

# Computer Networks

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**Educating the Architects of the  
Networked Economy.**

Cisco Networking Academy



**CN 2018**

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# General Info

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# General Info

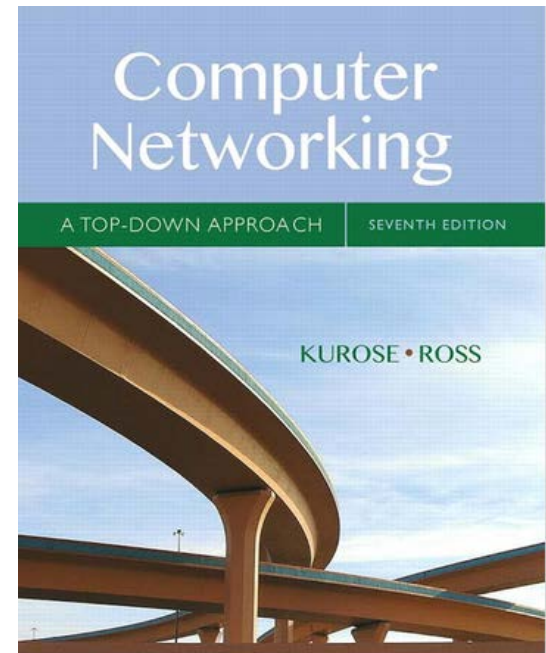
- Class Hour
- **Monday**  
8.00 - 9.30 & 9.45 - 11.15
- **Grading Policy**
  - **VLSM** (*Variable Length Subnet Mask*) – **test**
  - **2-3 Lab skills**

# Literature

1. J. F. Kurose and K. W. Ross, *Computer Networking : A Top-Down Approach*, 7<sup>th</sup> edition, Pearson, 2017
2. Wendell Odom, *CCNA Routing and Switching 200-125*, Official Cert Guide Library, Cisco Press, 2018
3. Behrouz A. Forouzan, *Data Communications and Networking*, McGraw-Hill, 2013
4. [www.google.com](http://www.google.com)

# Literature

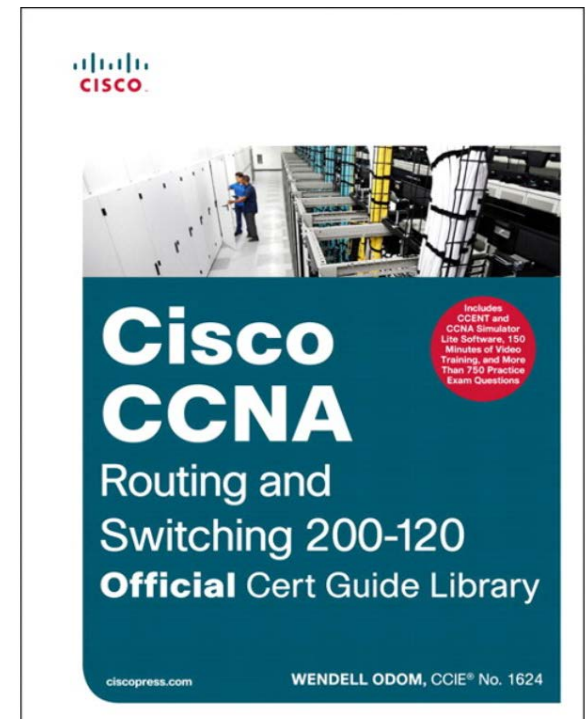
- James F. Kurose, W. Ross, [Computer Networking: A Top-Down Approach](#), 7th Edition, Pearson 2017



