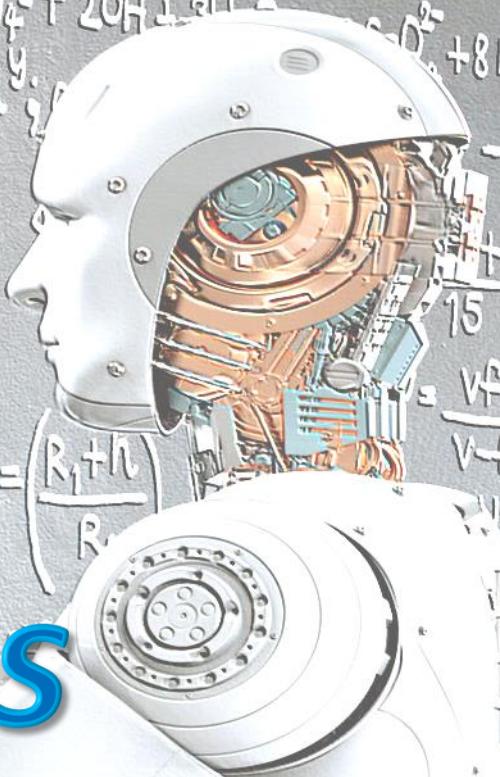
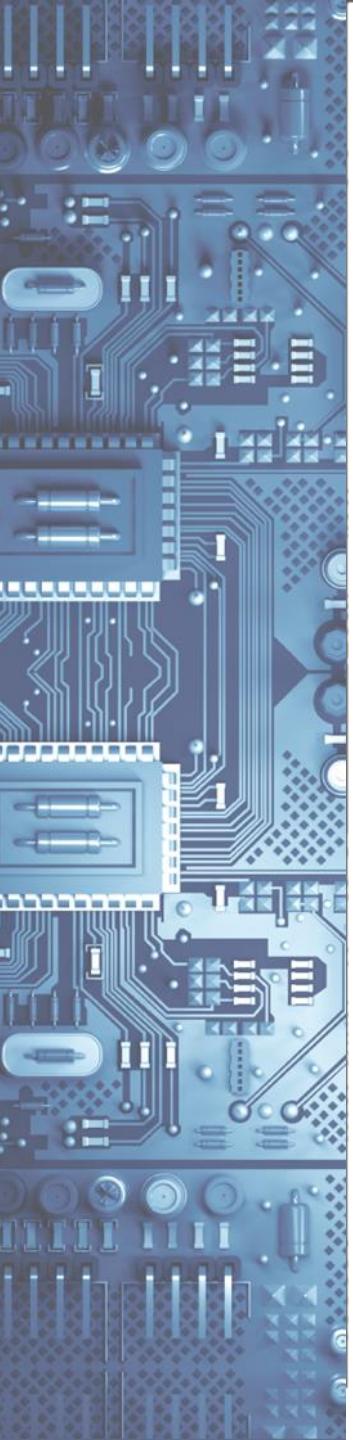
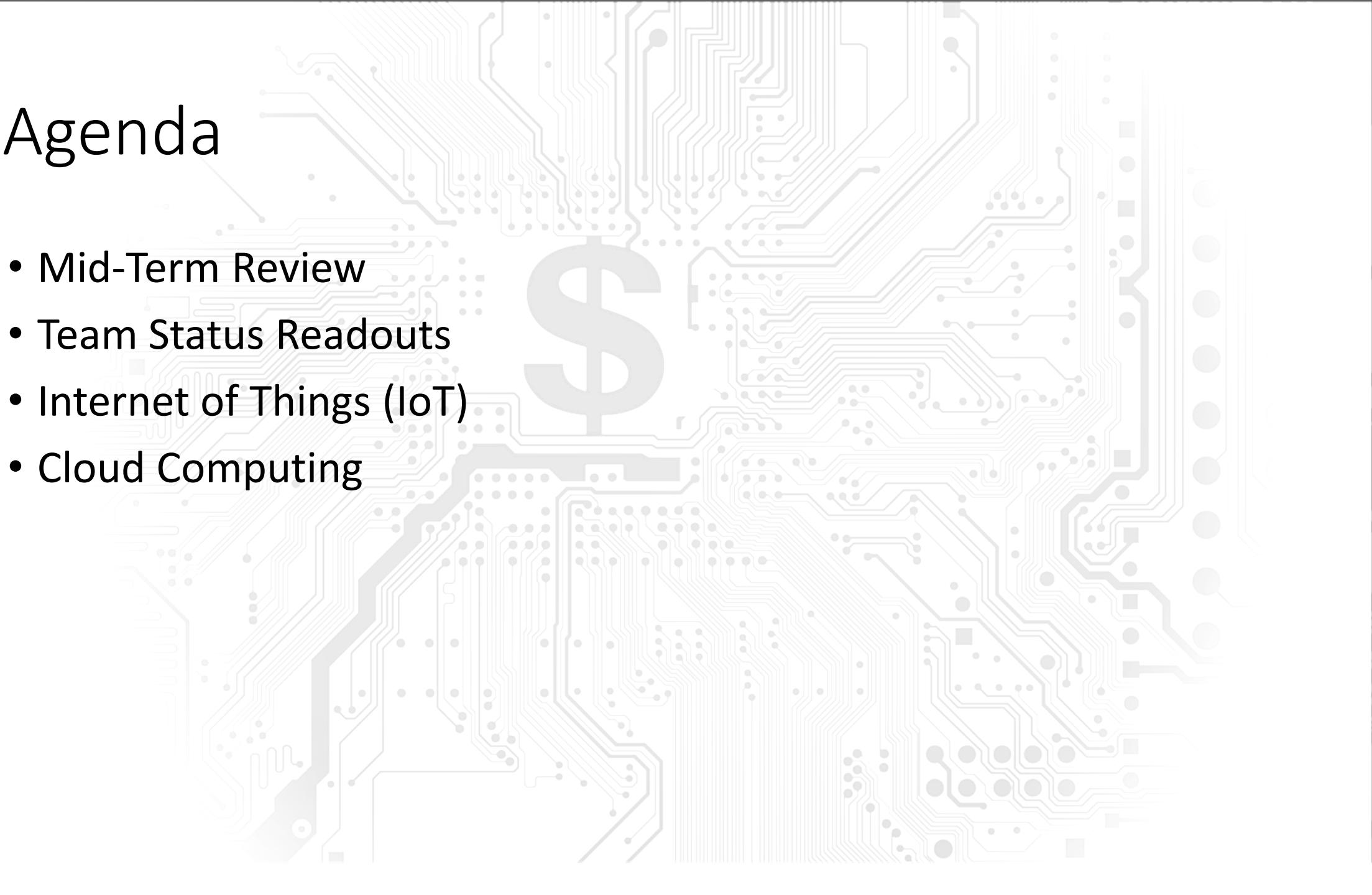


Advanced Topics in Information Systems





Agenda



- Mid-Term Review
- Team Status Readouts
- Internet of Things (IoT)
- Cloud Computing

