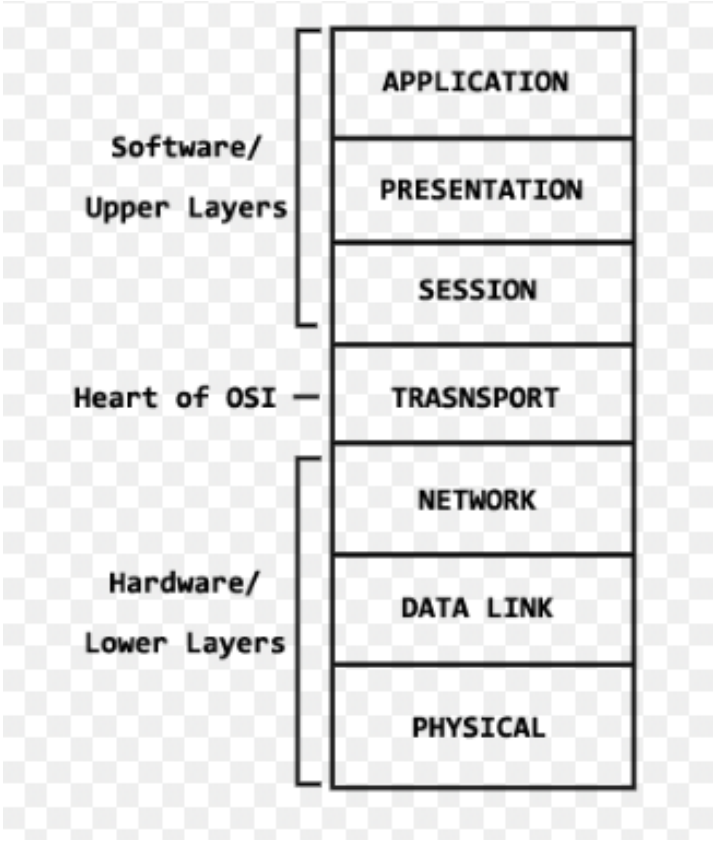
WHAT IS OSI MODEL

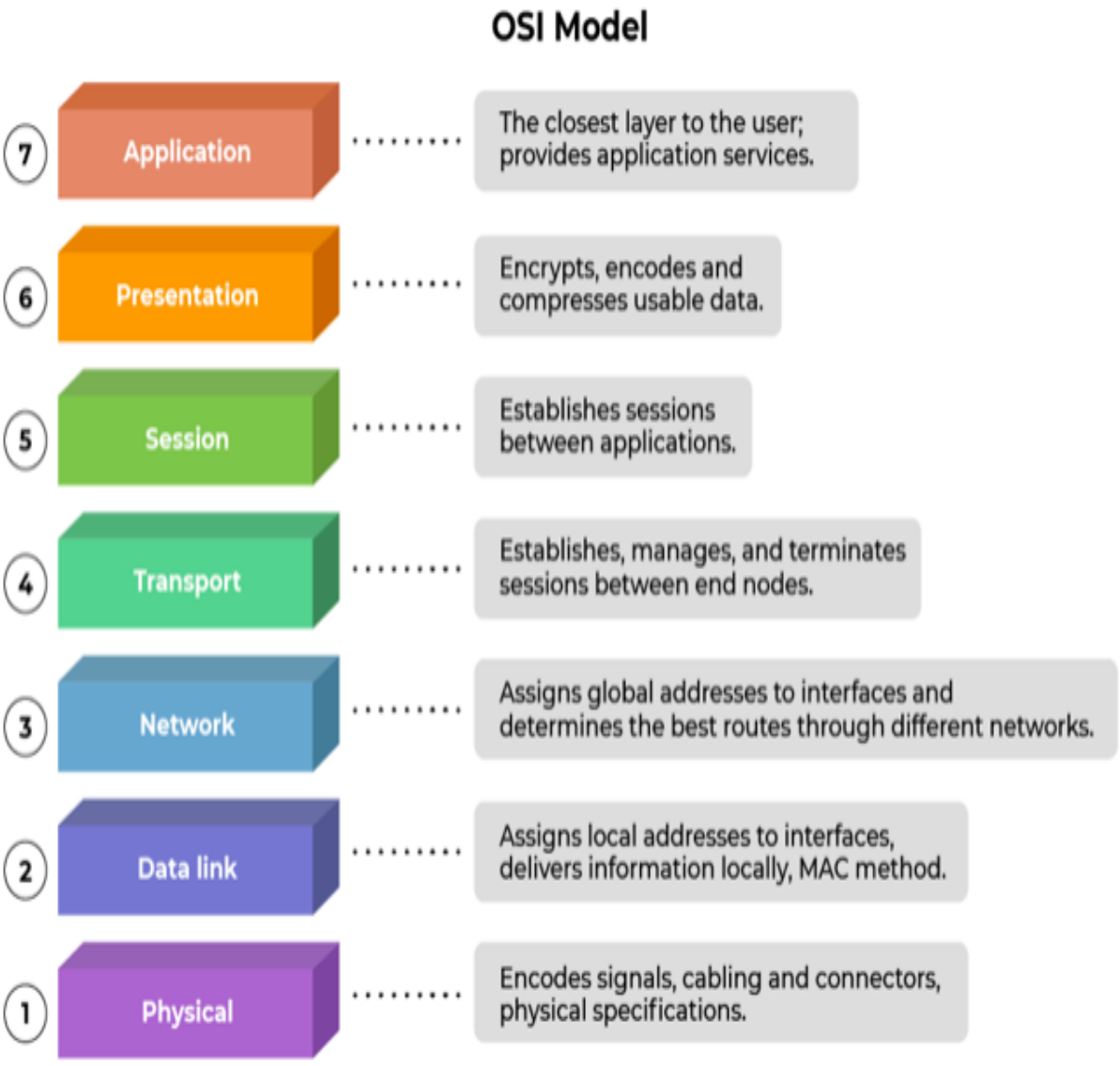
The OSI (**open systems interconnection**) model, created in 1984 by ISO(International Organization for Standardization), is a reference framework that explains the process of **transmitting data between computers**. It breaks the process into seven steps, making it easier to **manage and fix problems**. By setting common rules, it ensures that different devices and programs can work together smoothly, helping the internet and networks function better for everyone.



