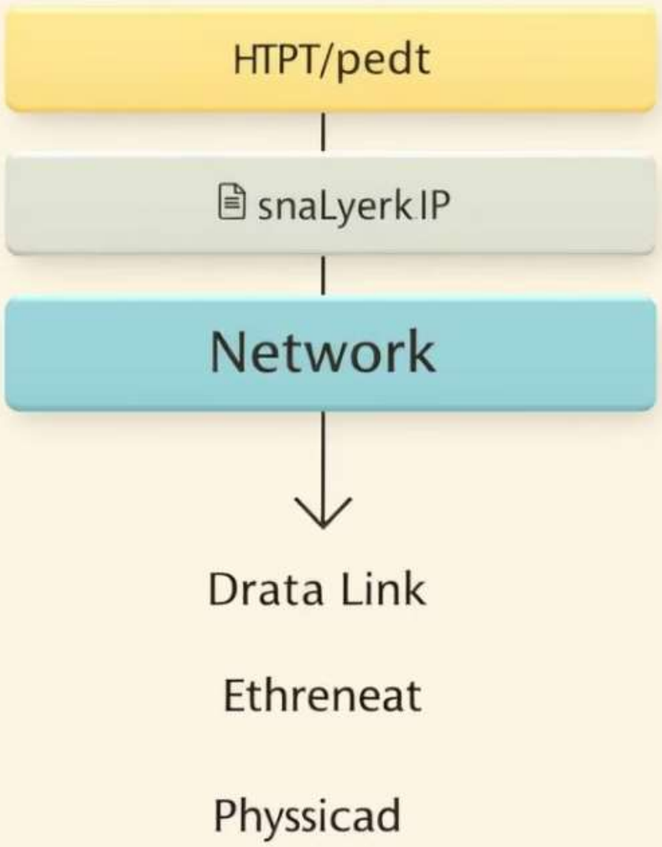
Handles data format, encryption, and compression. Examples are JPEG, ASCII, and SSL/TLS.

Layer 7: Application

Facilitates user interaction and network services. Examples include HTTP, FTP, DNS, and SMTP.

These top layers support direct interaction with applications. They ensure data is correctly formatted, presented, and managed for user services.

TCP/IP model



The TCP/IP Protocol Suite: Internet's Backbone

Application Layer

Combines OSI Session, Presentation, Application layers.

Transport Layer

Manages end-to-end communication.

Internet Layer

Handles logical addressing and routing.

Network Access Layer

Combines OSI Physical and Data Link layers.

The TCP/IP Protocol Suite was developed for ARPANET. It became the practical standard for the internet. It offers a more consolidated layering approach compared to the OSI Model.