# Literature

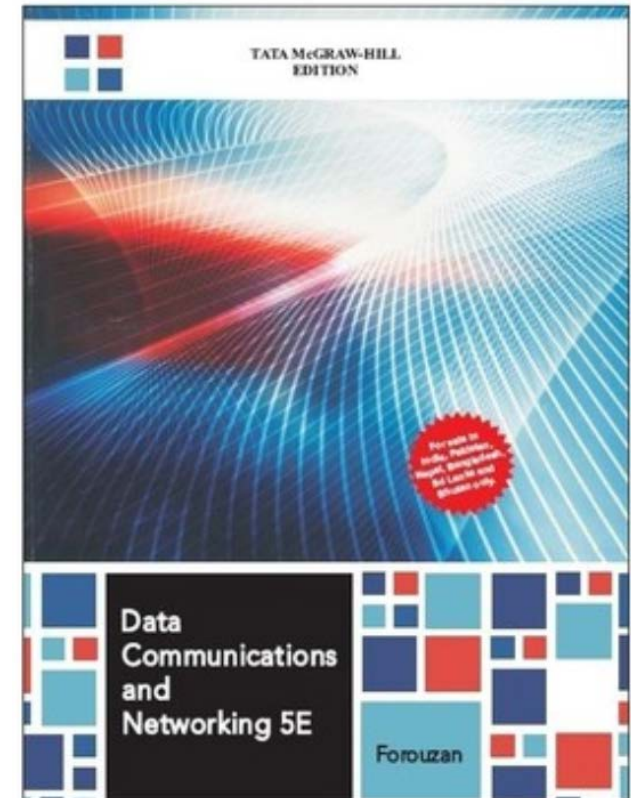
- Wendell Odom, *CCNA Routing and Switching 200-125*, Official Cert Guide Library, Cisco Press, 2018

Part of the Official Cert Guide series



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- Behrouz A. Forouzan, [Data Communications and Networking](#), McGraw-Hill, 2013



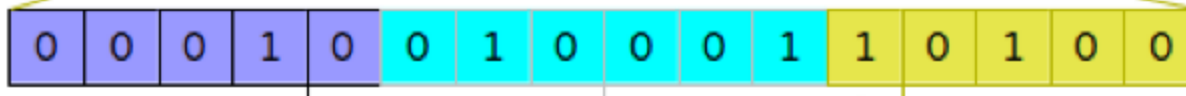
# Objectives

- IP address
- Subnet mask

An IPv4 address (dotted-decimal notation)

**172 . 16 . 254 . 1**  
↓ ↓ ↓ ↓  
10101100 . 00010000 . 11111110 . 00000001  
└───┬───┘  
One byte = Eight bits  
└──────────────────────────┘  
Thirty-two bits ( 4 \* 8 ), or 4 bytes

2001:db8:200:1234:a123:b123:c123:d1234





# Objectives

- How to install, configure, and troubleshoot a **computer network**
- **Protocols** and standards
- **Routing**
- **Topologies**
- **Hardware**
- Network **operating systems**
- Cisco **IOS**



# Objectives

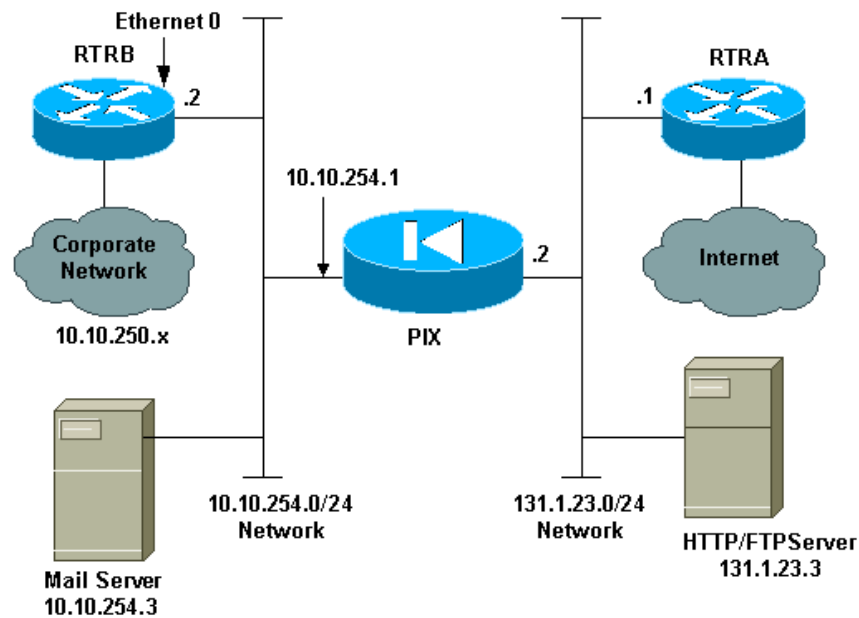
## ■ Standards

Protokół / Typ połączenia										
EIA/TIA 568A	3		2			4				
	1	2	3	4	5	6	7	8		
EIA/TIA 568B	2		3			4				
	1	2	3	4	5	6	7	8		
TELEFON / ISDN										
ETHERNET										
TOKEN RING										
TWINAX AS400										
COAX IBM 327										
ATM										
Masa										
	T2	R2	T3	R1	T1	R3	T4	R4		
Numery pinów										
	9	1	2	3	4	5	6	7	8	