1. The upper layer of the OSI model mainly **deals with the application related issues,** and they are implemented only in the software. The application layer is closest to the **end user. Both the end user and the application layer interact with the software applications**. An upper layer refers to the layer just above another layer.

2. The lower layer of the OSI model deals with the **data transport issues.** The data link layer and the physical layer are implemented in hardware and software. The **physical layer is the lowest layer of the OSI model and is closest to the physical medium.** The physical layer is mainly responsible for placing the information on the **physical medium.**

FUNCTIONS OF OSI LAYERS

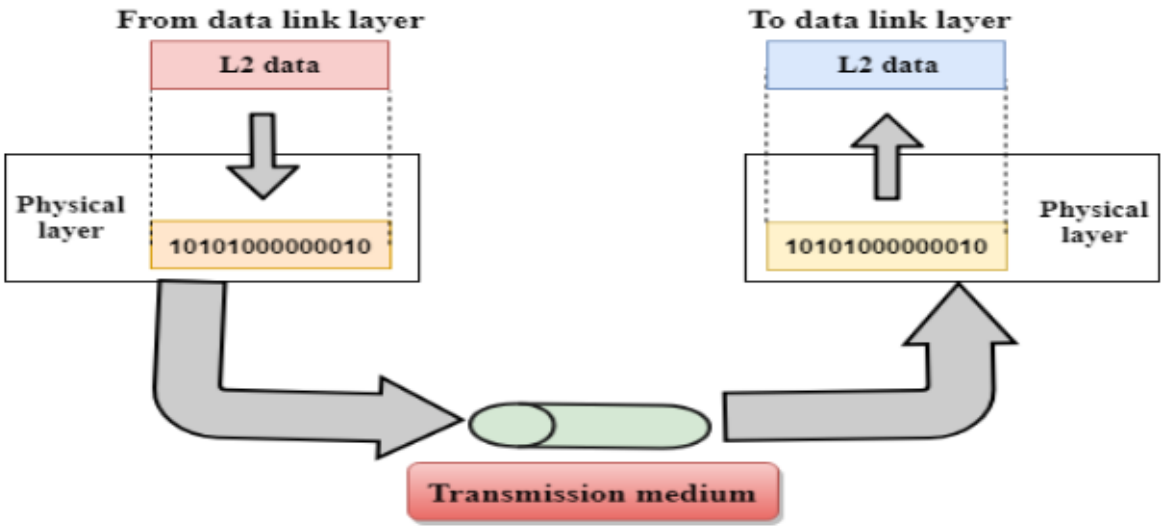


1. PHYSICAL LAYER (DATA FORMAT – IN BITS)

(DEVICE OR PROTOCOL: - HUB, REPEATER, MODEM, CABLES)

