INITIATION RESEAU
NETWORK INITIATION

TP1 – Computer network concepts & getting started with Wireshark

14 MAI 2018

Aakash SONI

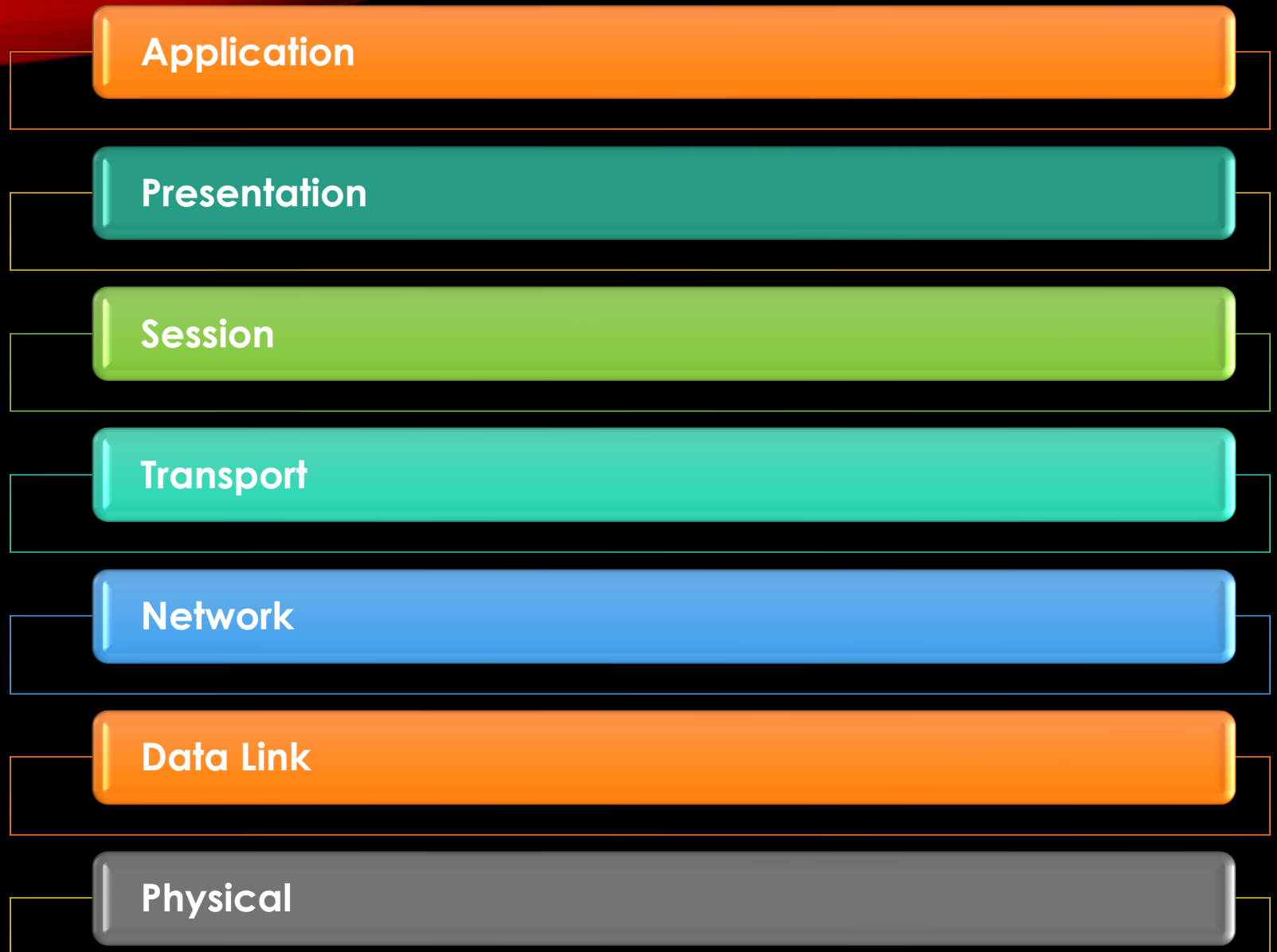
Based on the work of Mme Xiaoting LI

OVERVIEW

- OSI MODEL
- TCP/IP MODEL
- INTRODUCTION TO WIRESHARK

OSI MODEL

Open System Interconnection

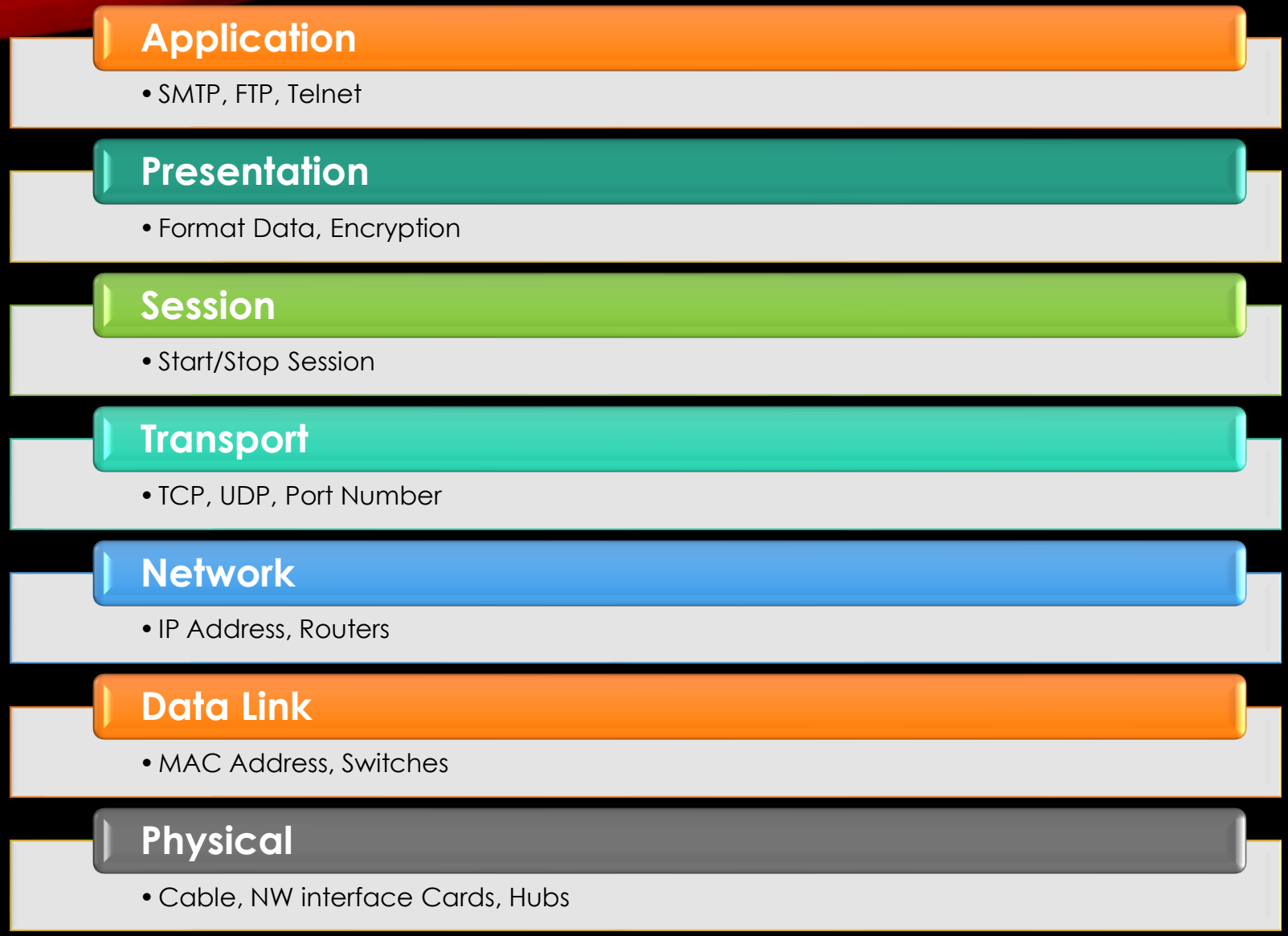


OSI MODEL

- Purpose
  - Introduced to standardize network.
  - Establish multi vendor network.

- Problem
  - Earlier there was only one vendor system.
  - Non-standard network device could not communicate.

OSI MODEL



- Application and user communication.
- Comprehensible data format and encryption.
- Establishing and terminating connection between devices.
- Error handling and sequencing.
- IP addressing and routing.
- Add physical addresses.
- Carry data across physical hardware.

EXAMPLE

- When we send an email, how does data travels across the internet over OSI model ?

EXAMPLE

- When we send an email, how does data travels across the internet over OSI model ?
  - The data is processed on each layer. This **process** is called **encapsulation**.

1

Source

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

- Create data : email content, address …
- SMTP(Simple Mail Transfer Protocol) request

Source

Application

Presentation

Session

Transport

Network

Data Link

Physical

Source

Application

Presentation

- Data formatting
- For example : ASCII
- Encoding

Session

Transport

Network

Data Link

Physical