TCP/IP Layers in Detail: Bottom Two

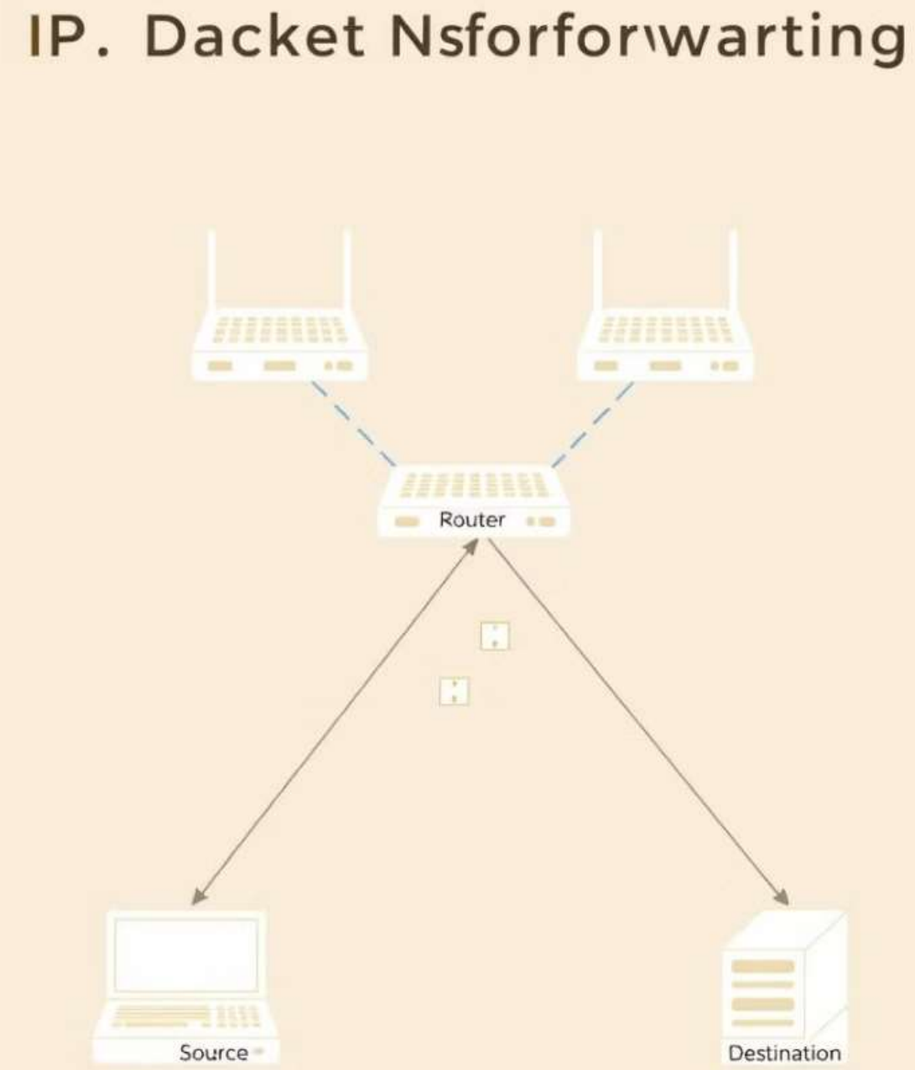
Network Access Layer

This layer combines OSI's Physical and Data Link functions. It handles physical addressing (MAC) and media access. Examples include Ethernet and Wi-Fi standards.

Internet Layer

Equivalent to the OSI Network Layer. It manages logical addressing (IP) and routing of packets across networks. Key protocols are IP, ICMP, and ARP.

These foundational layers enable devices to physically connect and send data. They ensure packets are correctly addressed and routed to their destinations.



TCP/IP Layers in Detail: Top Two

Transport Layer

This layer is the equivalent of the OSI Transport Layer. TCP provides reliable, ordered data streams for applications like HTTP. UDP offers fast, connectionless delivery for services like DNS and VoIP.

Application Layer

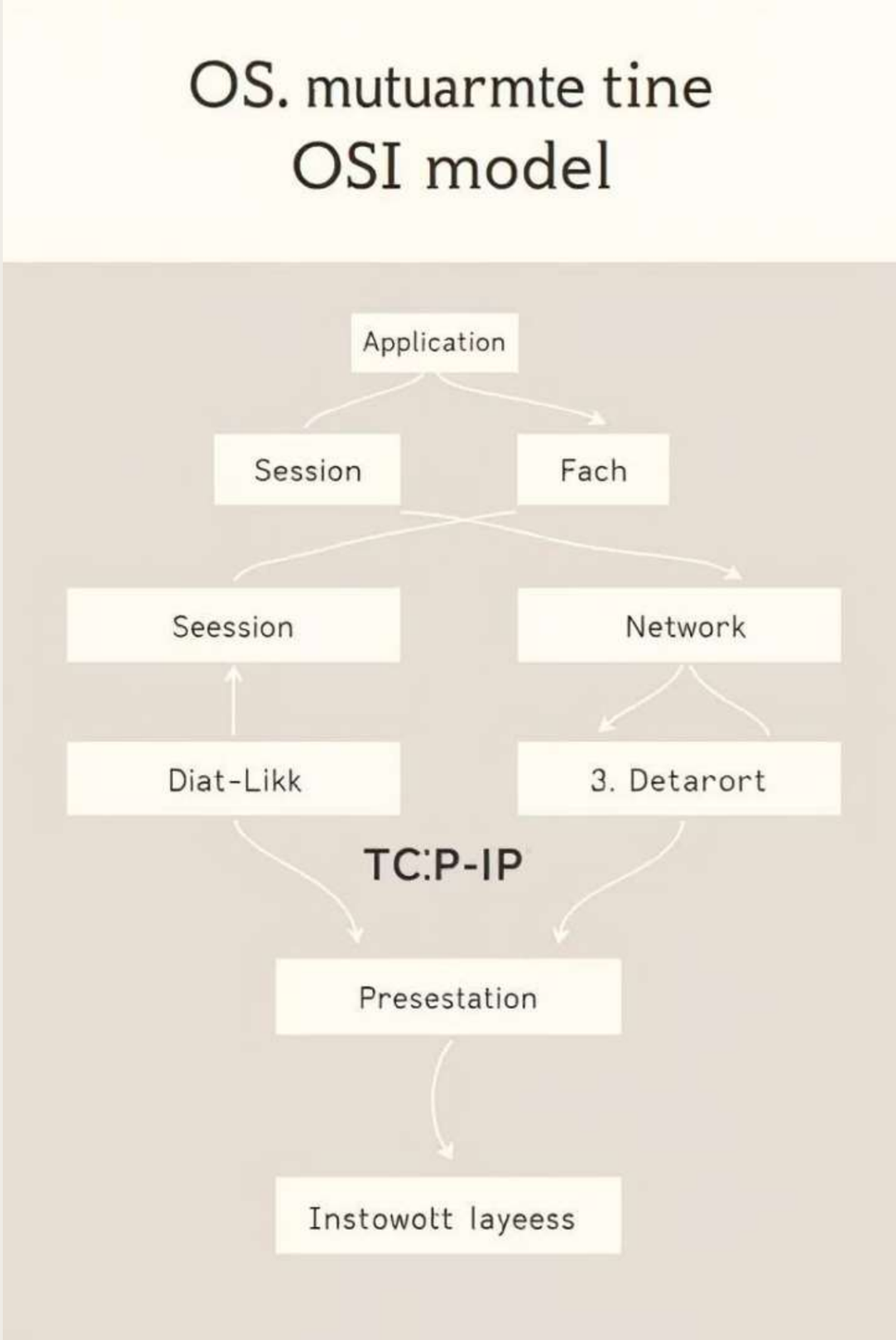
This consolidated layer combines OSI's Session, Presentation, and Application layers. It directly supports user applications and high-level protocols. Examples include HTTP (port 80/443), FTP (port 20/21), SMTP (port 25), and DNS (port 53).

