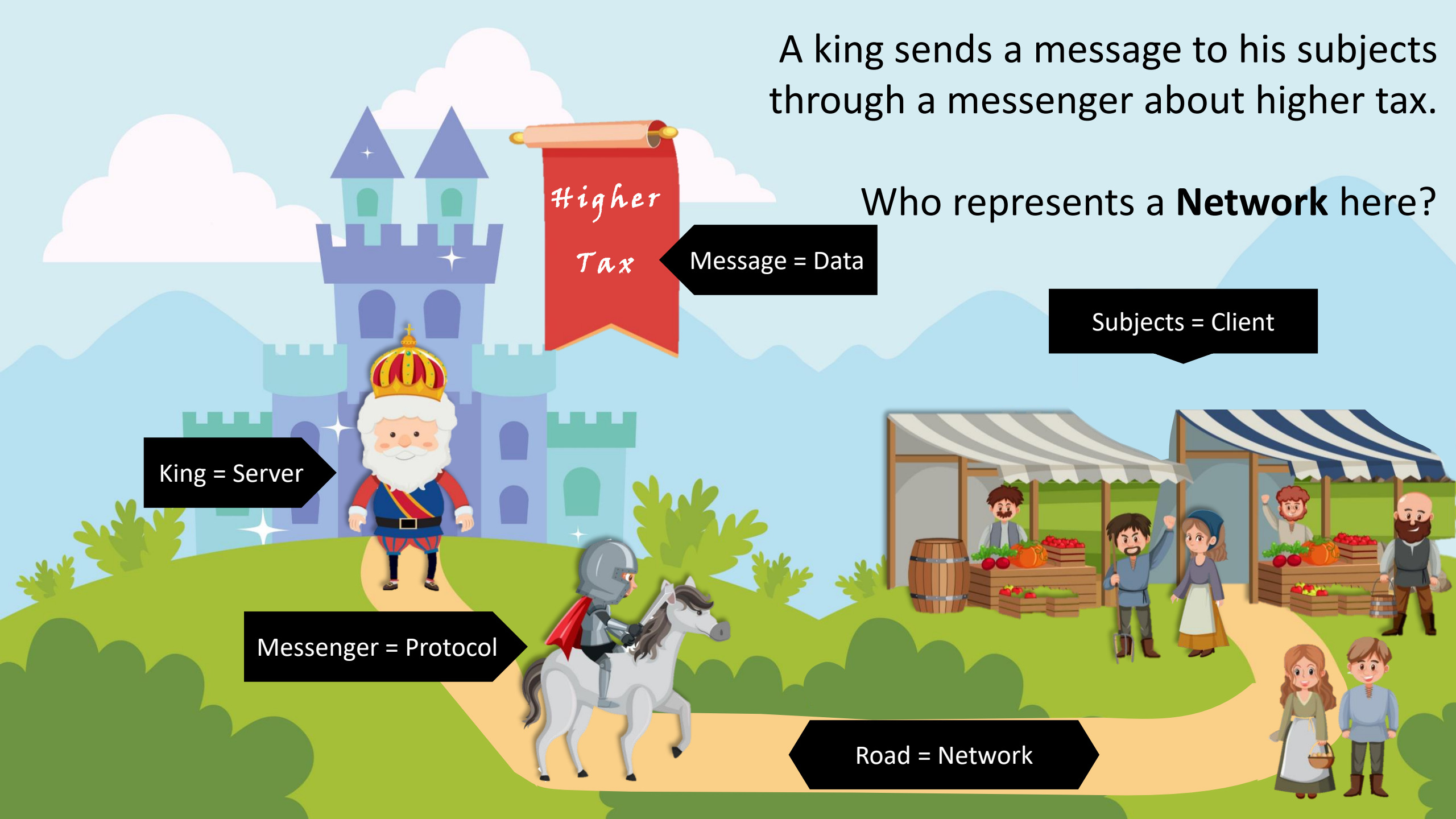
Networking Track

BeSA
Become a Solutions Architect

The Binary Choice - OSI Model / IP Addressing

A king sends a message to his subjects through a messenger about higher tax.