Source

Application

Presentation

Session

Transport

Network

Data Link

Physical

Source

Application

Presentation

Session

Transport

Network

Data Link

Physical

- Start session with mail server.

Source

Application

Presentation

Session

Transport

Network

Data Link

Physical

Source

- Application
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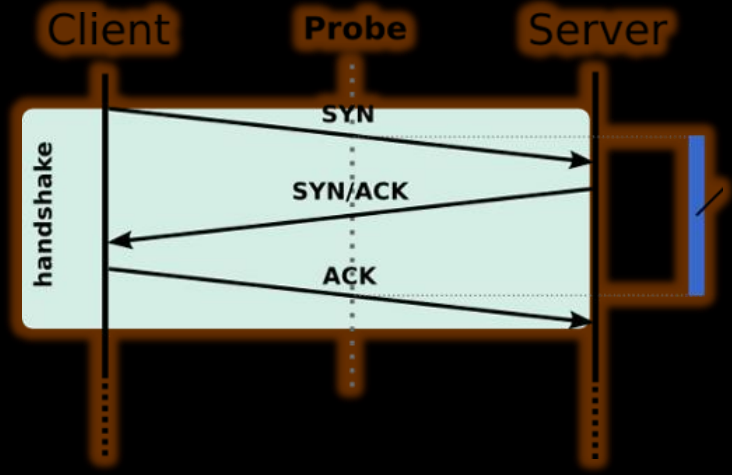
- Data Link
- Physical

- Establish a secured connection.
- Request TCP (To ensure delivery)
- Add SRC DST port address



Source

Application

Presentation

Session

Transport

Network

Data Link

Physical

Source

Application

Presentation

Session

Transport

Network

Data Link

Physical

- Add IP addresses to header.
- Why ?
  - To inform internet routers how to route the packet to the destination.
- Generate routable packet

Source

- Application
- Presentation
- Session
- Transport
- Network
- Data Link

- Physical

Source

Application

Presentation

Session

Transport

Network

Data Link

Physical

- Add router MAC addresses as local destination address.
- Why ?
  - To allow router to send packet out to the internet.

Source

Application

Presentation

Session

Transport

Network

Data Link

Physical

WHEN WE SEND AN EMAIL, HOW DOES DATA TRAVELS ACROSS THE INTERNET OVER OSI MODEL ?

Application

Presentation

Session

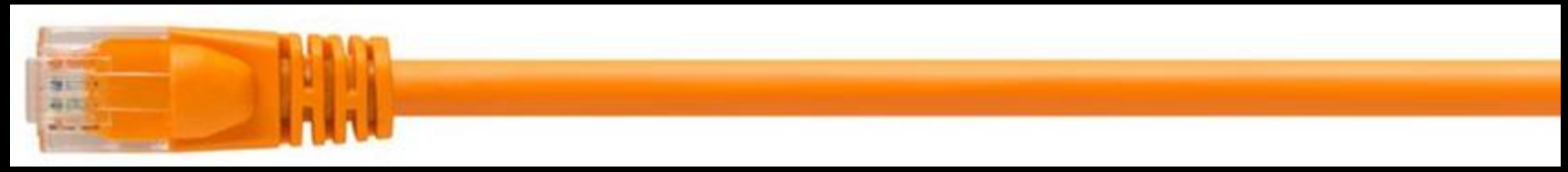
Transport

Network

Data Link

Physical

- Physically Encodes the binary packets onto the network cabling (Ethernet)