# Objectives

- Labs

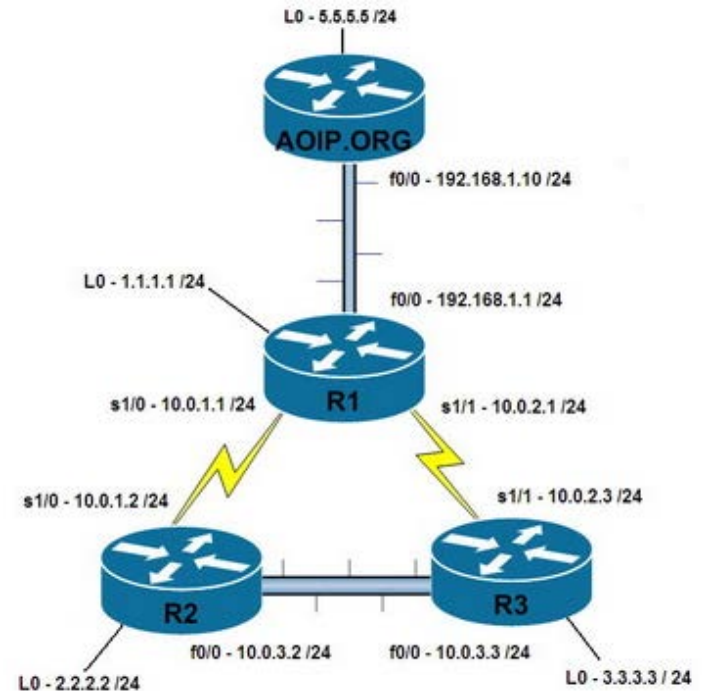


# Labs

- Show run

```
Dynamips(2): R3, Console port
R3(config)#router rip
R3(config)#router rip
R3(config-router)#version 1
R3(config-router)#network 1.1.1.0
R3(config-router)#exit
R3(config)#router rip
R3(config-router)#version 2
R3(config-router)#network 2.2.2.0
R3(config-router)#exit
R3(config)#show run | s r r
^
% Invalid input detected at '^' marker.

R3(config)#do show run | s r r
router rip
 version 2
 network 1.0.0.0
 network 2.0.0.0
R3(config)#
```



# Overview

- **Computer Networks** introduces a variety of topics to build skills and **understanding of networking**
- **Computer Networks** also introduces networking **devices** and the **IOS software**
- You will learn how **networks** are set up, how **devices** are configured, how **communication** takes place on a network and the basics of implementing **network security** best practices which will enhance the yours' confidence in **networking-related** professions

# Computer Networks



Why Computer Networks ?

# Why Computer Networks ?

- Imagine a world **without the Internet**
- No more **Google, YouTube**, instant messaging, **Facebook, Wikipedia**, online **gaming, Netflix, iTunes**, and easy access to current information

~~GAMEPLAY~~

~~YouTube~~



~~NETFLIX~~



# Why Computer Networks ?

- Imagine a world **without the Internet**
- No more **price comparison websites**, avoiding lines by **shopping online**, or quickly looking up phone numbers and **map directions** to various locations at the click of a button



Google Maps





# What Is a Network?

- **Definition** (*Techopedia*) - What does Network mean?
- *A network, in computing, is a group of **two or more devices** that can communicate. In practice, a network is comprised of a **number of different** computer systems connected by physical and/or wireless connections. **The scale** can range from a **single PC** sharing out basic peripherals to massive **data centers** located around the World, to the Internet itself. Regardless of scope, all networks allow computers and/or individuals to **share information** and resources.*