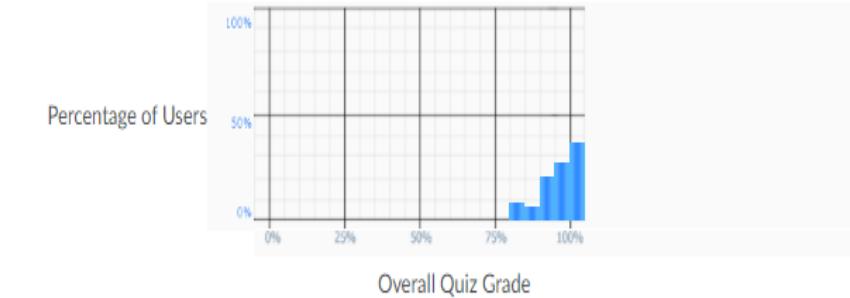


MIDTERM EXAM REVIEW

Statistics

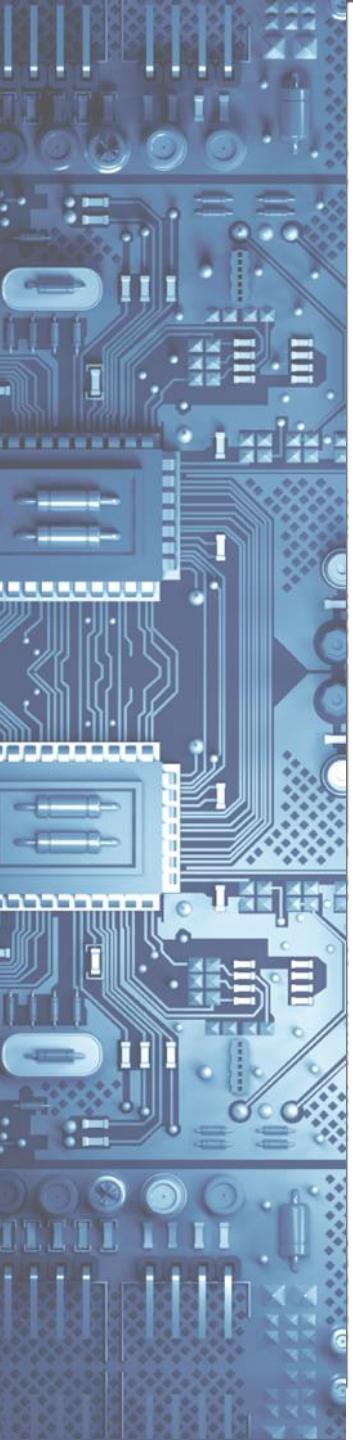
- ❖ Low = 80% (4) , High = 100% (18)
- ❖ Mean (Average) = 94.24%
- ❖ Median (Midpoint of distribution) = 95% (13)
- ❖ Mode (Most frequently occurring) = 100% (18)

Grade Distribution:

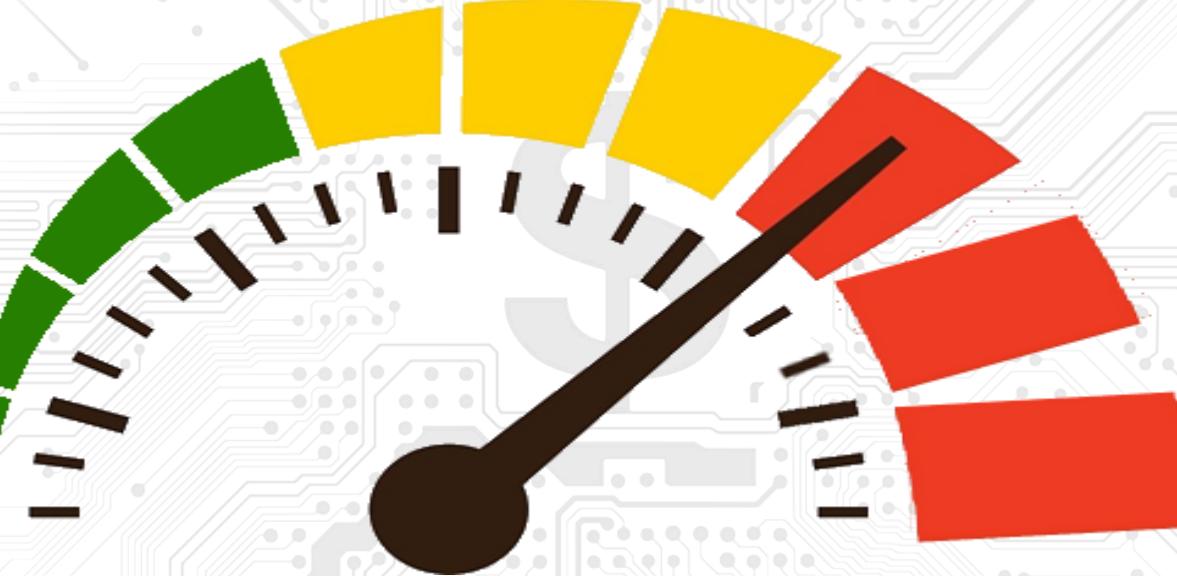


Class Average:

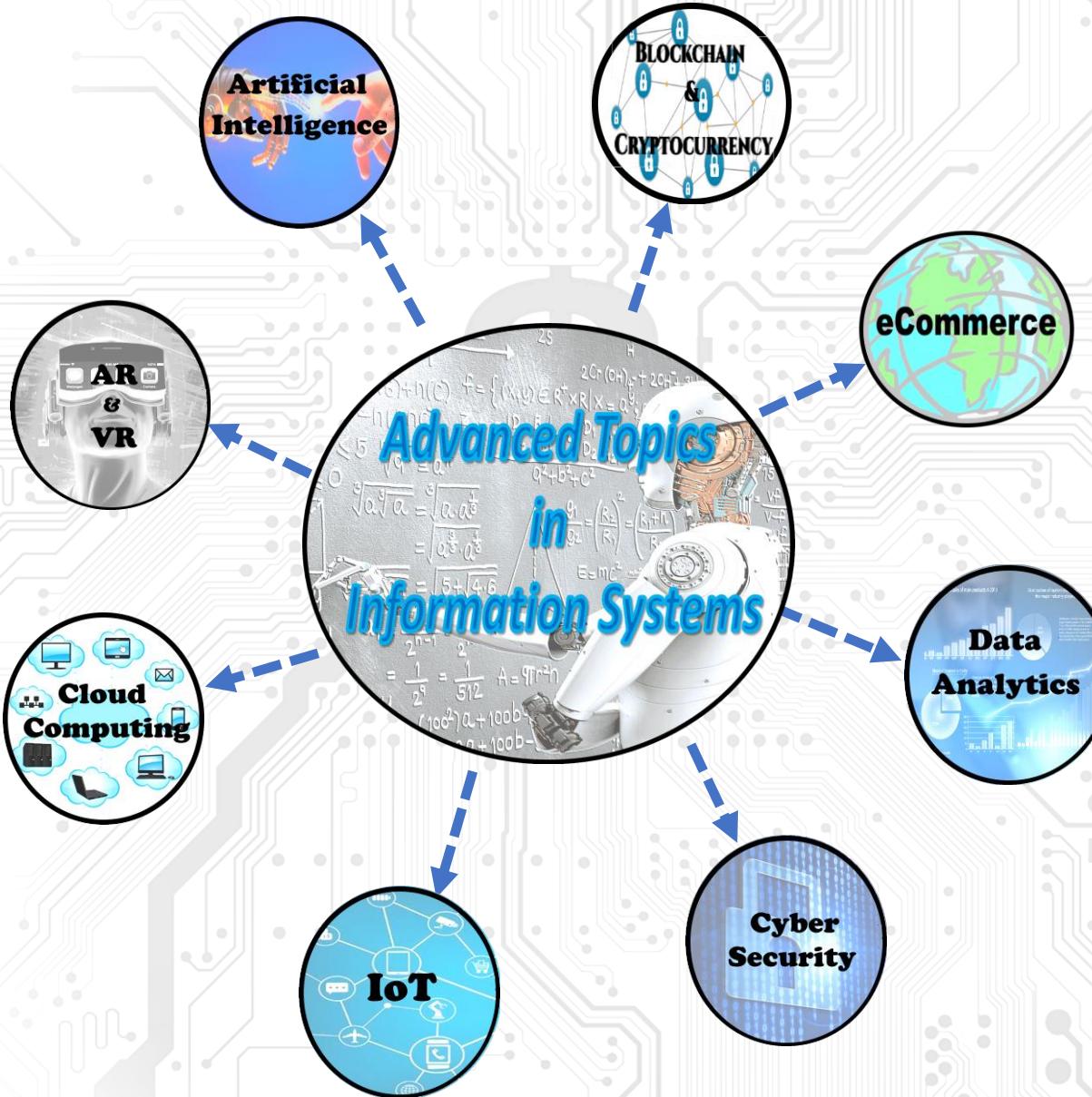
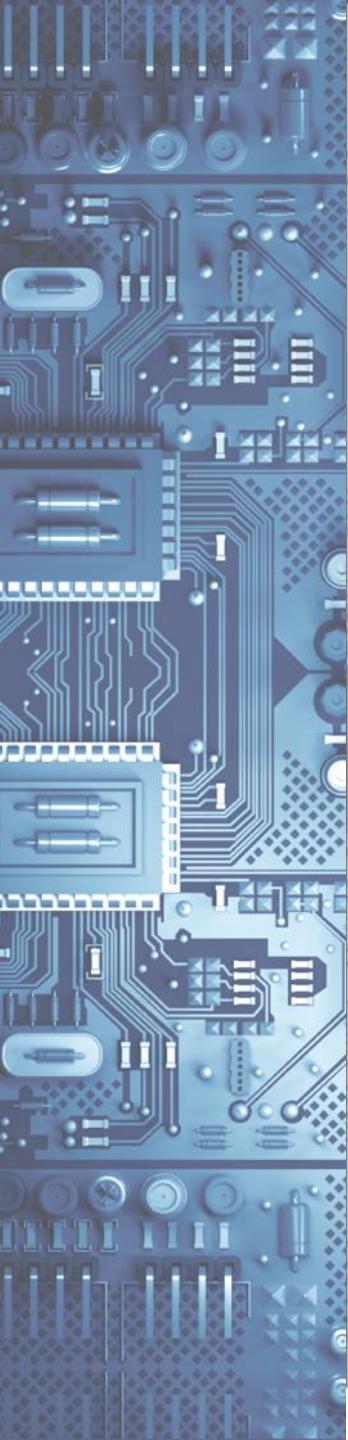
94.24 % (Std Dev = 6.23 %)



