**ENCAPSULATION DEFINED**

Example: When you order something online, you can think of the assembly line in a warehouse, where multiple people have specific roles in picking, assembling, packaging, preparing, shipping and receiving.

This method also applies for any data which needs to be sent from one computer to another, The OSI guidelines are set in place to ensure each computer can communicate with the next, whether it be a mac or a PC.

*Note. data flows 2 ways in the OSI model,****DOWN****(****data encapsulation****) and****UP****(****data decapsulation****).*

The Application layer is where the user interacts with the application, this data is then passed to the Presentation layer and then to the session layer. During this time the 3 layers add extra information to the data that the user input. It is then passed onto the Transport layer. This is where the data is broken into smaller pieces in sequence, and the TCP header is added. We now have what is called a Segment.

Each sequenced segment is then handed to the **Network** layer for logical addressing and routing. At this layer the data is called a *Packet.* This is when the IP header is added and gets sent to the Datalink layer. With the data now including the Network layer header, Transport layer header, and the upper layer info, it is now referred to as a ***frame****.*

The datalink layer is responsible for taking packets from the network layer and placing them on the network medium (digital, cable, etc). The Datalink layer **Encapsulates** each packet in a frame that contains the hardware address/ MAC address of the source and destination computers and the Logical Link Control information that is used to define which protocol in the network layer the packet should be passed onto when it arrives. The FCS field is used for error checking and is added at the end by the Datalink layer.

Since a frame is a logical group of 1’s and 0’s the Physical layer encapsulates these digits into a digital signal to be read by devices on the same local network. On a remote network the frame is sent to the router or gateway to be routed to its destination. In order to put this Frame on the network, it has to be put into a digital signal. There are also a few 1’s and 0’s added to the beginning of the frame so the recipient computer can synchronize with the digital signal.

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**DE-ENCAPSULATION**

De-encapsulation takes place on the receiving computer and is the opposite of the encapsulation process, where the headers and trailers are removed.

The physical layer reads encoded signals from the media and converts them into frames, which will be handed to the datalink layer

The Datalink layer will do a CRC check on the frame, and confirms that the received frame is correct. when that passes without any errors, this layer will strip off any information and headers which were put on by the senders Datalink layer and will send the rest of the **packet** to the Network layer above. If the frame is wrong, it will be discarded at this point.

The Network layer will check the IP address and if it matches, the IP header is stripped from the packet and the rest of the data, which is now called a **Segment**, is passed onto the Transport layer above.

The Transport layer will process the segment, rebuild the data stream, and acknowledge that each piece is received in the correct order, to the sender’s computer using TCP. Next it removes the segment header and reassembles all segments in the original data stream which is then handed to the upper layer application.

Upper layers convert the data steam in a format that the target application can understand.

So in closing, we can compare encapsulation to the assembly line in any production, as in each part has a specific role in the building and completion of a frame or package and delivery of such package, we can also compare De-encapsulation to receiving the package, ensuring the proper address via shipping label, opening the boxes and ensuring the material is what was asked for, acknowledgment of receipt and enjoying the product purchased or requested.