FUNCTIONS: -

1. Establish and deactivate the connection.
2. this layer will get the signal received and convert it into 0s and 1s and send them to the Data Link layer.
3. LINE CONFIGURATION: - It defines the way how two or more devices can be connected physically.
4. **Bit Rate Control:** The Physical layer also defines the transmission rate i.e. the number of bits sent per second.
5. **Transmission Mode:** Physical layer also defines how the data flows between the two connected devices. The various transmission modes possible are Simplex, half-duplex and full-duplex.

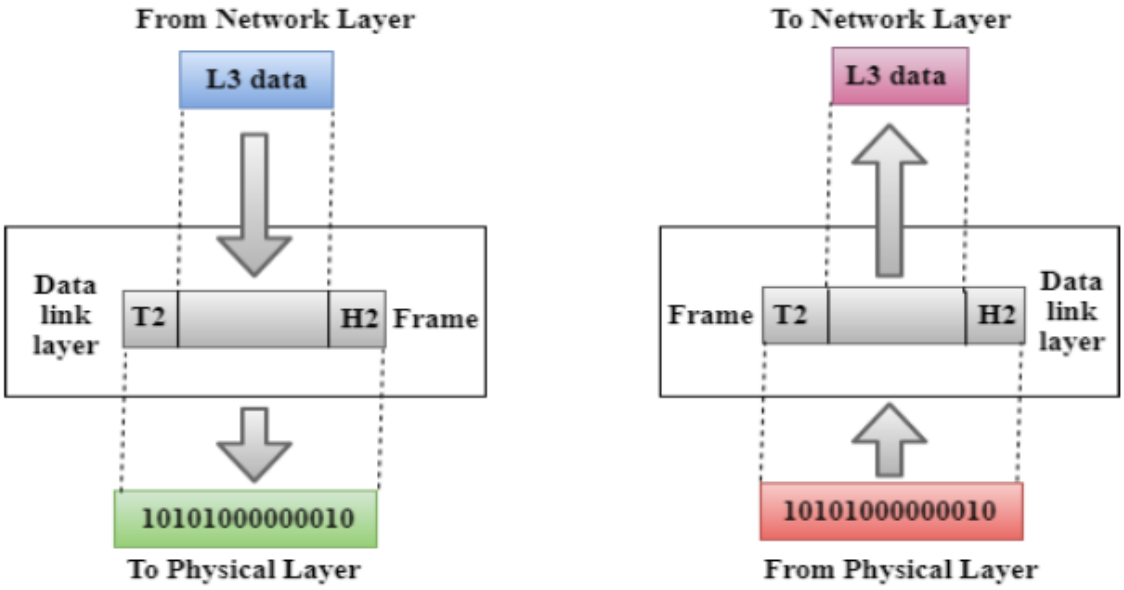


2. DATA LINK LAYER (DATA FORMAT – IN FRAMES)

(DEVICE OR PROTOCOL:- SWITCH, BRIDGE)

FUNCTIONS: -

1. **Frame Data**: Divides data into frames for easier handling and transmission.
2. **Physical Addressing:** After creating frames, the Data link layer adds physical addresses (**MAC addresses**) of the sender and/or receiver in the header of each frame.
3. **Error Detection and Correction**: Checks for errors in the data and corrects them if possible.
4. **Flow Control**: Manages the rate of data transmission to prevent network congestion.
5. **Data Sequencing**: Ensures that frames are delivered in the correct order.