# Why Computer Networks ?

- Network **has no boundary** and supports the way we:
  - **Learn**
  - **Communicate**
  - **Work**
  - **Play**



# Why Computer Networks ?

- Network **has no boundary** and supports the way we:
  - **Online banking**
  - **World News**
  - **Information about traffic**
  - **Weather forecasts**
  - **e-learning**
  - **File exchange**
  - **E-mail**
  - **Google Earth**
  - **Other .....**



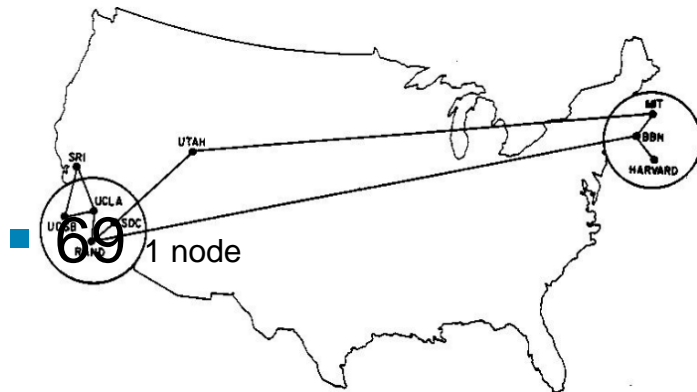
# Networks are Everywhere

- **Mobile phones** use radio waves to transmit voice signals to antennas mounted on towers located in specific geographic areas
- The abbreviations **3G**, **4G**, and **4G-LTE** are used to describe enhanced **cell phone networks** that are optimized for the fast transmission of data
- Other networks that are **used by smart phones** include **GPS**, **Wi-Fi**, **Bluetooth**, and **NFC**

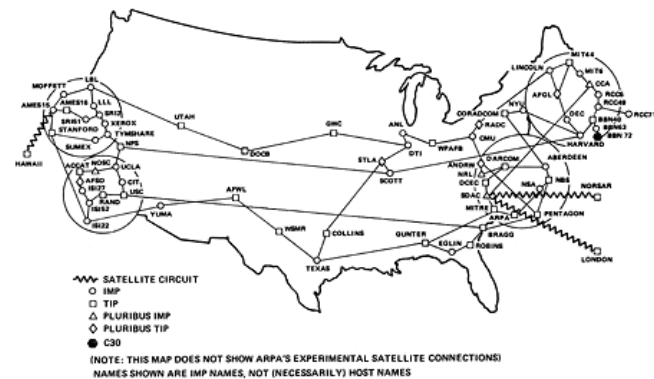


# Arpanet

- In the **1960s**, the Department of Defense of the United States began to create a computer network (**ARPANET**), whose aim was to **connect universities** and other units implementing projects for the army in order to allow them **mutual access to** the computing power of computers