Who represents a **Network** here?



A road like this…

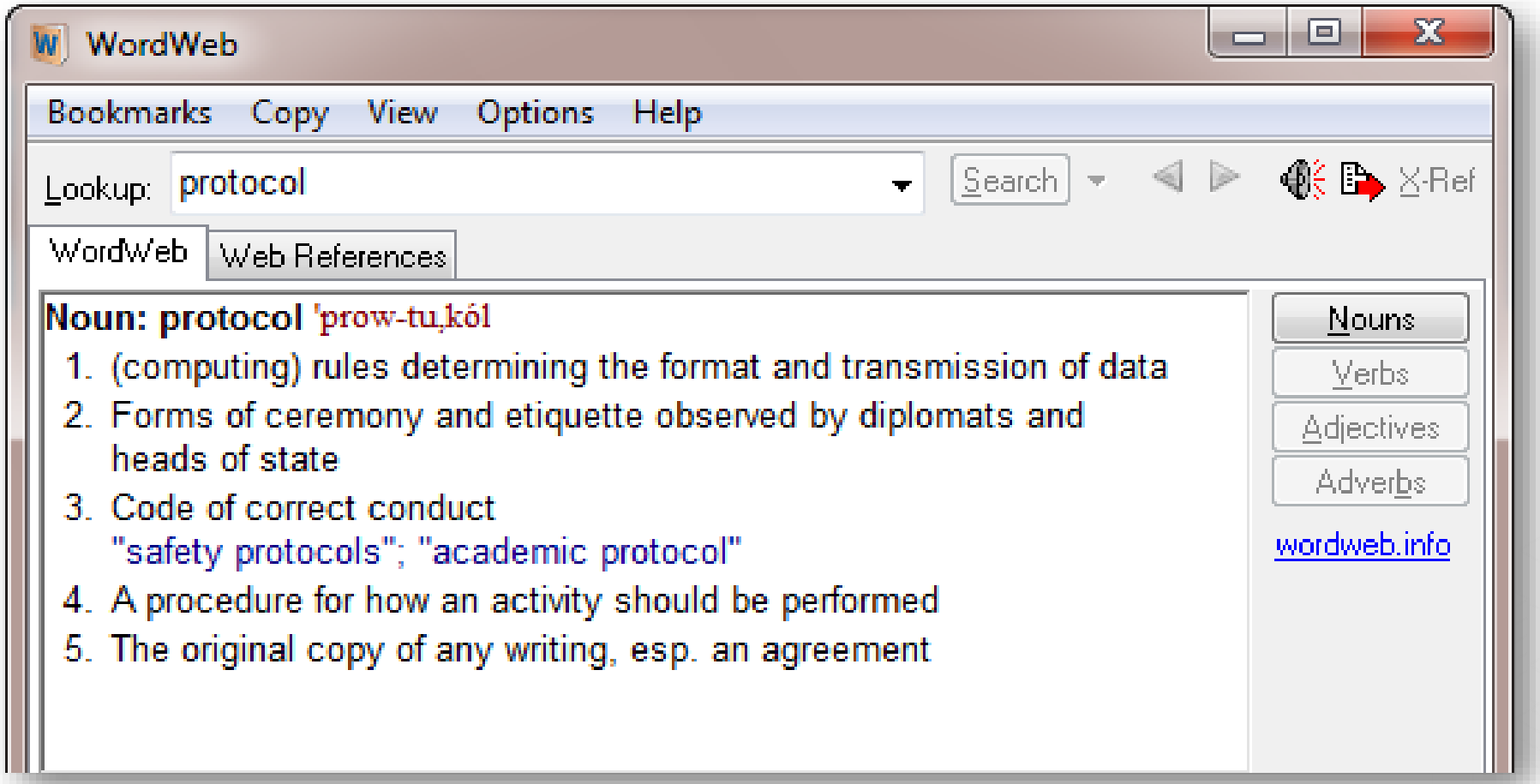

Or like this…

What is a network?