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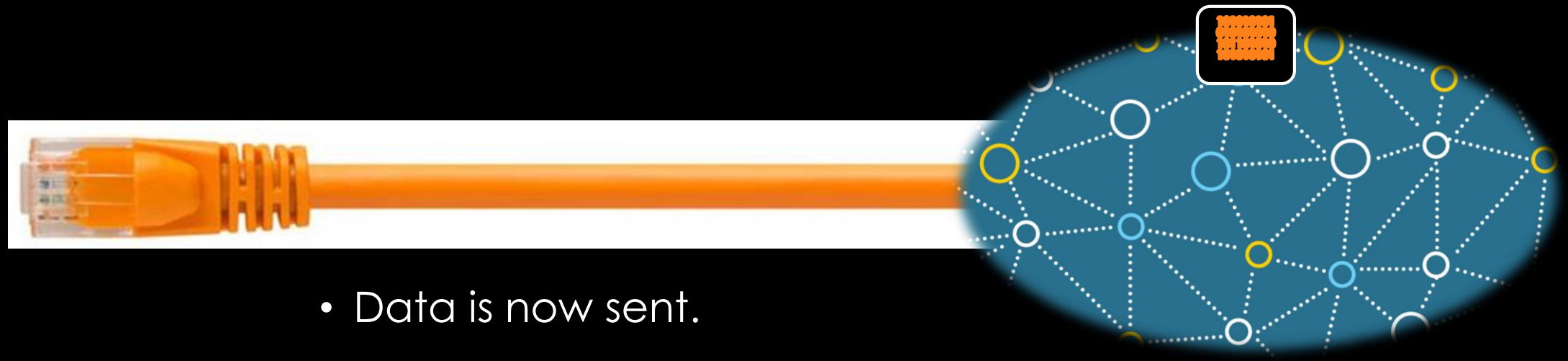
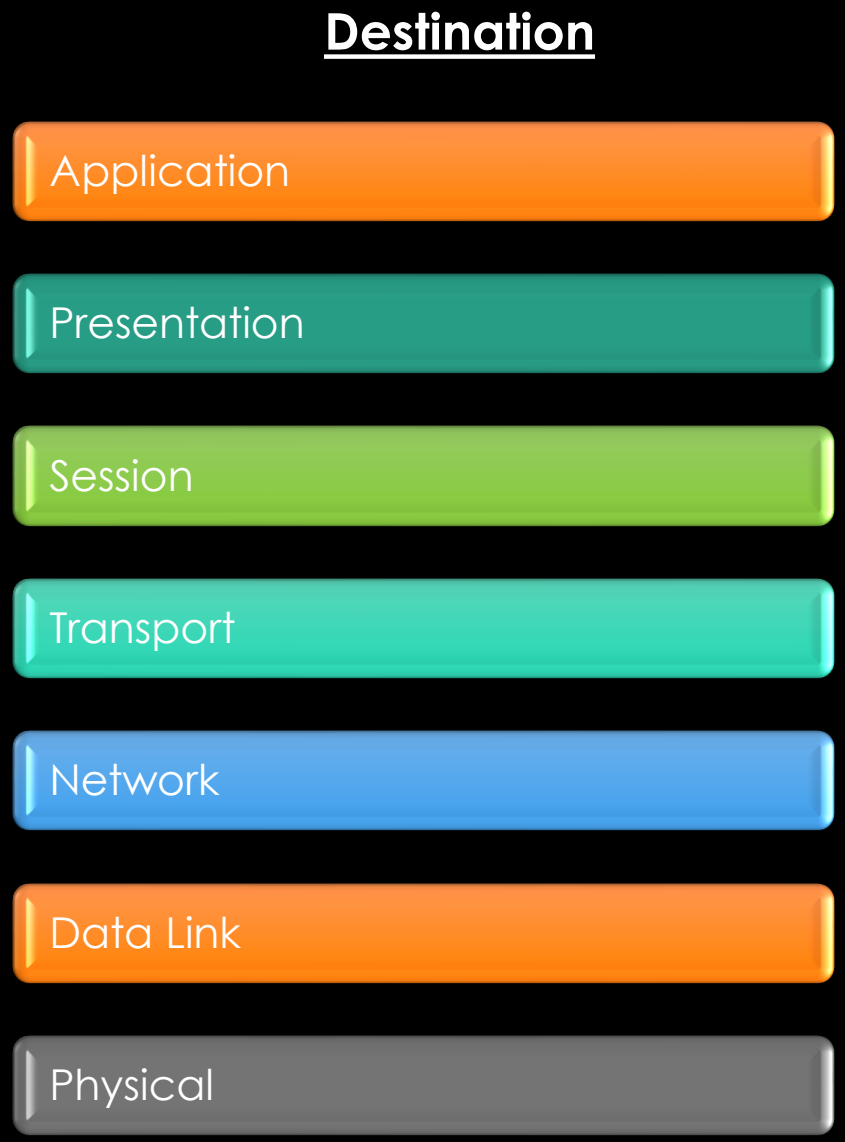


- Data is now sent.

WHEN WE SEND AN EMAIL, HOW DOES DATA TRAVELS ACROSS THE INTERNET OVER OSI MODEL ?

- Once the data reaches the destination address.
  - Reverse process.
  - Data travels back up the OSI model.

- The whole process repeats constantly.



OSI MODEL

- Advantages
  - Easy to understand network concept.
  - Simplified layer model.
- Uses
  - It is used as a reference only !
  - Troubleshooting.
- Questions ?