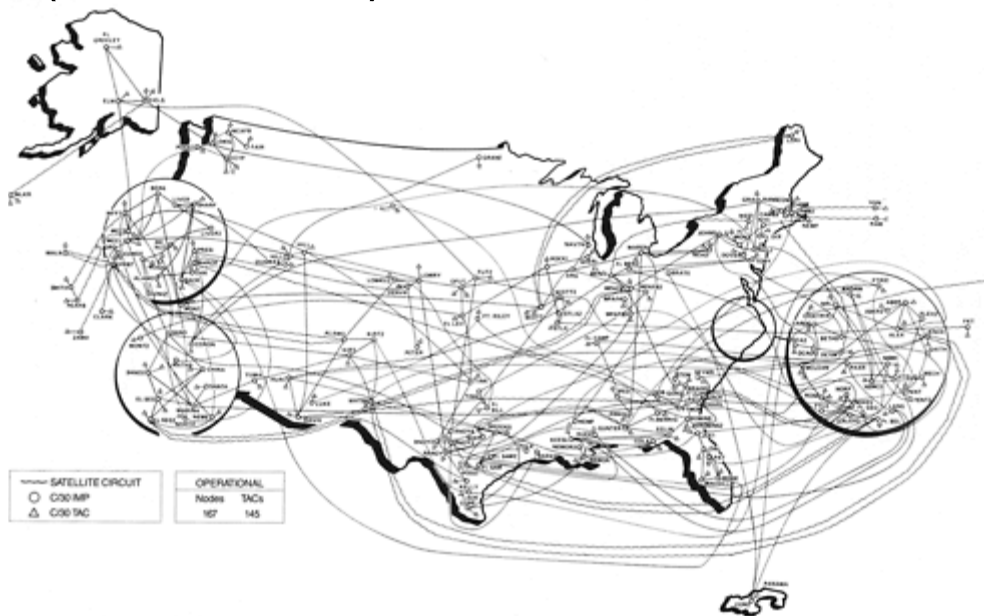


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# Arpanet

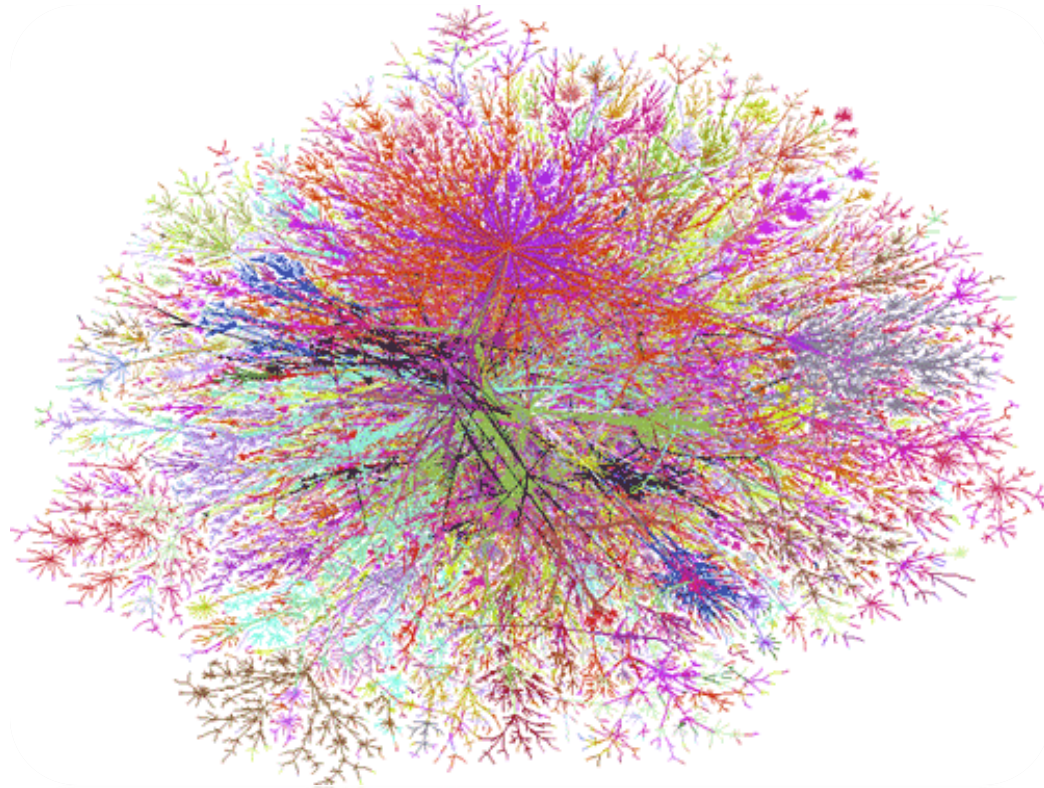
- Advanced Research Projects Agency Network (ARPANET)





# Internet

- Nowadays



Nowadays, the Internet as a medium is **the fastest and the largest** source of information, which affects changes in business behavior