- A collection of devices that can communicate together.
- The Fabric that ties business applications together.

What is a protocol?

- Dictionary Definitions



Sending a letter

- Through Royal Mail
  - Write a letter
  - Put it in an envelope
  - Write address
  - Affix stamp
  - Drop it in a letter box

- Through a Courier Company
  - Write a letter
  - Put it in an envelope
  - Attach a barcode
  - Schedule a pickup
  - Hand over the letter

What is a protocol?

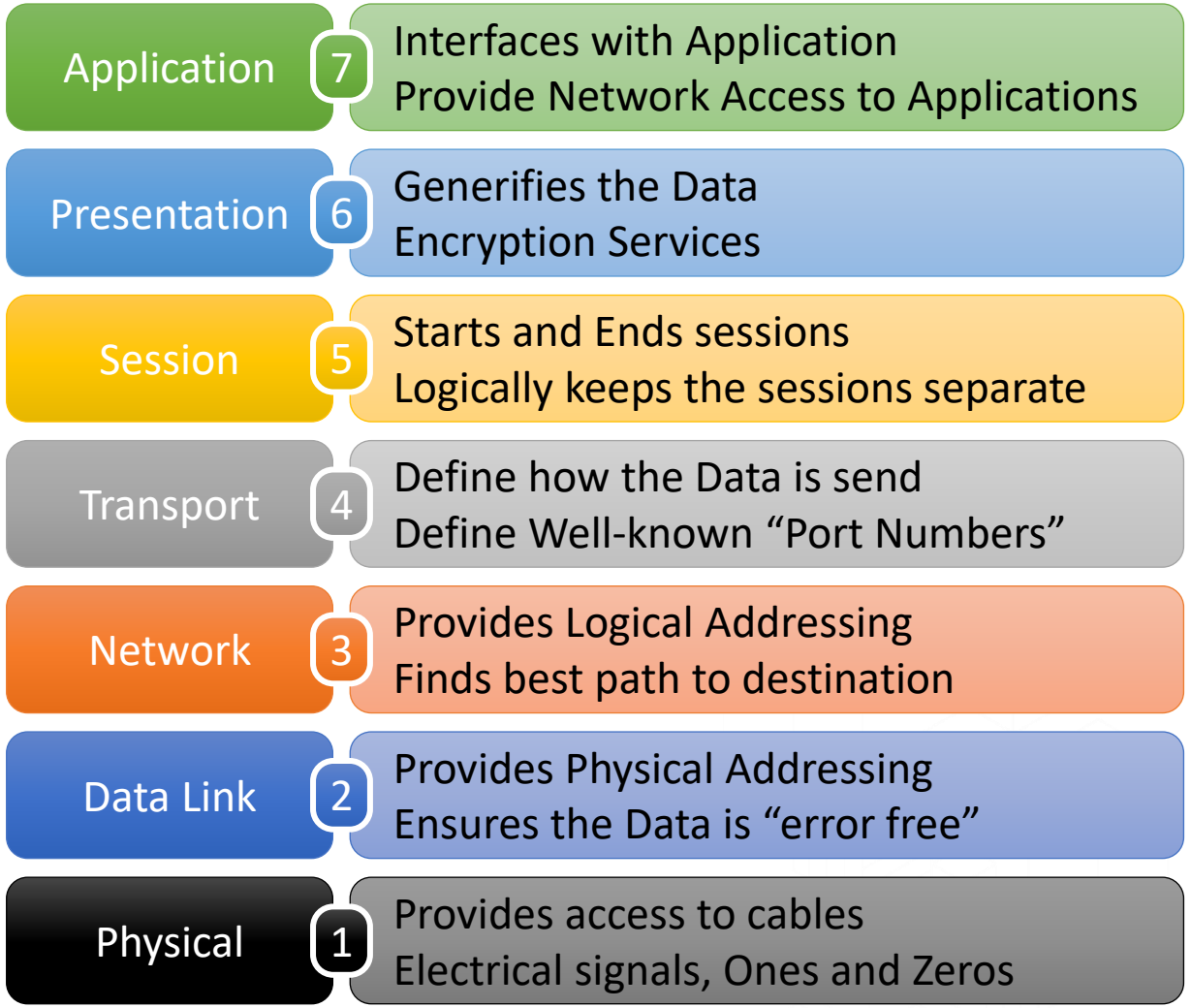
- Standards of Communication
  - In this example:
    - Packaging
    - Addressing
    - Payment
    - Getting the package on the network