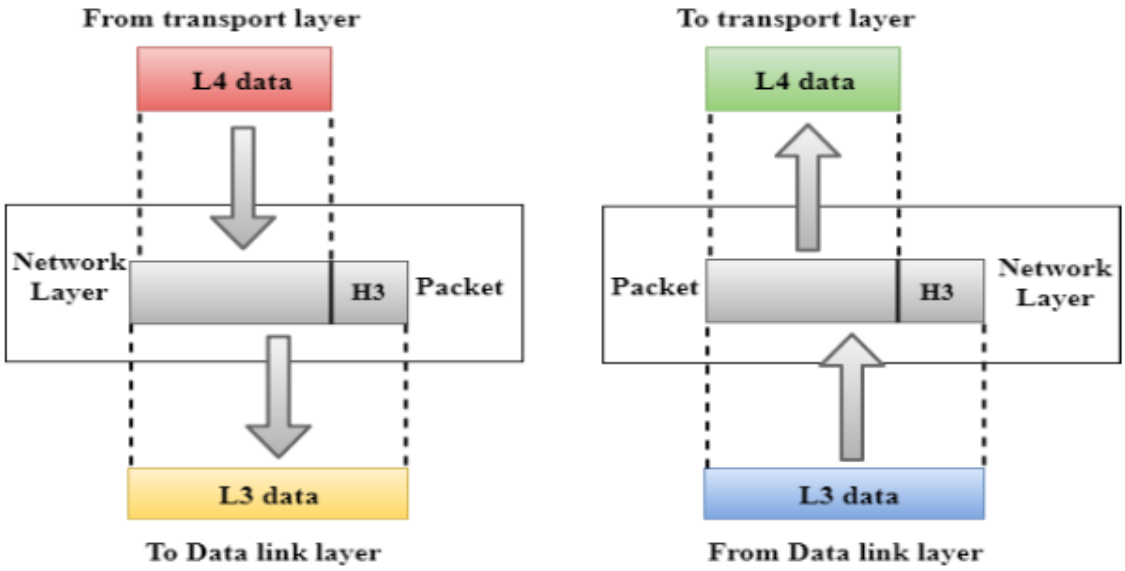


3. NETWORK LAYER (DATA FORMAT – IN PACKET)

(DEVICE OR PROTOCOL: - ROUTER)

FUNCTIONS: -

1. **Routing**: Determines the best path for data to travel across networks.
2. **Logical Addressing**: Uses IP addresses to identify devices on different networks.
3. **Packet Forwarding**: Moves data packets from one network to another.
4. **Network Communication**: Helps different networks talk to each other.
5. **Data Fragmentation**: Breaks big data into smaller pieces for easier travel.



4. TRANSPORT LAYER (DATA FORMAT – IN SEGMENTS)

(DEVICE OR PROTOCOL:- FIREWALL)

HEART OF OSI

FUNCTIONS: -

1. Segmentation:- Breaks down large chunks of data into smaller segments for easier transmission and reassembles them at the destination.

EG:- 1 DATA PACKET(15 MB) INTO 3 UNITS (5MB IN EACH UNIT)

2. This layer ensures that data has not duplication and sends complete data.

3. Flow control: The transport layer also responsible for flow control but it is performed end-to-end rather than across a single link.

4. **Error control:** The transport layer is also responsible for Error control. Error control is performed end-to-end rather than across the single link. The sender transport layer ensures that message reach at the destination without any error.

5. **Connection control:** Transport layer provides two services Connection-oriented service and connectionless service.

Connection-Oriented Service: It is a three-phase process that includes:

- Connection Establishment
- Data Transfer
- Termination/disconnection

In this type of transmission, the receiving device sends an **acknowledgment, back to the source after a packet or group of packets is received.** This type of transmission is reliable and secure.

Connectionless service: It is a one-phase process and includes Data Transfer. In this type of transmission, **the receiver does not acknowledge receipt of a packet.** This approach allows for much faster communication between devices. Connection-oriented service is more reliable than connectionless Service.

The two protocols used in this layer are:

Transmission Control Protocol

o It is a standard protocol that allows the systems to communicate over the internet.