Team Readouts:



- Status (Green / Yellow / Red)
- Issues / Concerns?
- Team Dynamics?



Recent Technology Developments



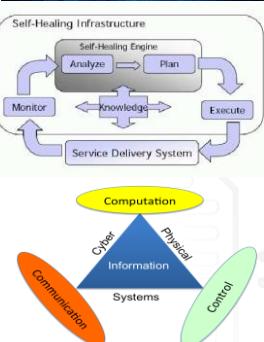
1. Technology Miniaturization (small & cheap)



2. Expanding Global Network

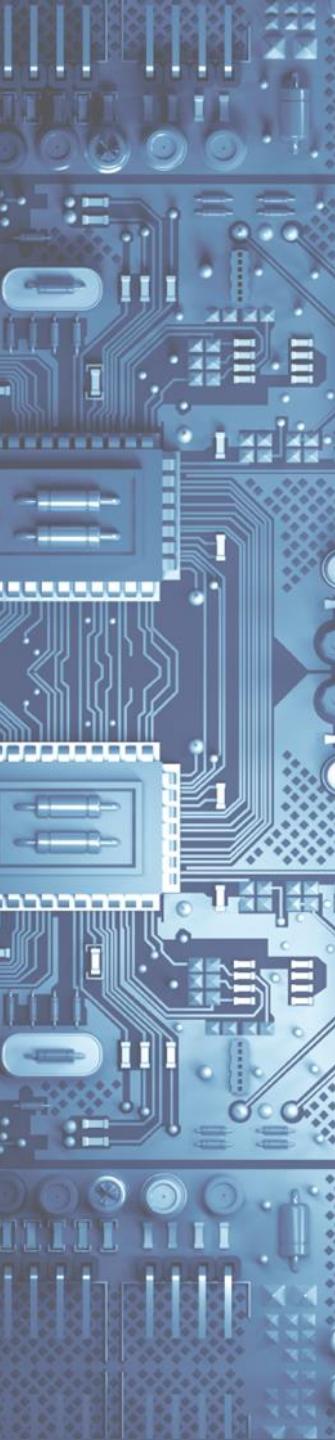


3. Increased DISTRIBUTED computing Power



4. Self-Healing Systems using AI and Machine Learning

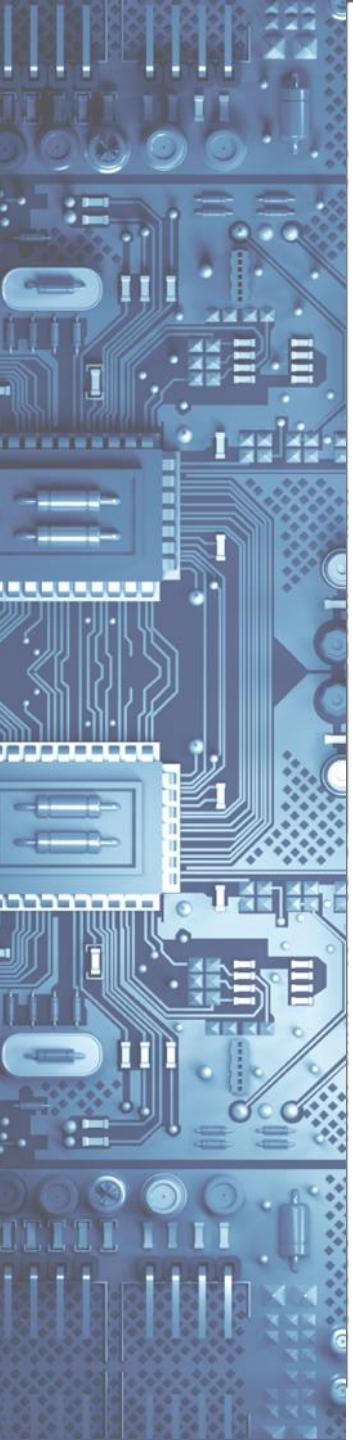
5. Cyber-Physical Systems!