- Computers on a network must agree upon a common protocol in order to communicate

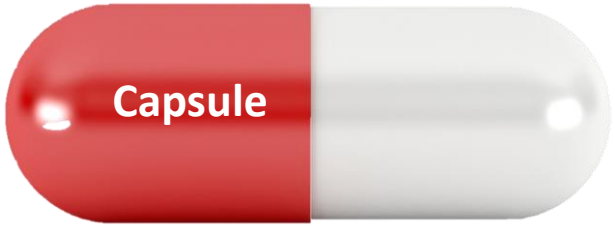
Open System Interconnection Model (OSI Model)

- In 1970 the International Standards Organization (ISO) developed the **Open Systems Interconnections** (OSI) reference model to define the basic standards for network communication.

- OSI Model is a 7 layer theoretical model
  - Reduces Complexity
  - Standardized interfaces
  - Facilities modular engineering
  - Ensure interoperability



Does anyone remember these?



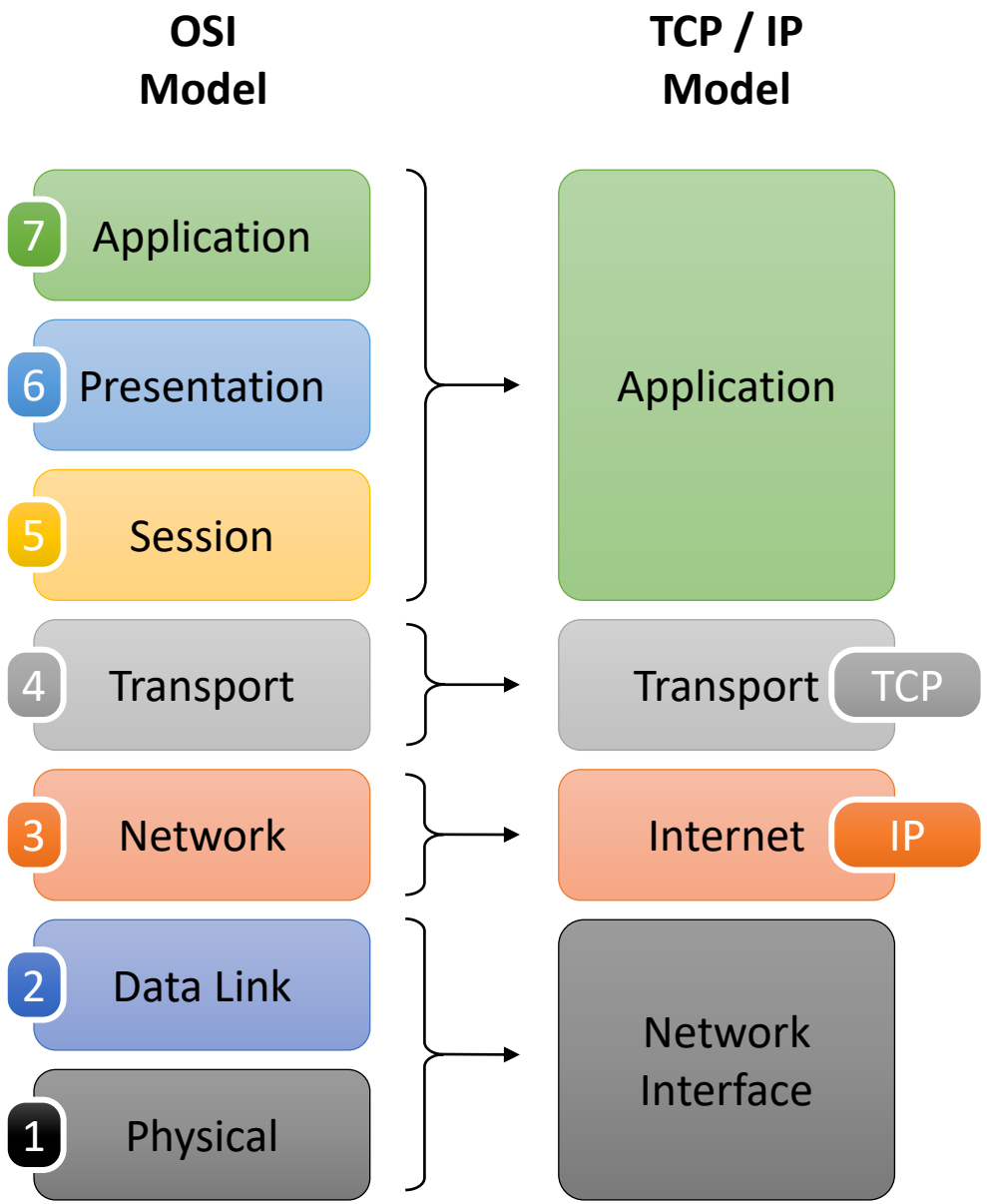
How it works?