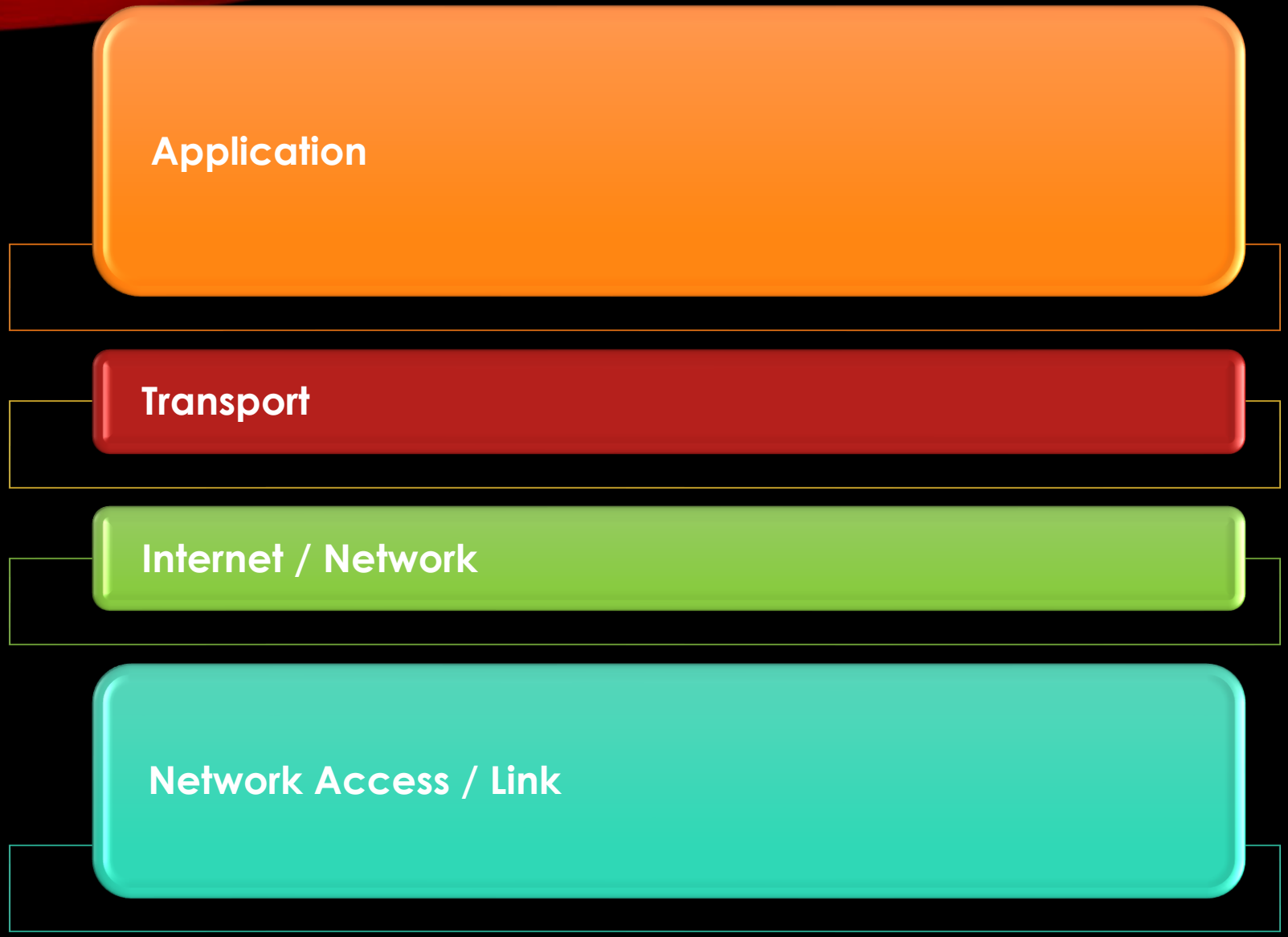
OSI MODEL

- Why don’t we use this model ?
  - It is a reference model.
  - Reference models are abstractions :
    - They are a way of thinking about a subject, not necessarily a way of implementing something.
  - Inefficient use of bandwidth.
  - Expensive.
  - Development of TCP model.