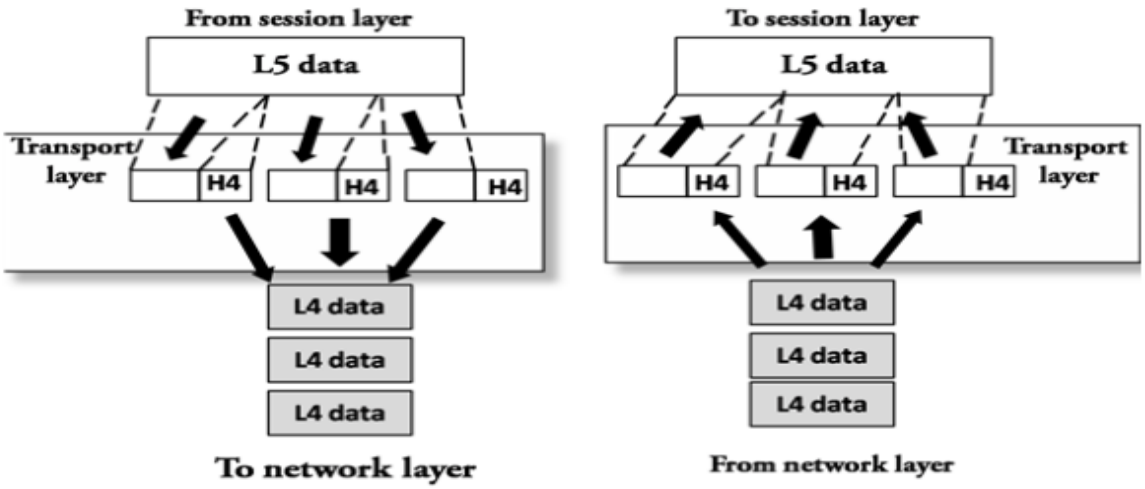
o It establishes and maintains a connection between hosts.

o When data is sent over the TCP connection, then the **TCP protocol divides the data into smaller units known as segments**. Each segment travels over the internet using multiple routes, and they arrive in different orders at the destination. **The transmission control protocol reorders the packets in the correct order at the receiving end.**

User Datagram Protocol

o User Datagram Protocol is a transport layer protocol.

o It is an unreliable transport protocol as in this case receiver does not send any acknowledgment when the packet is received, the sender does not wait for any acknowledgment. Therefore, this makes a protocol unreliable.



5. SESSION LAYER (DATA FORMAT – IN SESSIONS)

(DEVICE OR PROTOCOL:- GATEWAY)

FUNCTIONS: -

1. SESSION:- In this layer work done in a particular period of time.

2. Synchronization: Ensures that data transmission remains synchronized between devices.

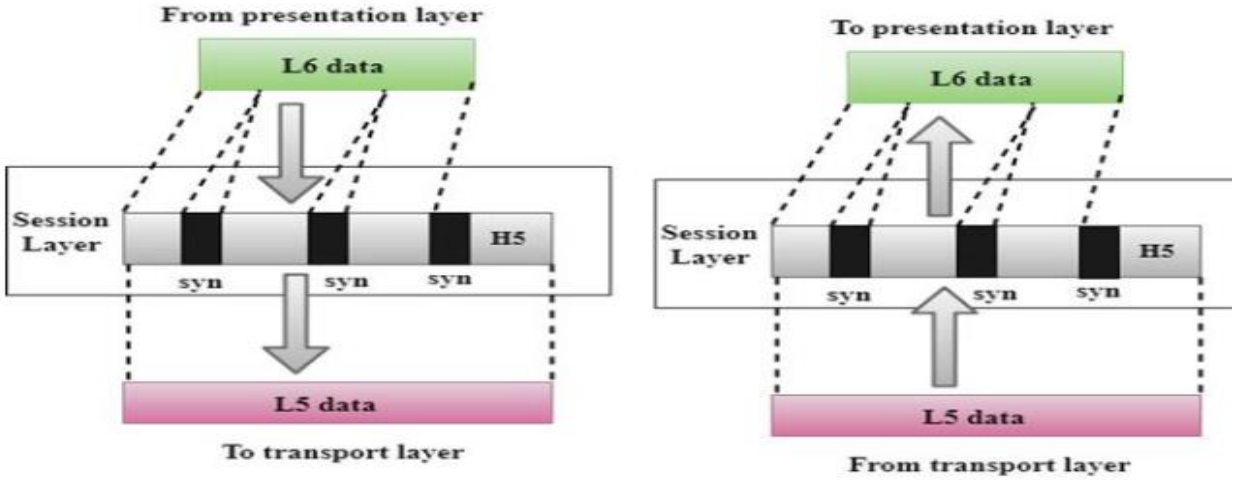
3. Session Establishment: Sets up communication sessions between applications running on different devices.