Source Host

Destination Host

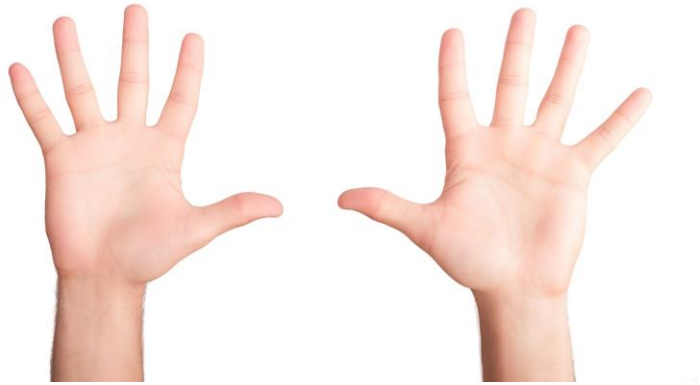
7 Application	Data					Data	7 Application
6 Presentation	Data	+PH	H = Header		-PH	Data	6 Presentation
5 Session	Data + PH	+SH			-SH	Data + PH	5 Session
4 Transport	Data + PH + SH	+TH			-TH	Data + PH + SH	4 Transport
3 Network	Data + PH + SH + TH	+NH			-NH	Data + PH + SH + TH	3 Network
2 Data Link	Data + PH + SH + TH + NH	+DLH			-DLH	Data + PH + SH + TH + NH	2 Data Link
1 Physical	Data + PH + SH + TH + NH + DLH		→			Data + PH + SH + TH + NH + DLH	1 Physical

OSI vs TCP/IP Model



The Binary Choice

- We humans use decimal number system. (0, 1, 2, 3, 4, 5, 6, 7, 8, 9)
  - Why?



- Computers use binary number system (1 and 0).
  - Why?