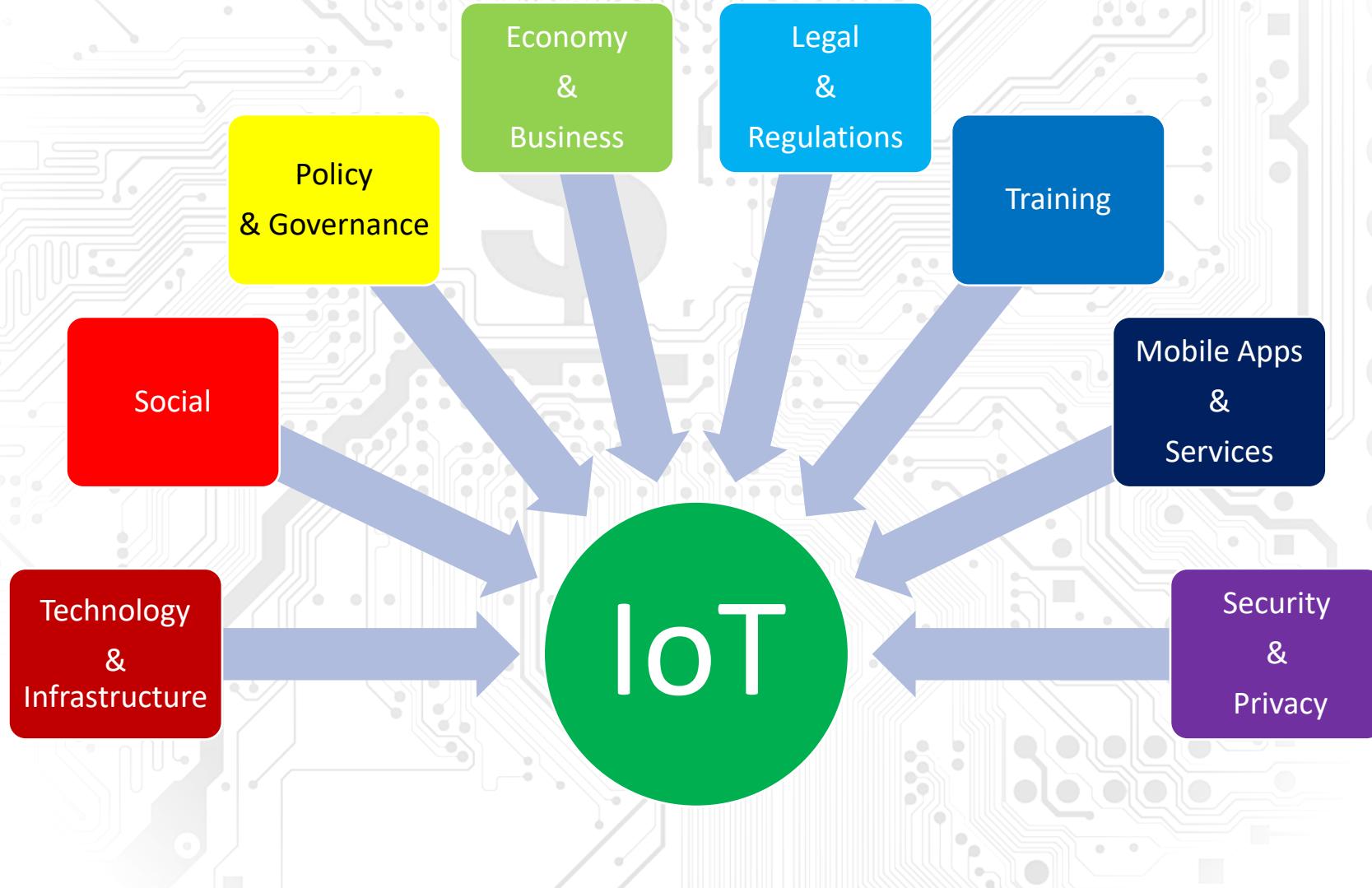
What is the Internet of Things?

- A **network of devices** such as vehicles, and home appliances that contain electronics, **software, sensors, actuators, and connectivity** which allows **these things to connect**, interact and exchange data.
- These devices collect useful data with the help of various existing technologies and then autonomously flow the data between other devices.



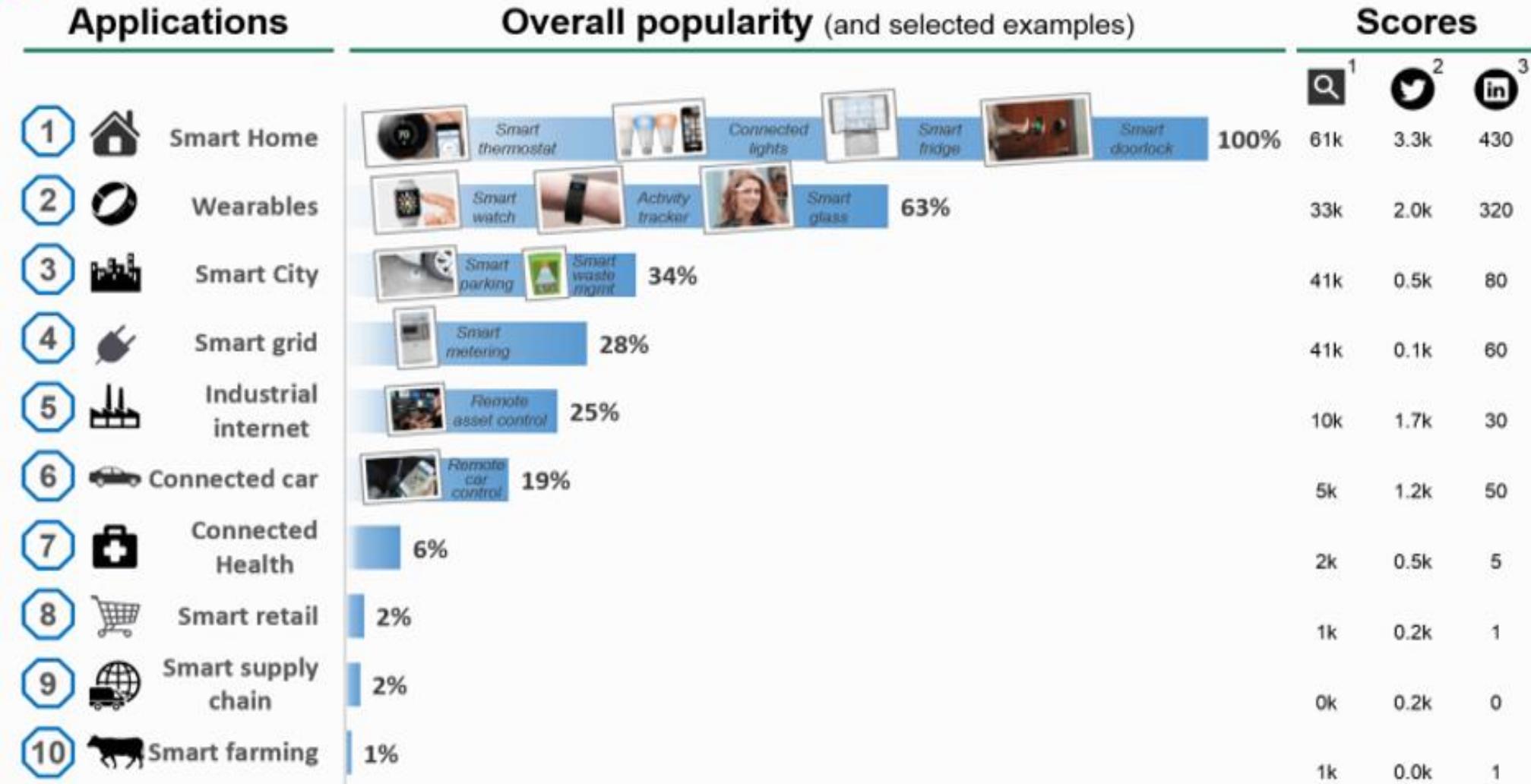


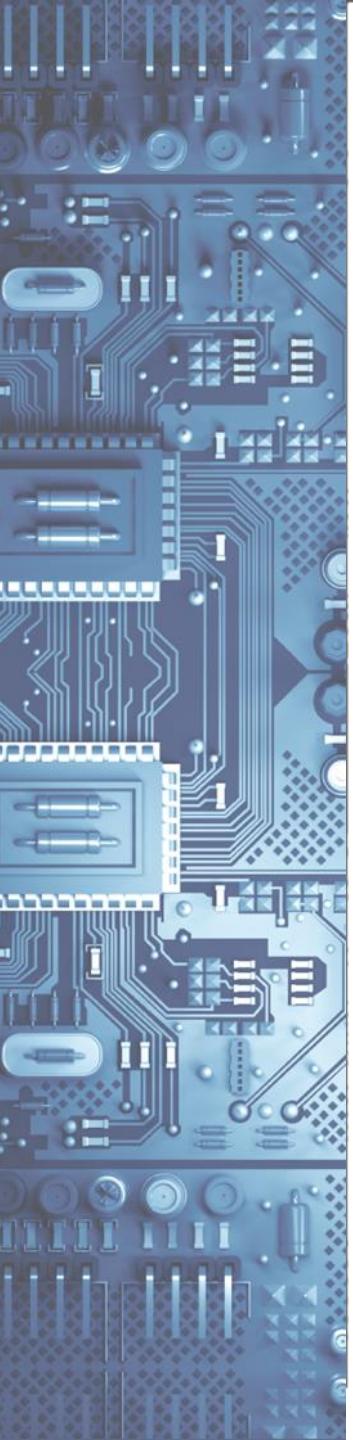
Where is it Being Used?



How Often is IoT Searched?