TCP/IP MODEL

Transmission Control Protocol

Internet Protocol

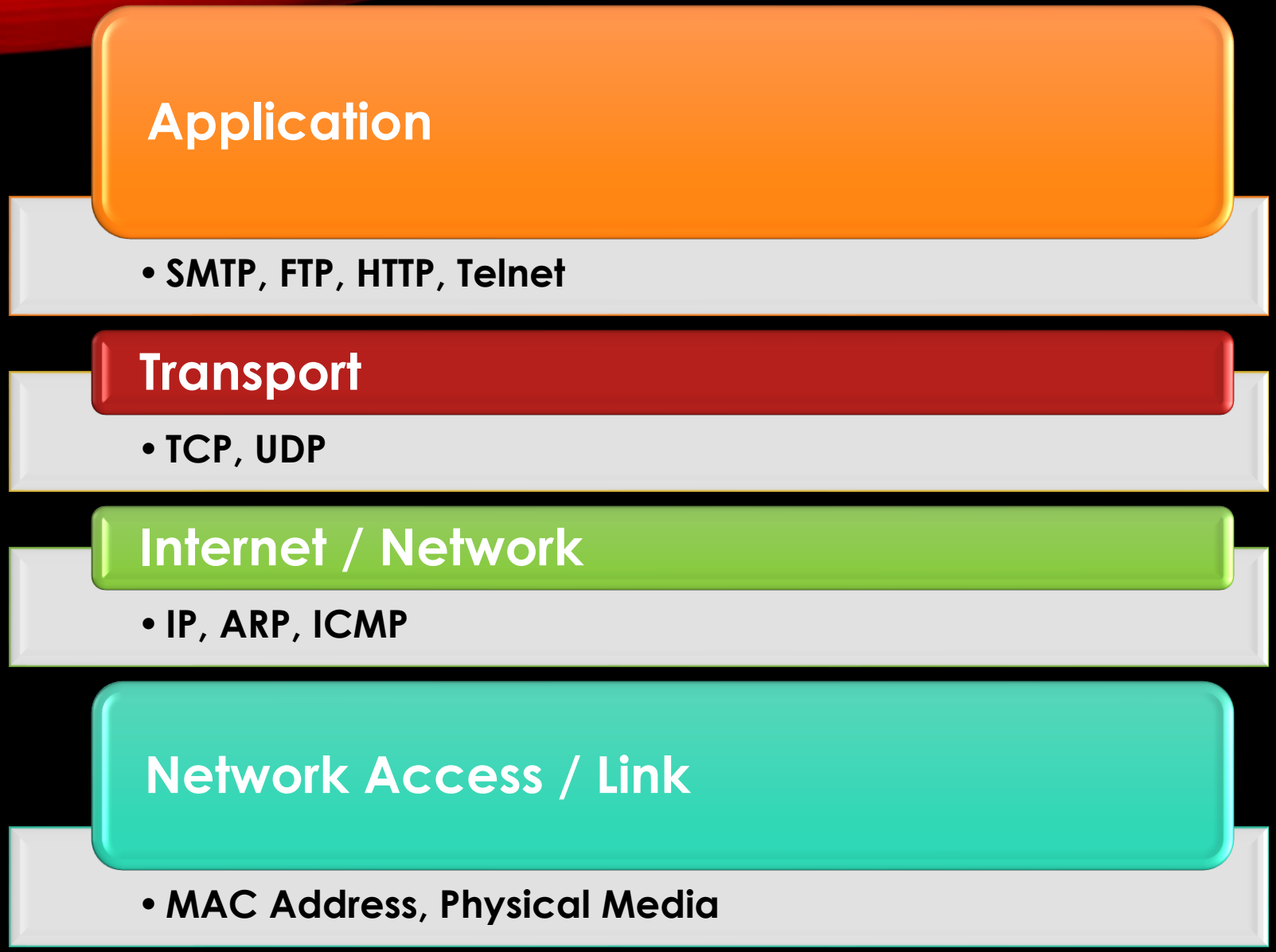


TCP/IP MODEL

- Purpose
  - Simplified network model.
  - Establish multi vendor network.

- Problem
  - Earlier there was only one vendor system.
  - Non-standard network device could not communicate.
  - OSI model was complex and expensive to implement.

TCP/IP MODEL



- Application and user communication.
- Regulates network connection.
- Inform higher layer if any error occurs.