On

Off

Current

No Current

On

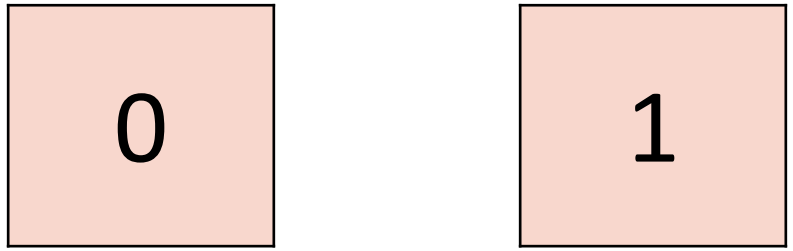
Off

1
On

0
Off

Bits and Bytes

- A bit can have a single value out of 2 possible values – Either 0 or 1



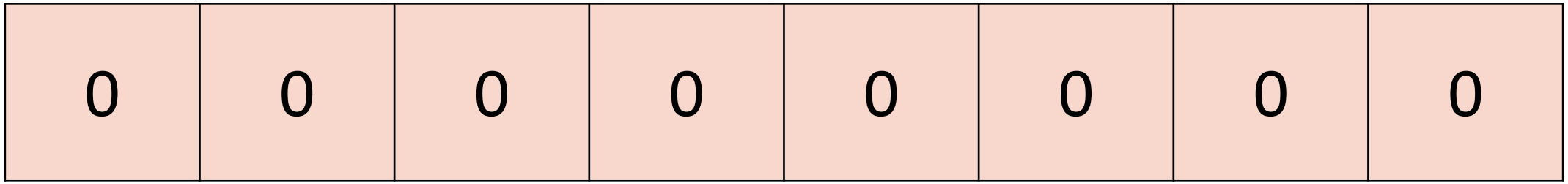
- 8 bits combined is a byte

Place value 7	Place value 6	Place value 5	Place value 4	Place value 3	Place value 2	Place value 1	Place value 0
2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
128	**64**	**32**	**16**	**8**	**4**	**2**	**1**