# Data is Growing Exponentially

## ■ Growth of Data

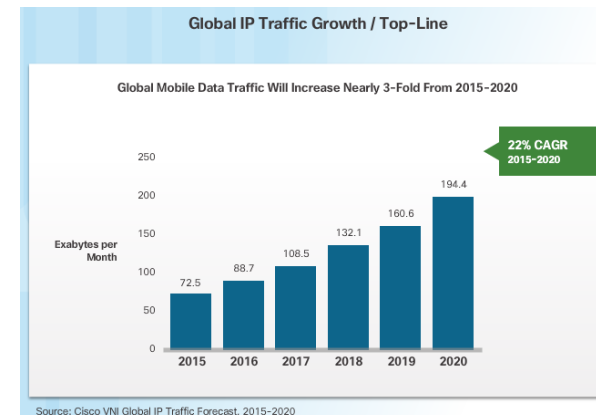
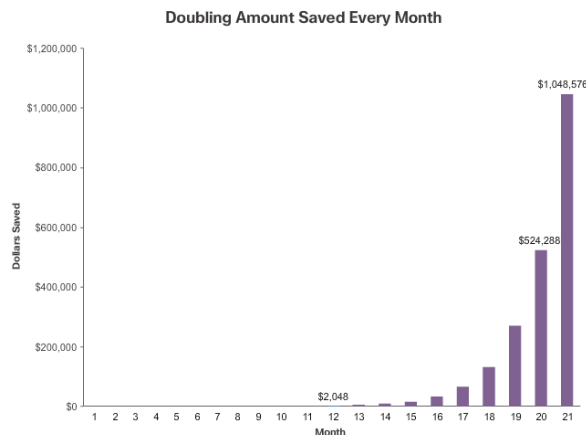
Today's data is growing **exponentially**.

**Sample data growth** forecast for 2015 to 2020 from Cisco's Visual Networking Index (VNI)

Consumer **mobile data** traffic will reach **26.1 exabytes** per month in 2020.

**IP traffic** will reach **194.4 exabytes** per month in 2020.

**64%** of all global Internet traffic will cross **content delivery** networks in 2020.





# The Data Aspect of a Connected World

- The **Value of Data**

The **amount of data** to be stored and analyzed is expanding

The **variety of data** will reach new areas

The **digital transformation** will impact three elements of our lives:

**business,**

**social,**

**environmental.**



# Internet

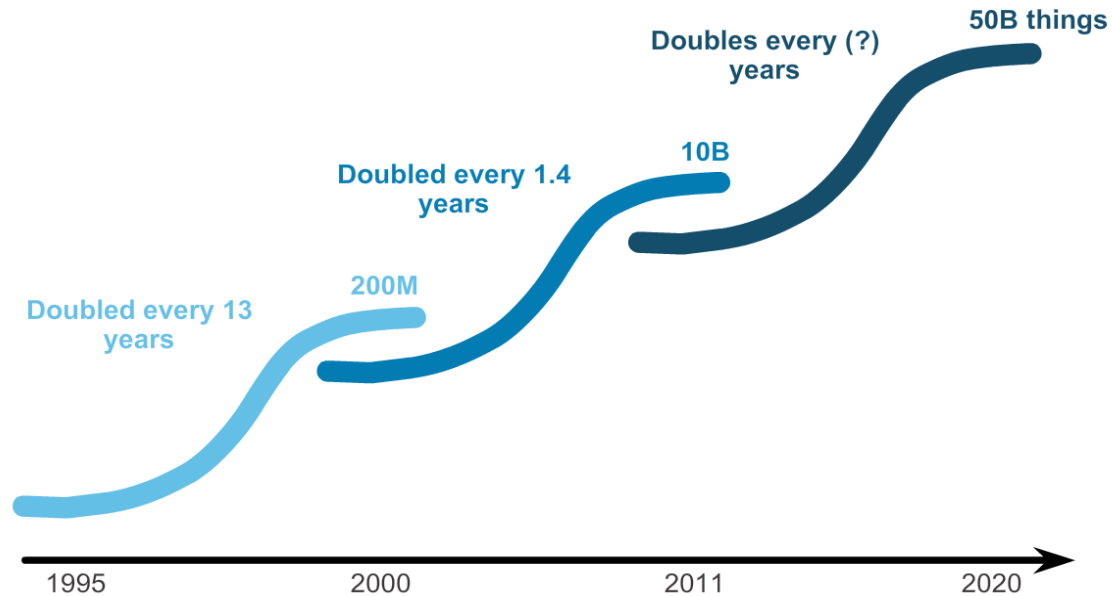
## ■ The Biggest Internet Trends

**"Fixed" Computing**  
(You go to the device)

**Mobility/BYOD**  
(The device goes with you)

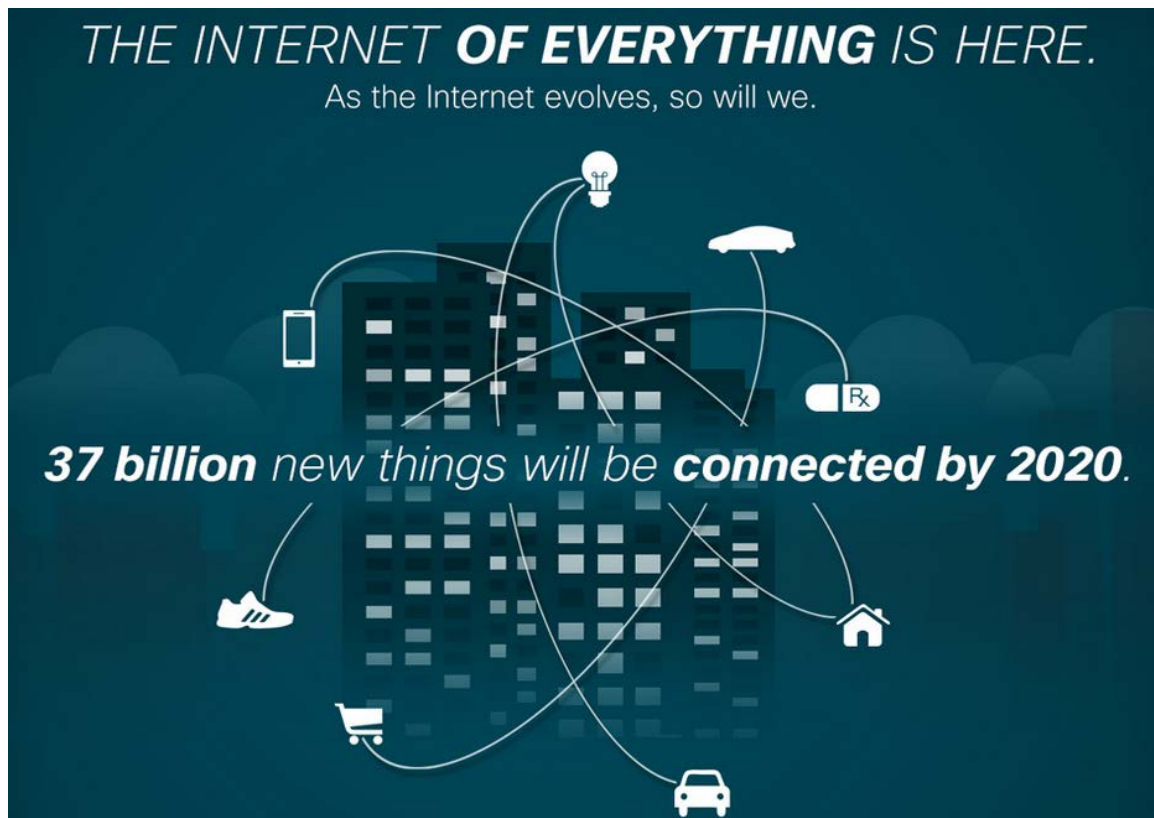
**Internet of Things**  
(Age of Devices)

**Internet of Everything**  
(People, Process, Data, Things)



# Internet

- Internet of Everything



# Five Truths about the Internet of Everything

1.



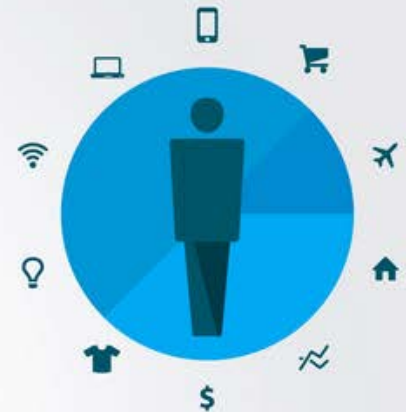
*The Internet of Everything will level the playing field for large and small companies.*

2.



*Real-time, on-the-ground information fueled by sensor technology will reveal patterns we couldn't previously see.*

3.



*Humans will still be in control.*

4.