These upper layers facilitate direct interaction with applications. They ensure data is correctly formatted, presented, and managed for user services.

TCP/IP vs. OSI Model: A Mapping

OSI Model (7 Layers)	TCP/IP Model (4 Layers)
7. Application	Application Layer
6. Presentation	
5. Session	
4. Transport	Transport Layer
3. Network	Internet Layer
2. Data Link	Network Access Layer
1. Physical	

The OSI model is a conceptual framework. TCP/IP is a practical implementation. TCP/IP integrates several OSI layers for real-world networking.



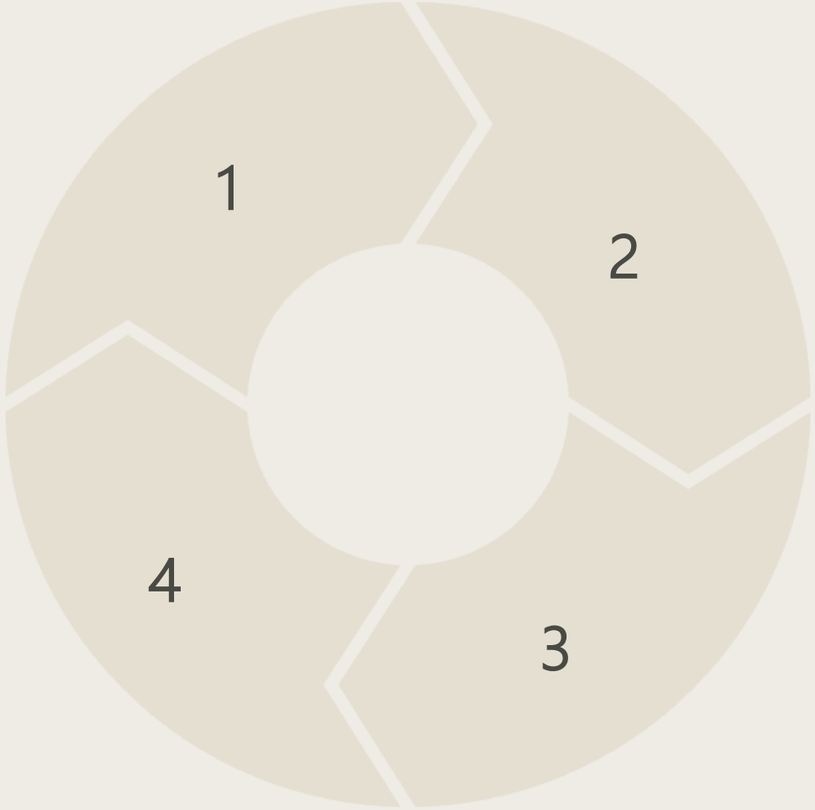
Conclusion: The Power of Layered Communication

Complementary Models

TCP/IP and OSI offer robust network understanding.

Aids Development

Layer knowledge helps troubleshoot and design systems.



Future Ready

Models evolve for new technologies like IoT and 5G.

Global Foundation

Ensures secure, efficient communication worldwide.

Understanding these models is vital for modern networking. They provide the framework for all digital communication. This layered approach ensures adaptability and reliability.