Bits and Bytes

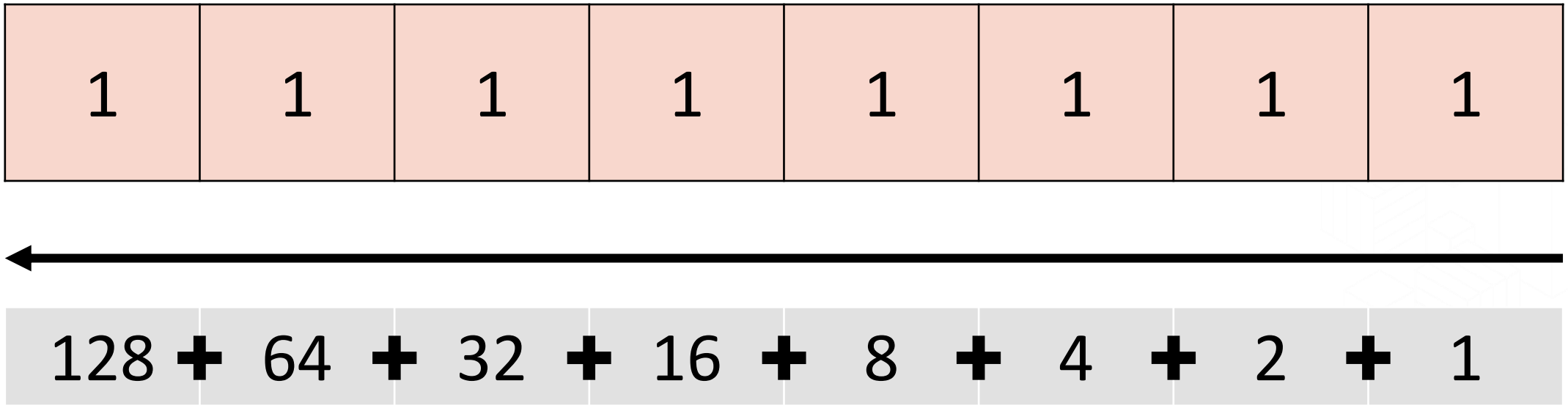
- Minimum value of a Byte

0

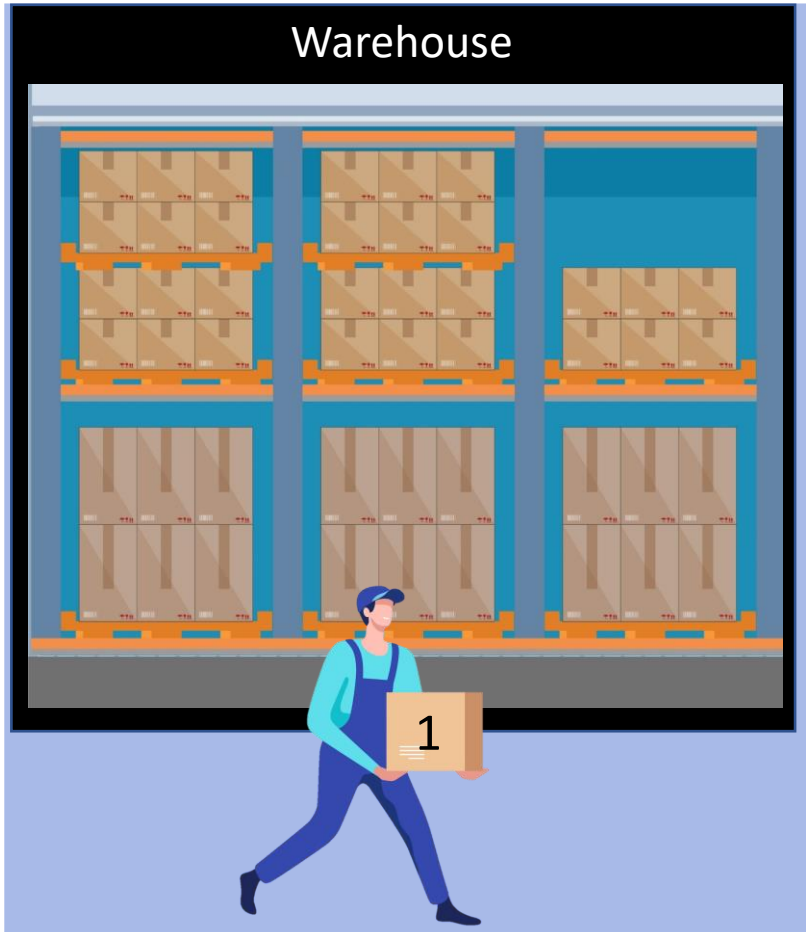


- Maximum value of a Byte

255



Better Box – A Red & Blue Startup



Here is a story of Red and Blue who invented a new type of box, and started a shop to sale it.

Mr. Red took the orders of customers and Mr. Blue brought the boxes from store.