TCP/IP MODEL

Application

- SMTP, FTP, HTTP, Telnet

Transport

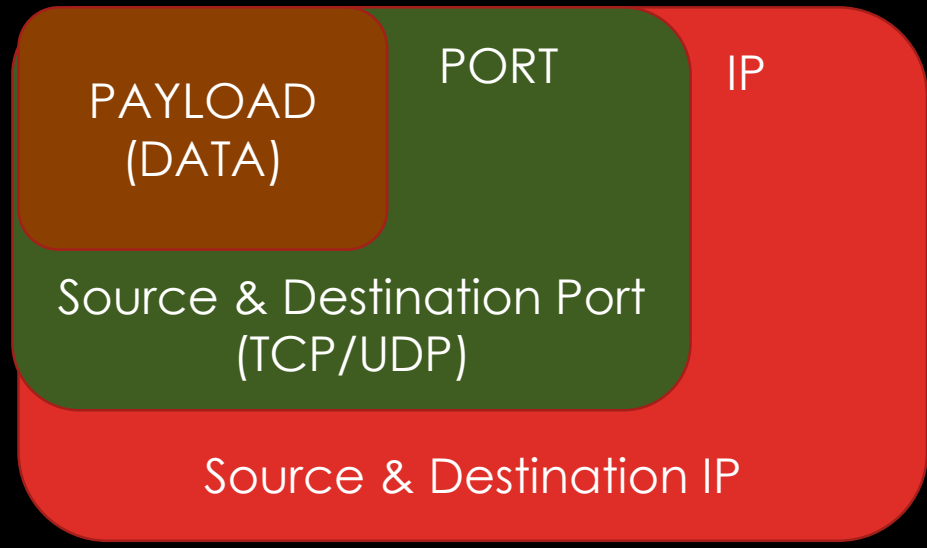
- TCP, UDP

Internet / Network

- IP, ARP, ICMP

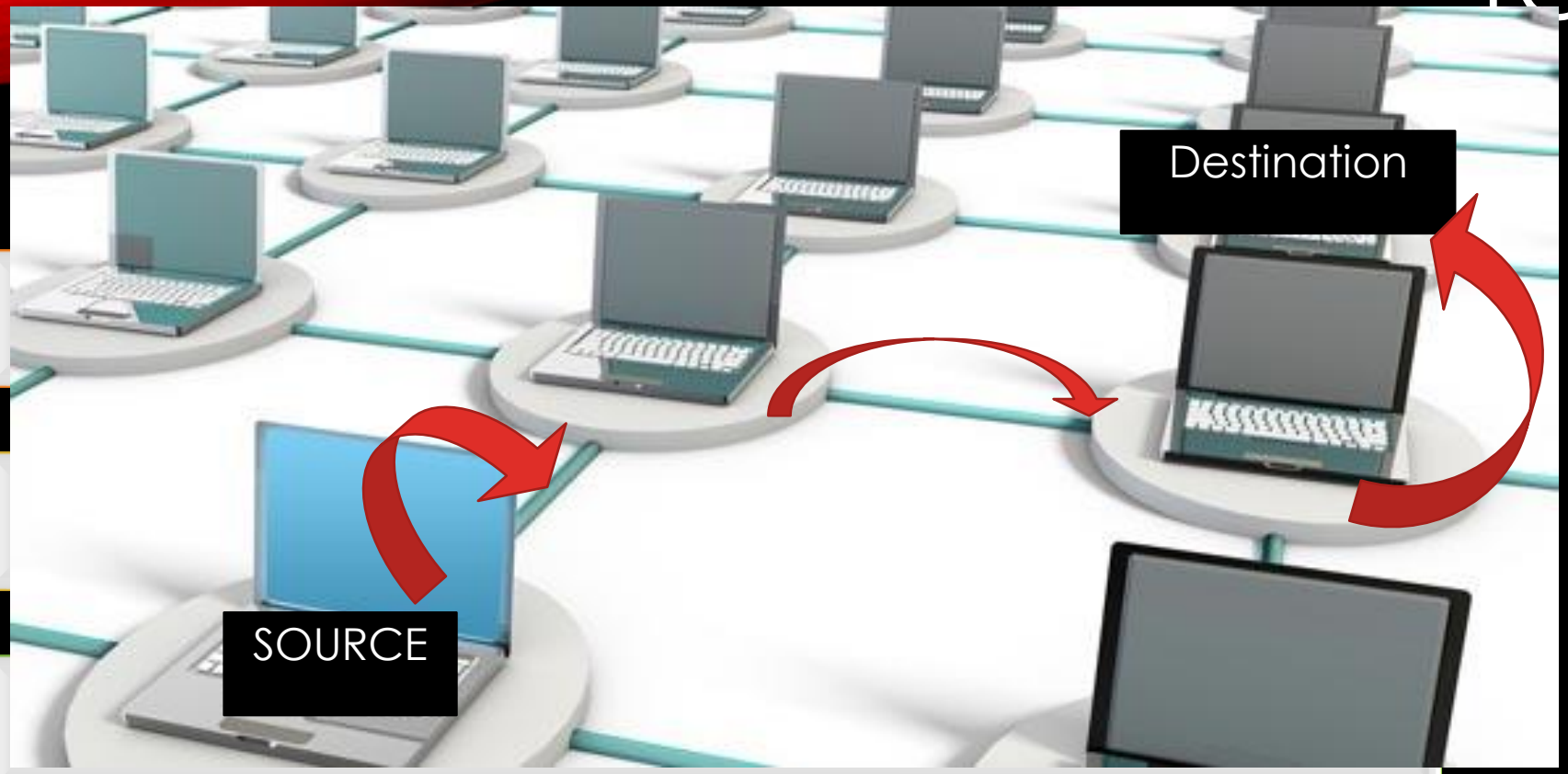
Network Access / Link

- MAC Address, Physical Media



- Identifies intended network and host on global network.

TCP/IP MODEL



- IP packet is transformed to an Ethernet or 802.11 frame.
- These frames are built and rebuilt on each hop until the packet reaches the destination.

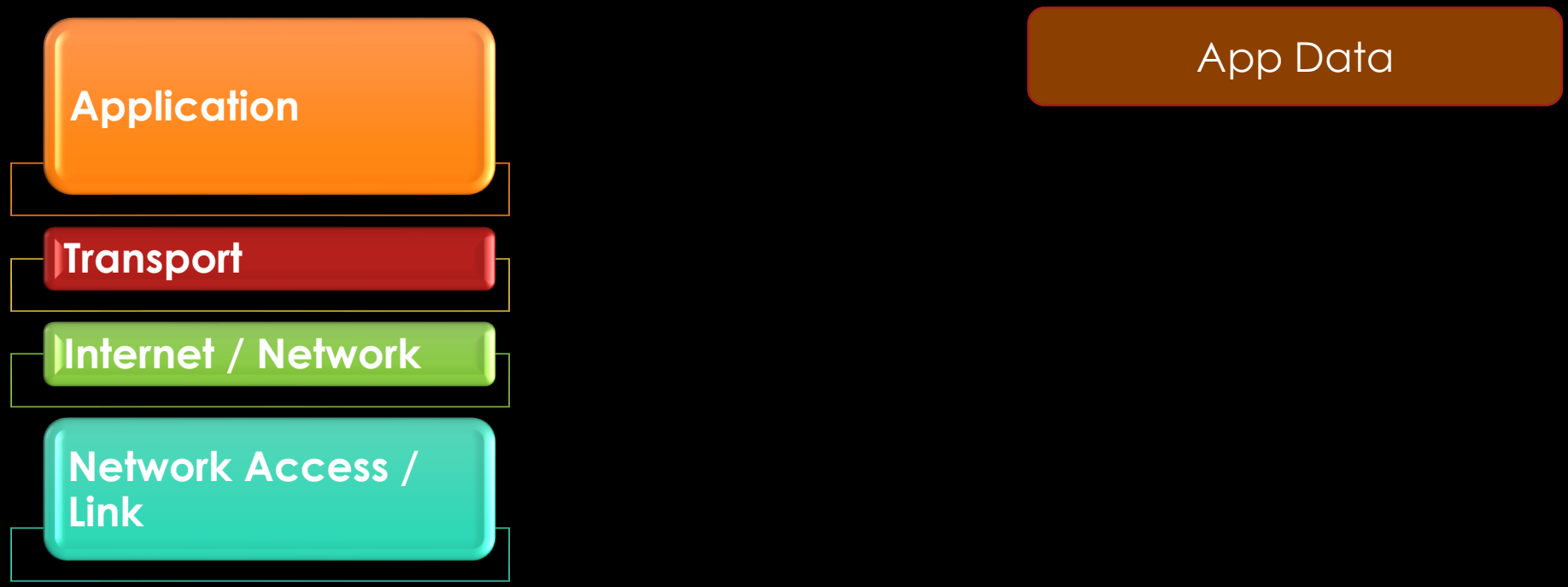
Network Access / Link

- **MAC Address, Physical Media**

- Moves the traffic across physical links.

SUMMARY

- Encapsulation
  - Each layer adds a header and an optional trailer to the information from preceding layer.