3. **Session Management**: Coordinates data exchange, ensuring that data is sent and received in the correct order. (diff workdone in diff session)

4. **Session Termination**: Ends communication sessions when they are no longer needed.

5. Authentication:- To check user id and password.

6. Authorised:- Permission need for access



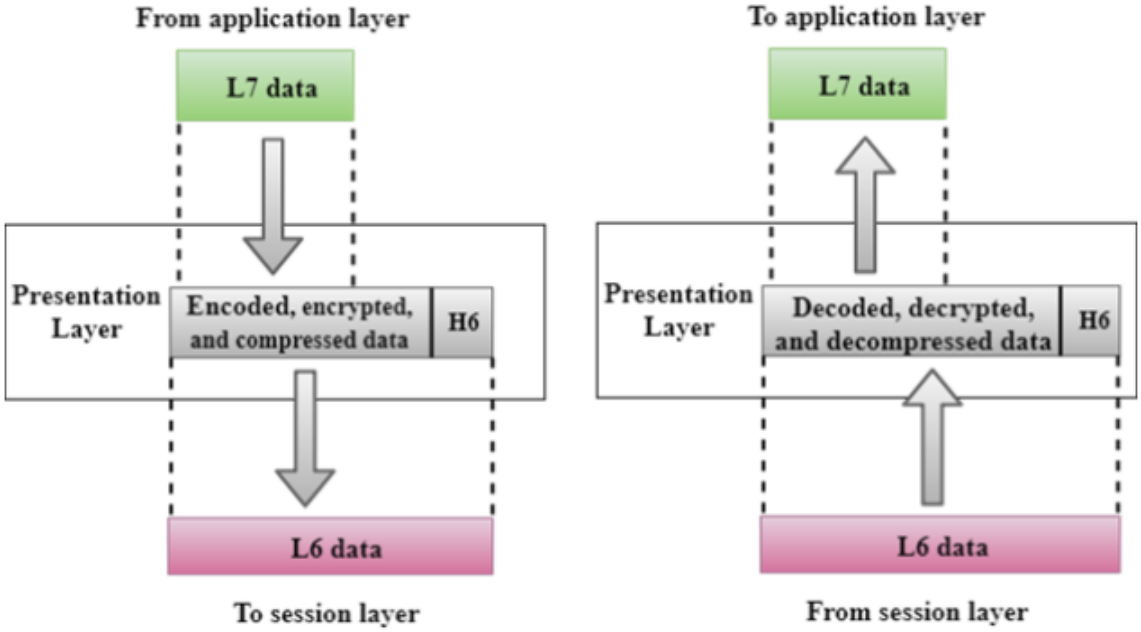
6. PRESENTATION LAYER (DATA FORMAT – IN MESSAGE)

(DEVICE OR PROTOCOL: - JPEG, MPEG, GIF***)***

FUNCTIONS: -

1. **Data Translation**: Converts data from the format used by the application into a format that can be transmitted over the network and vice versa.

2. **Encryption and Decryption**: Secures data by encrypting it for transmission and decrypting it upon receipt.
3. **compression**: Reduces the size of data for efficient transmission over the network.
4. **Data Formatting**: Ensures that data is presented in a readable and understandable format for the receiving application.



7. APPLICATION LAYER (DATA FORMAT – IN MESSAGE)

(DEVICE OR PROTOCOL:- SMTP)

FUNCTIONS:-

1. **interface with User Applications**: Provides interfaces and services that allow applications to communicate over the network. Examples include web browsers, email clients, and file transfer protocols.

2. **Data Exchange**: Handles the exchange of data between different applications or devices.
3. **Network Services**: Provides network services such as email, file transfer, remote access, and directory services.
4. **Protocols**: Implements protocols that applications use to transmit and receive data over the network, such as HTTP (for web browsing), FTP (for file transfer), and SMTP (for email).