*Standards will be key.*

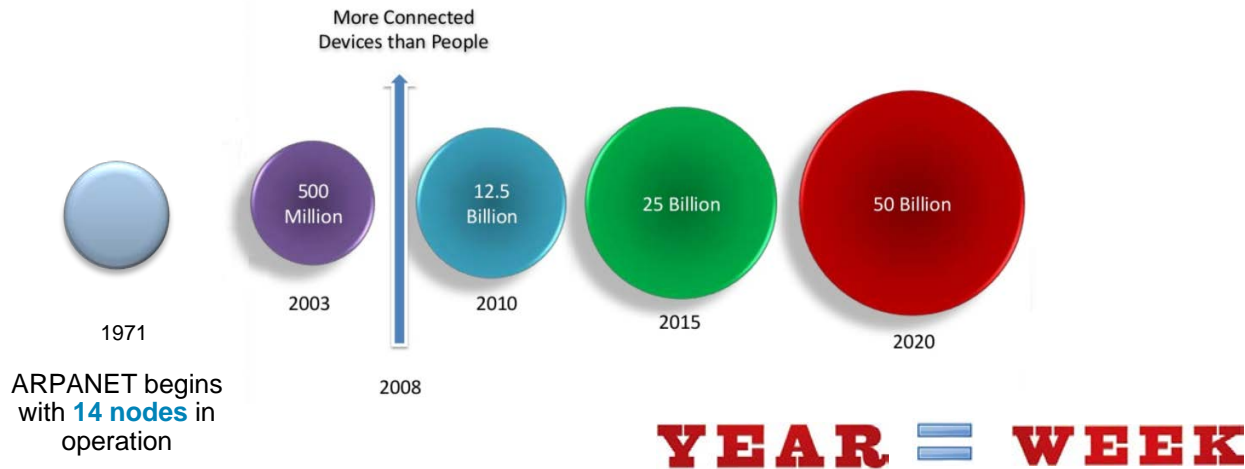
5.



*Intelligence and security at the edge will be critical.*

# The Zettabyte Era

- Annual **global IP traffic** will reach **3.3 ZB** per year by 2021



*Improving the **quality of service (QoS)** of Internet traffic is widely recognized as a **critical issue** for next-generation networks (NGN)!*

# Why Computer Networks ?

- The Internet **Big Picture**

<b>WORLD INTERNET USAGE AND POPULATION STATISTICS DEC 31, 2017 - Update</b>						
<b>World Regions</b>	<b>Population ( 2018 Est.)</b>	<b>Population % of World</b>	<b>Internet Users 31 Dec 2017</b>	<b>Penetration Rate (% Pop.)</b>	<b>Growth 2000-2018</b>	<b>Internet Users %</b>
<u><b>Africa</b></u>	1,287,914,329	16.9 %	453,329,534	35.2 %	9,941 %	10.9 %
<u><b>Asia</b></u>	4,207,588,157	55.1 %	2,023,630,194	48.1 %	1,670 %	48.7 %
<u><b>Europe</b></u>	827,650,849	10.8 %	704,833,752	85.2 %	570 %	17.0 %
<u><b>Latin America / Caribbean</b></u>	652,047,996	8.5 %	437,001,277	67.0 %	2,318 %	10.5 %
<u><b>Middle East</b></u>	254,438,981	3.3 %	164,037,259	64.5 %	4,893 %	3.9 %
<u><b>North America</b></u>	363,844,662	4.8 %	345,660,847	95.0 %	219 %	8.3 %
<u><b>Oceania / Australia</b></u>	41,273,454	0.6 %	28,439,277	68.9 %	273 %	0.7 %
<u><b>WORLD TOTAL</b></u>	7,634,758,428	100.0 %	4,156,932,140	54.4 %	1,052 %	100.0 %

<https://www.internetworldstats.com/stats4.htm>

\* **Internet User** = individual who can access the Internet at home, via any device type and connection



# Why Computer Networks ?

- No matter you want to be a **Network Engineer** or not, everybody need to have a foundational **understanding of networking** and its important role in our **daily lives** and the success of businesses of all sizes



# Network certification exam

- **Routing & Switching**
- **Design**
- **Security**
- **Wireless**
- **Storage Networking**
- **Service Provider**
- **VoIP (Voice over IP)**





QA



L1