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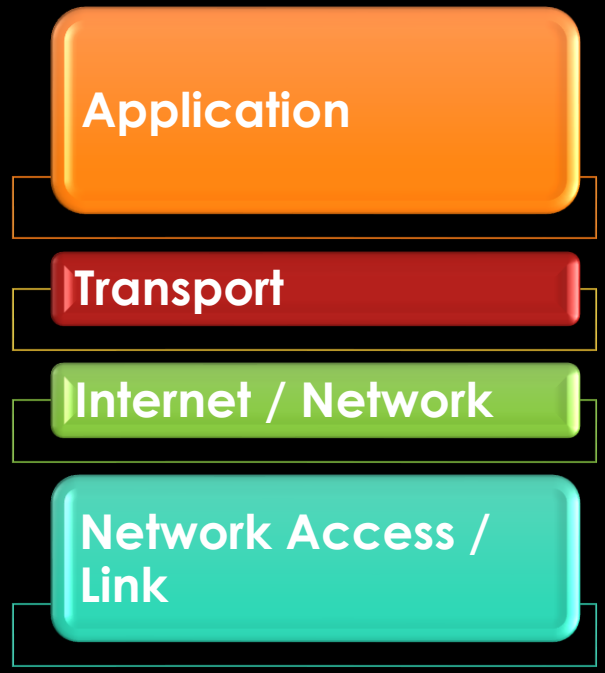
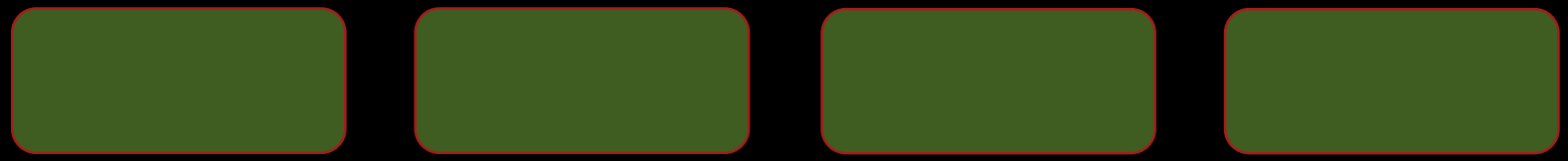
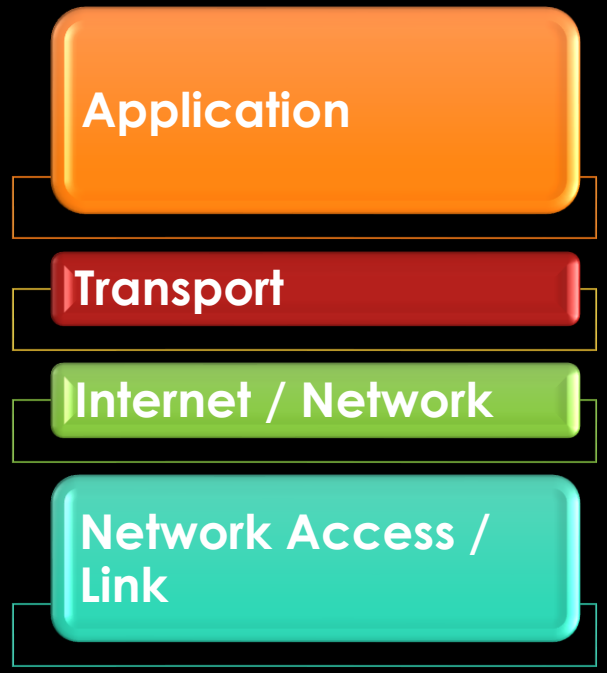




- Segmentation

SUMMARY

- Encapsulation
  - Each layer adds a header and an optional trailer to the information from preceding layer.



Segment 1 | Segment 2 | Segment 3 | Segment 4

- Segmentation
- Sequence Numbers

SUMMARY

- Encapsulation
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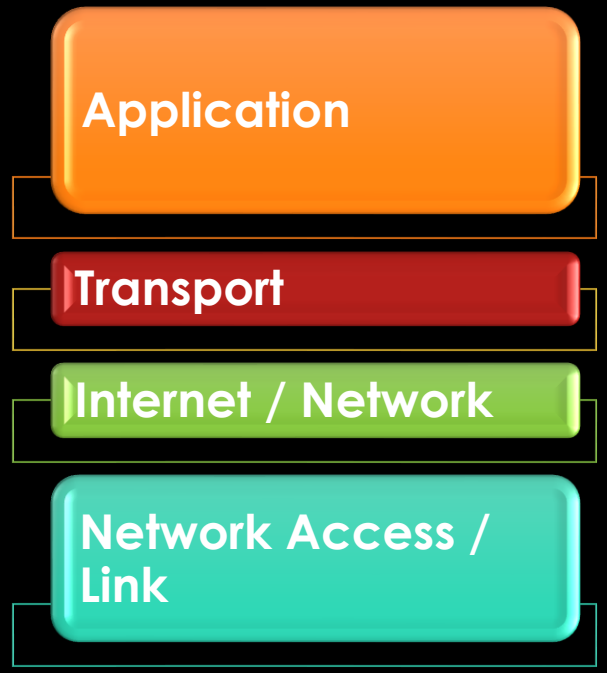