IoT Analytics – Quantifying the connected world





Why Fintech should be concerned about IoT?

- Like all new technology, the Internet of Things brings both a **beneficial** and **disruptive** element.
 - With the concept of “always-on”, IoT technology will require a change in mindset when considering implementation of fintech products and services.
- 

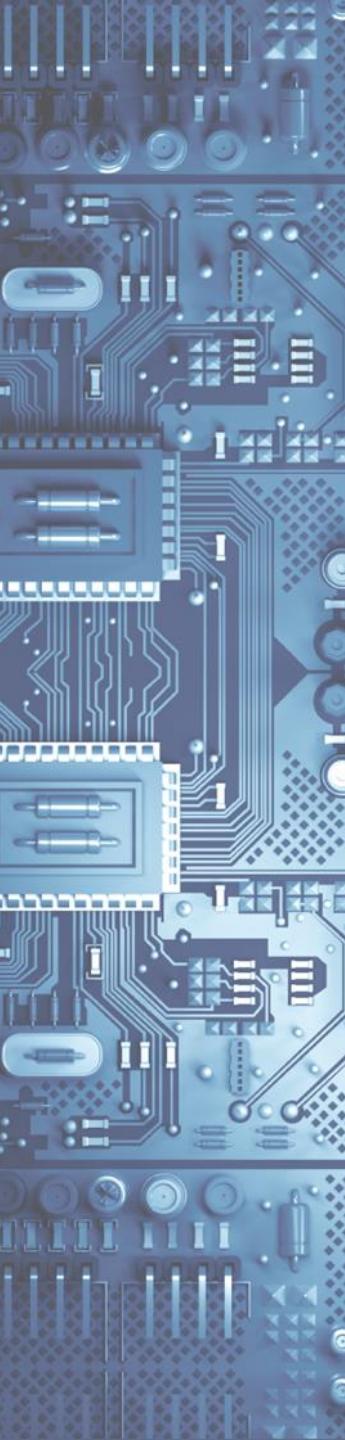


Things Changing in Fintech Due to IoT

1. Increased transparency

By using IoT solutions, banks and financial organizations gain real-time data on their own and their clients' assets, which leads to effective risk management.



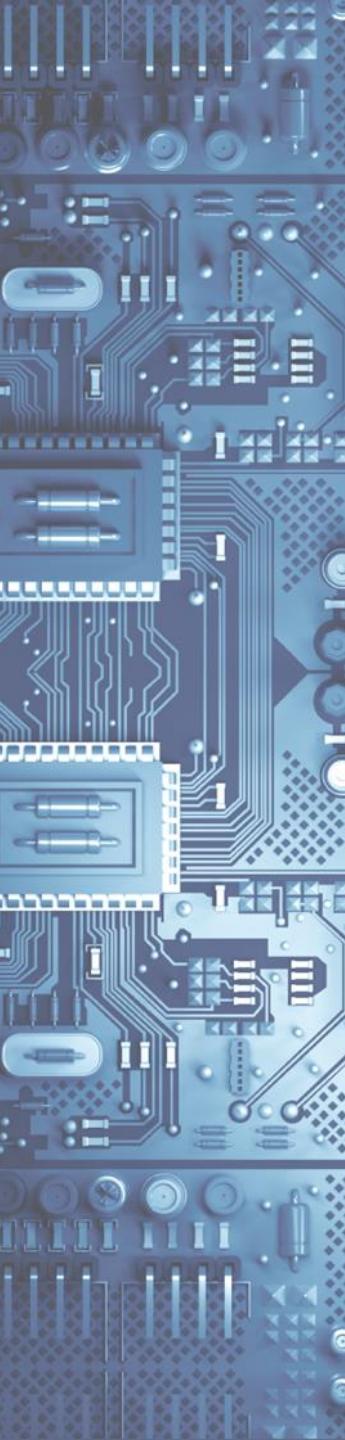


Things Changing in Fintech Due to IoT

2. Automation of trading and investment activities

- According to Dr. John Bates, “**The future of the financial services industry lies in real-time market surveillance** and pricing engines enabling companies to monitor traders’ activities on stock markets, social media and communication platforms and **adjust their policies accordingly**. ”
- Brett King, CEO of Moven, believes “**most payment and financial transactions will be fully automated in the near future.**”



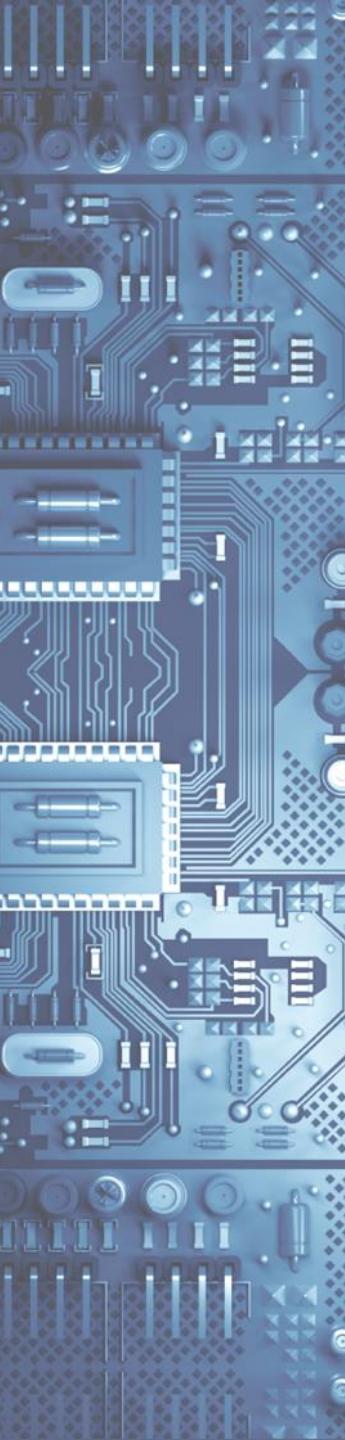


Things Changing in Fintech Due to IoT

3. Payment transaction security

- Smart gadget manufacturers are now offering multiple tools to secure payment transactions.
- These include tokens, biometrics-based authentication programs and Near Field technology paired with POS terminals.