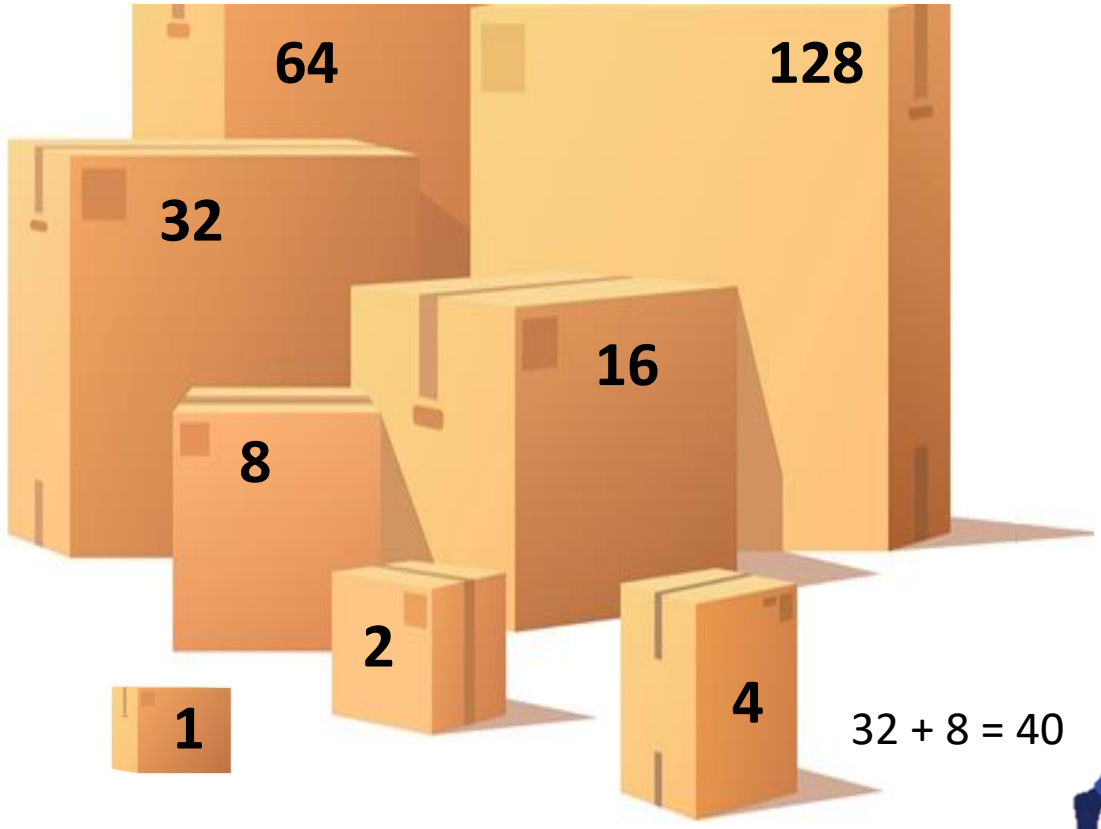
Customers with different demands regularly come and Mr. Blue is exhausted by this.

Is there a better way?

Instead of bringing one box at a time Mr. Blue arranges them into a group. He makes a bigger box which contains small boxes.

Number of small boxes in each big box is as follows:

128, 64, 32, 16, 8, 4, 2, 1

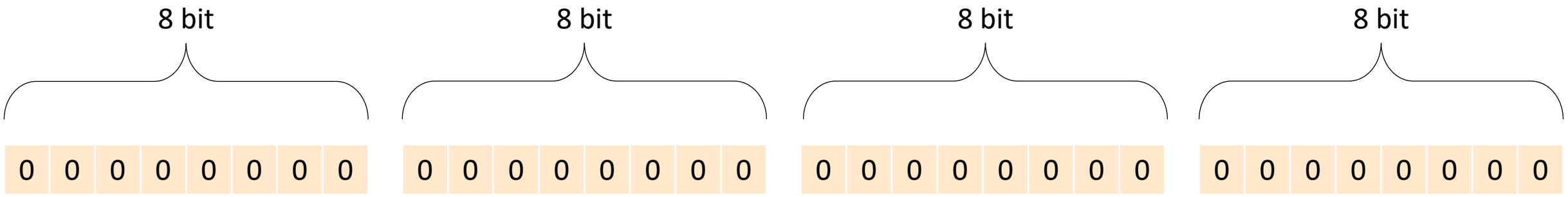


32 + 8 = 40

IPv4 Addresses

- A device on the TCP/IP network is identified by its IP address

- IPv4 addresses are 32 bit



- From 0.0.0.0 up to 255.255.255.255

Converting Decimal to Binary

- Convert following to binary

		128	64	32	16	8	4	2	1
• 40	=	0	0	1	0	1	0	0	0
• 128	=	1	0	0	0	0	0	0	0
• 19	=	0	0	0	1	0	0	1	1
• 228	=	1	1	1	0	0	1	0	0
• 230	=	1	1	1	0	0	1	1	0

Time for Hands on