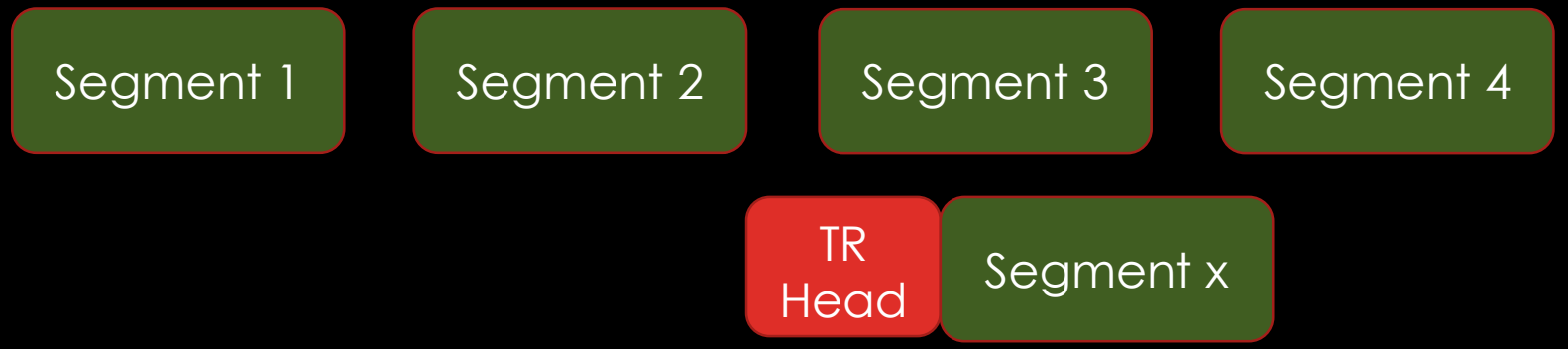

- Port Numbers & Transport Header

SUMMARY

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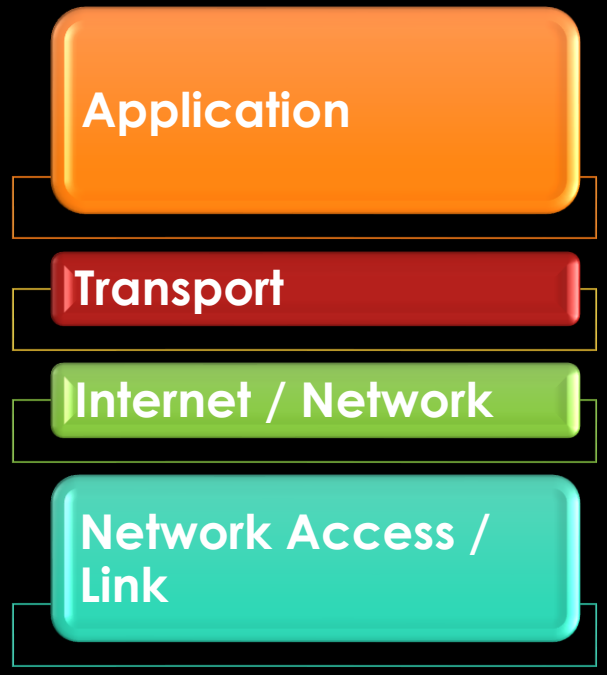
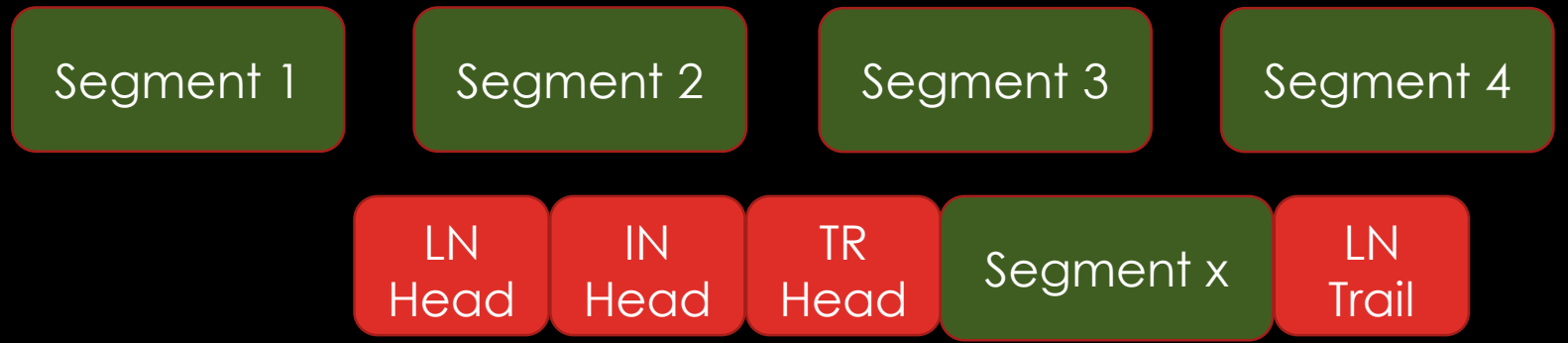
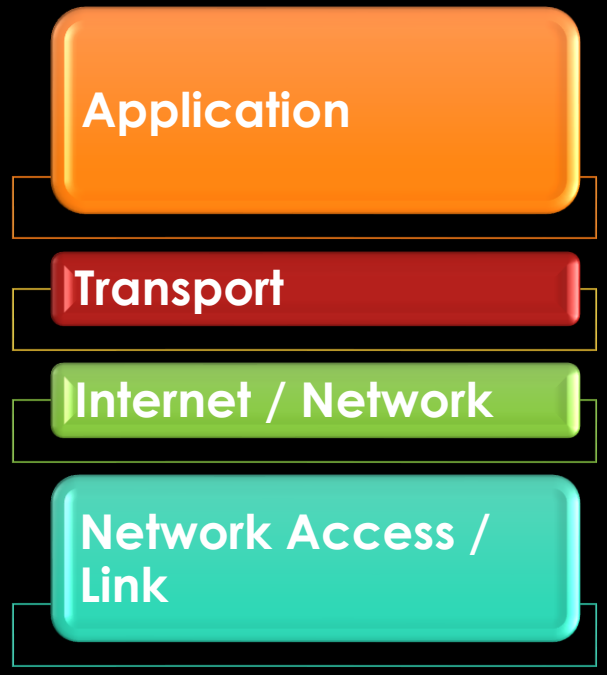


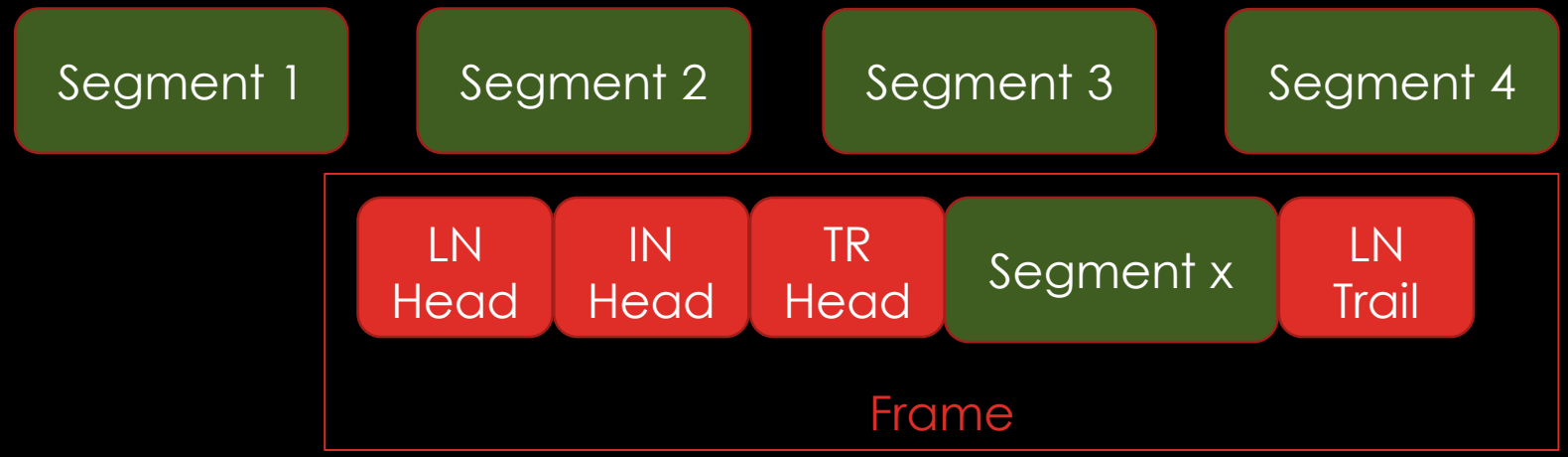


- Internet Header
- Link Header

SUMMARY

- Encapsulation
  - Each layer adds a header and an optional trailer to the information from preceding layer.





- Frame Transmission