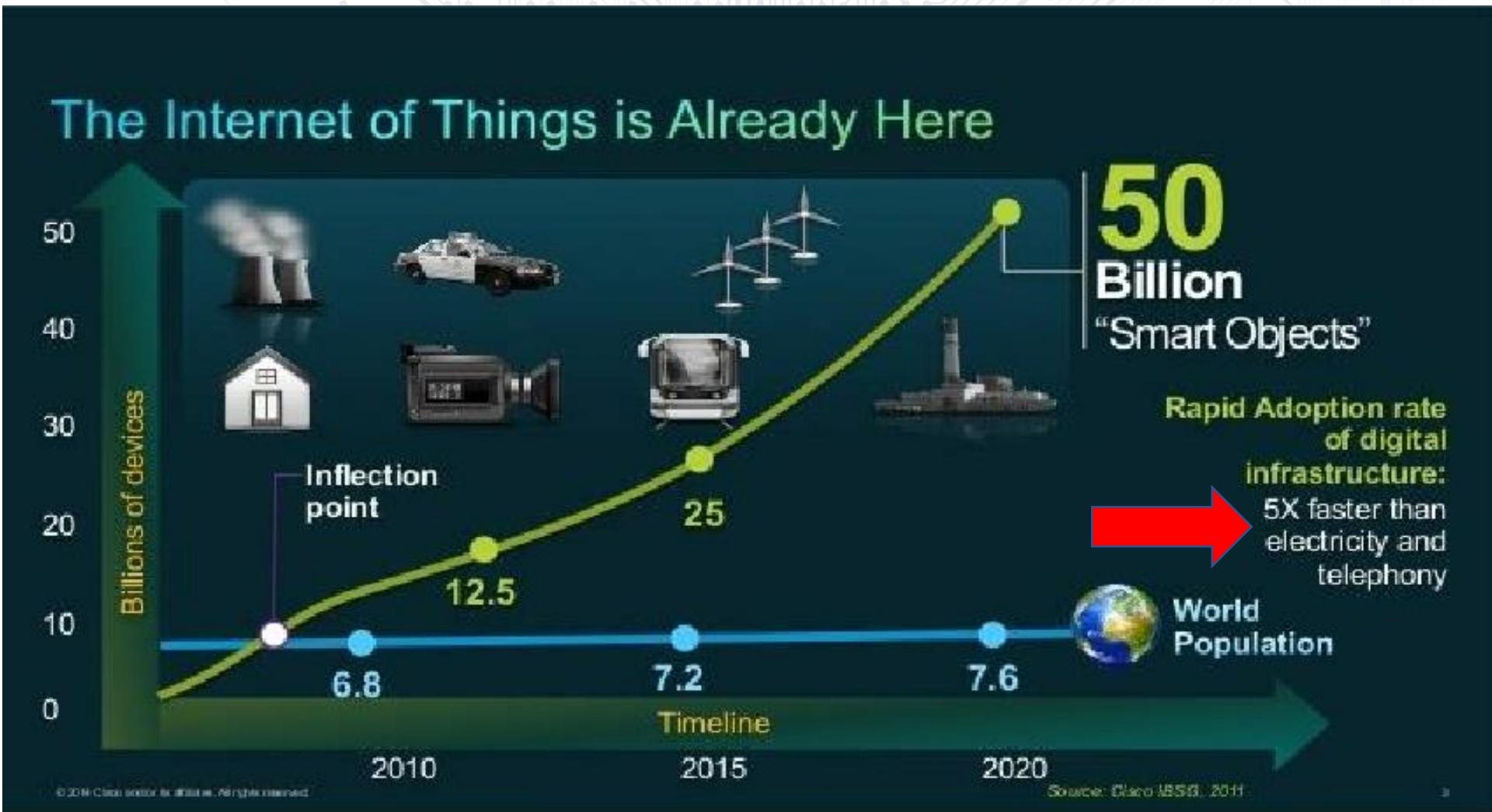
Things Changing in Fintech Due to IoT

4. Improved customer services

- There are several ways to increase customer satisfaction with innovative IoT financial services
 - For example, Barclays putting their mobile app on a smart watch.
 - Westpac Australia (retail bank) installing beacons to engage customers who walk past their office or come for an appointment.
 - The beacon strategy includes a personal greeting, product offers based on a customer's previous activities and surveys.



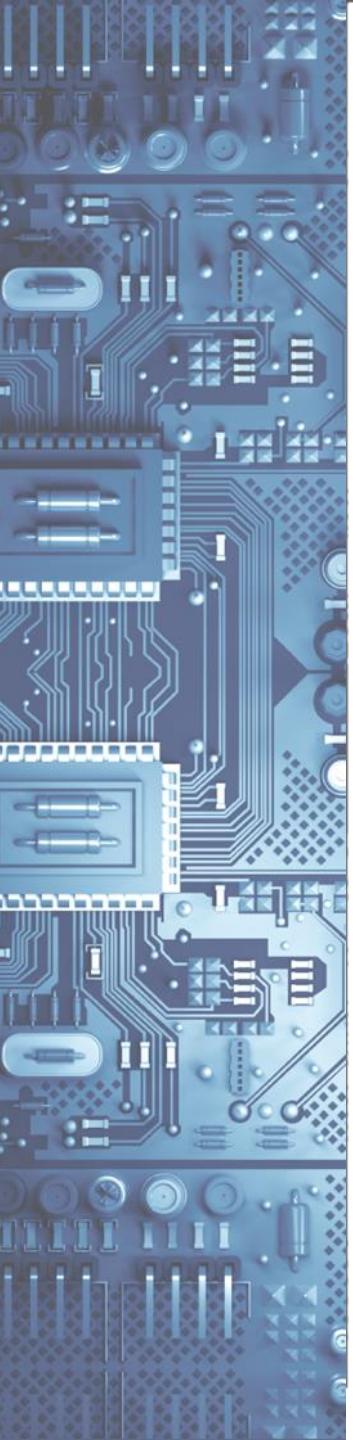
Future of IoT



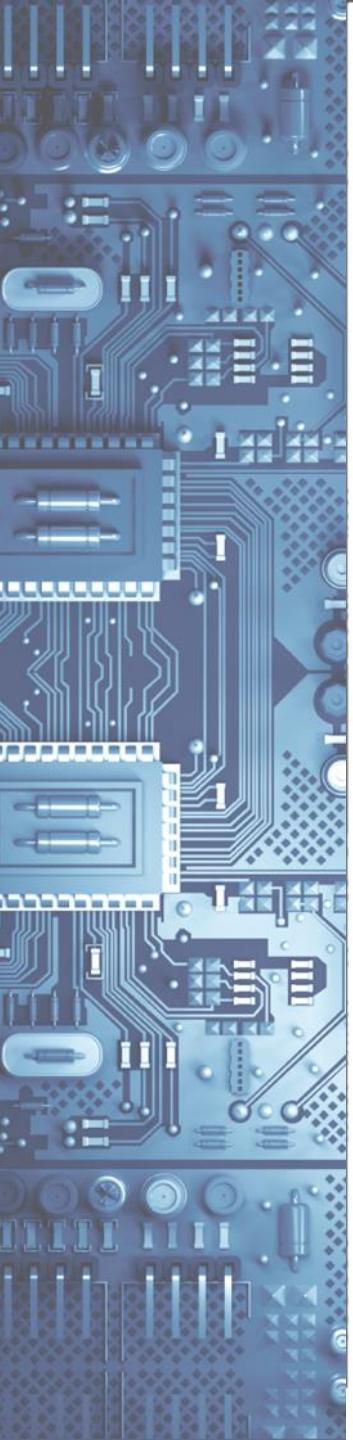
Threat or Opportunity in Fintech

- IoT can **pose a risk to the customer, the organization, and to society as a whole.**
- *But.... if done correctly, IoT will*
 - Enhance communications
 - Provide a richer lifestyle to the customer
 - Deliver high quality services to the market



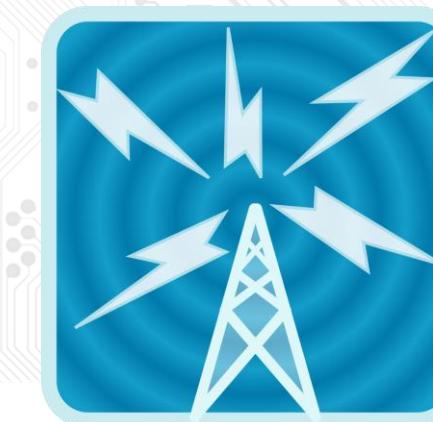


IoT requires
Mobile Computing



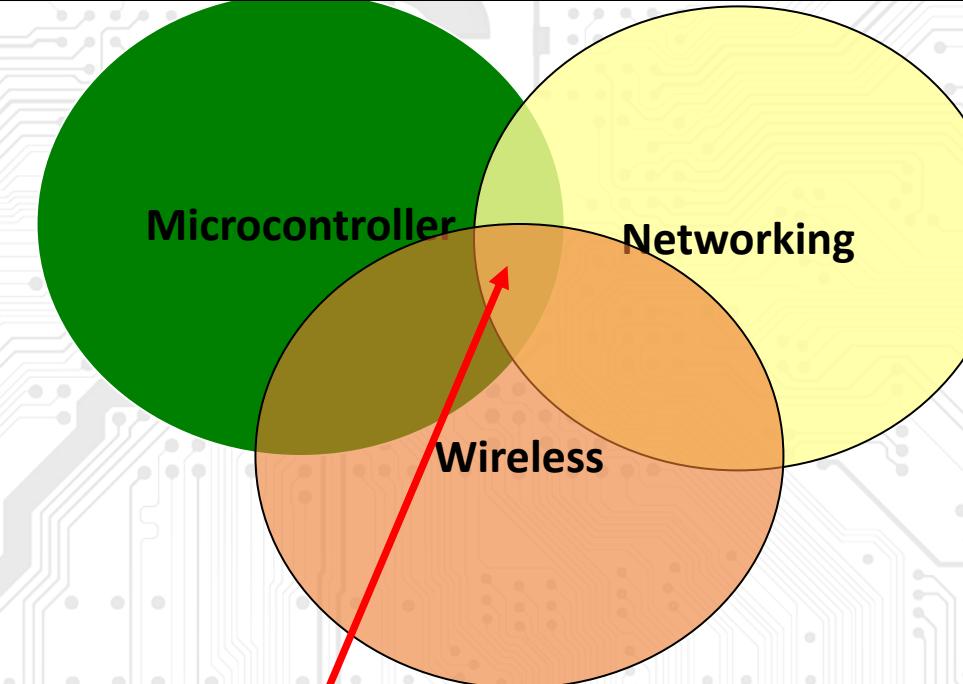
Telecommunication Terms

- **Data Communications**
 - The electronic transmission of encoded information to, from, or between computers.
- **Networking**
 - Linking multiple devices so that they can readily share information and software resources
- **Networks of Communication Systems (*IoT!*)**
 - Collection of individual telecommunications **networks, transmission systems**, relay stations, tributary stations, and terminal equipment usually capable of interconnection and interoperation to form an integrated whole

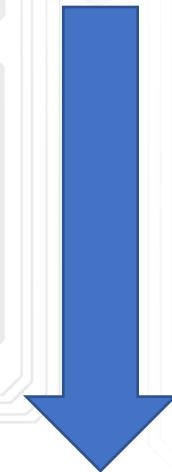


Network Trends (1980-Present)

Combining Voice, Image, Data, Video



1980



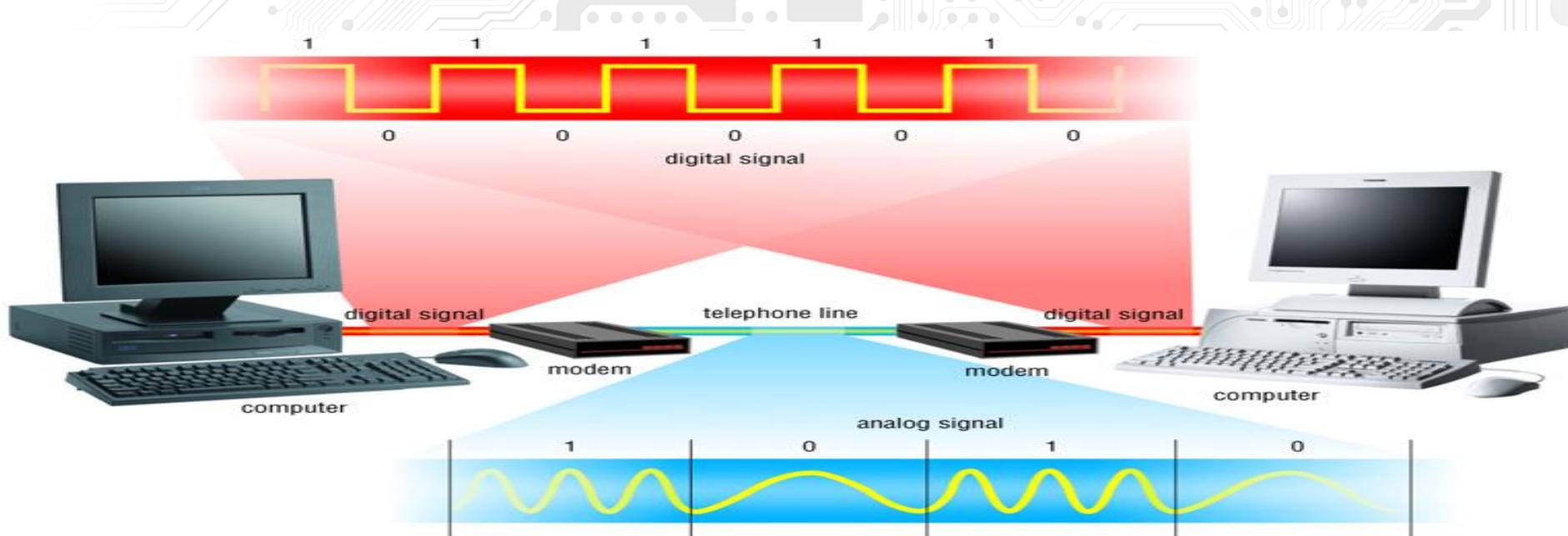
Present

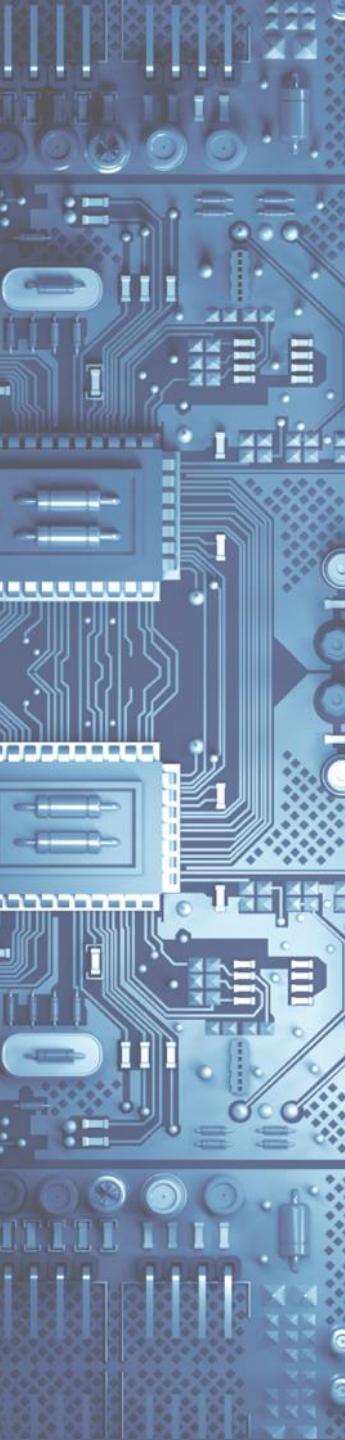
Integrated Systems is where it is at in Fintech!



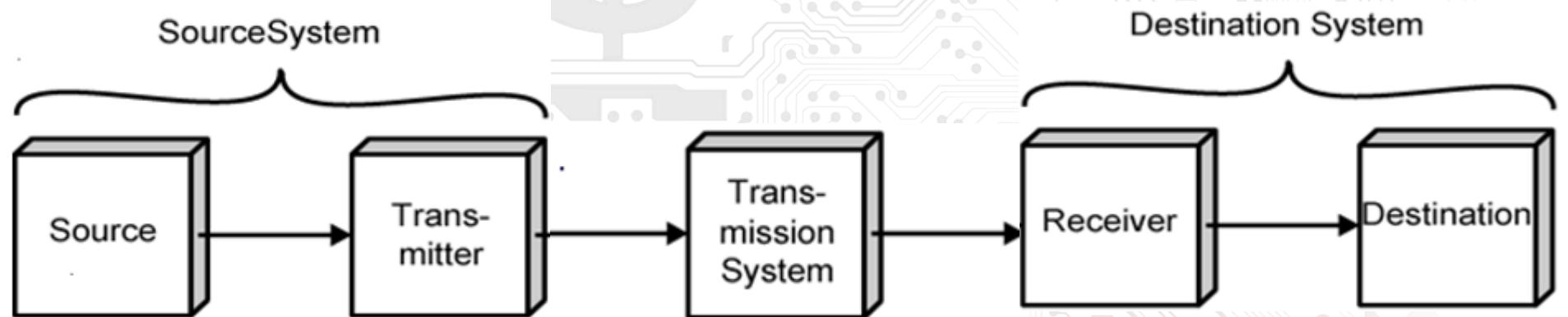
Communication Systems

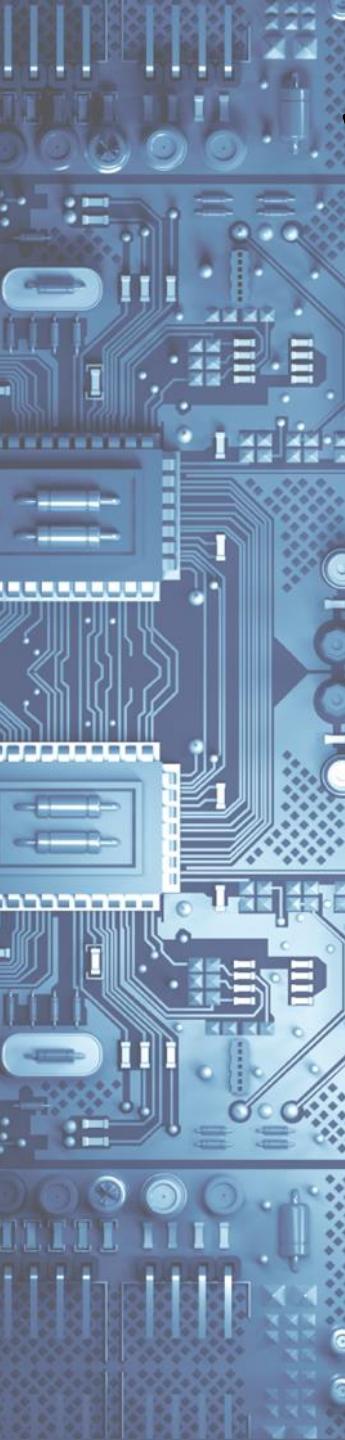
- There are a lot of components in the communication ecosystem.
- More than the computers sitting on opposite endpoints of the path
- There are modems, usually “telephone” lines and it often involves a combination of analog and digital signals!





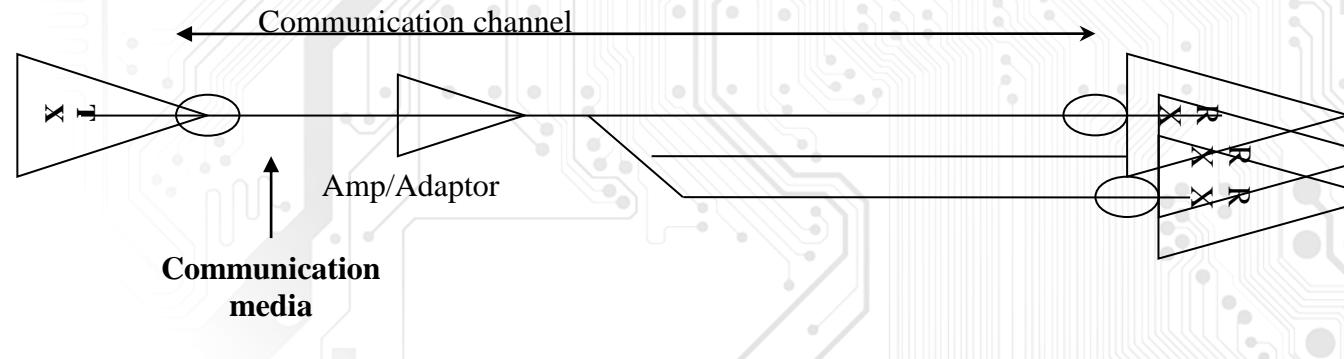
A Common Communications Model

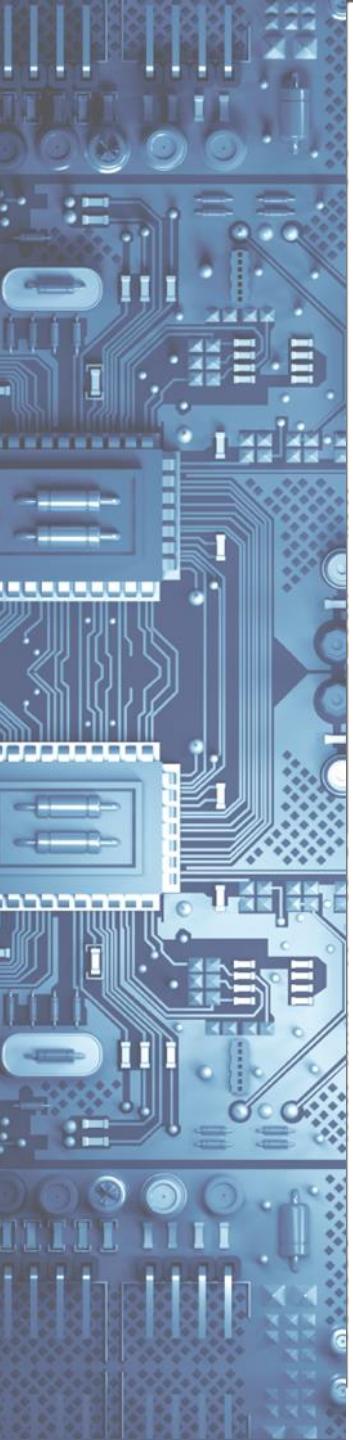




What are Communication Systems

- The process describing transfer of information, data, instructions between one or more systems through some media
- Includes signals passing through the communication channel that can be Digital, or Analog
 - **Analog signals:** *continuous electrical waves*
 - **Digital signals:** *individual electrical pulses* (bits & bytes)
- Receivers and transmitters

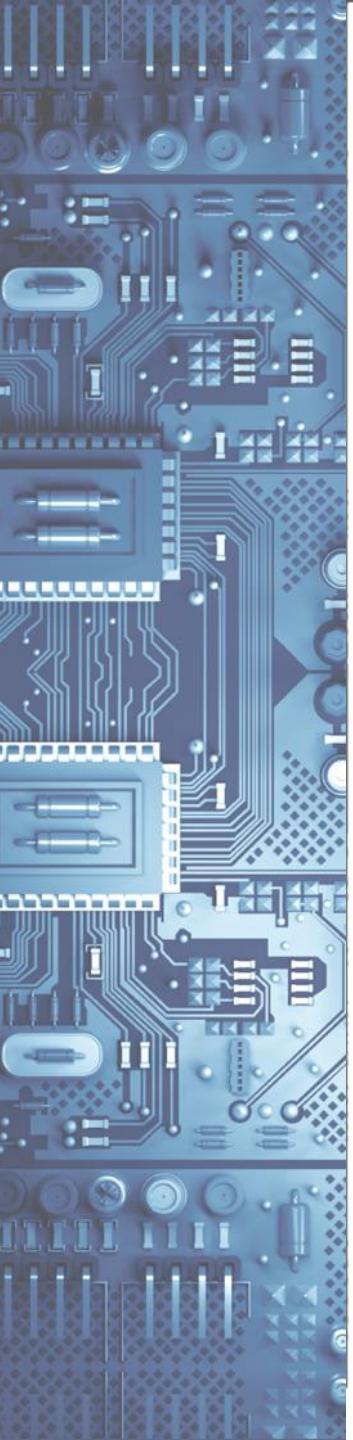




Communication System Terminology

- **The source** originates a message
- **The transmitter** modifies the baseband signal for efficient transmission.
- **The channel** medium through which the output is sent
 - **Wireline** communication systems
 - **Wireless** communication systems
- **Receiver** reprocesses original Signal from source





Digital vs. Analog Communications

Messages / Signals are either digital or analog

- **Digital messages** are constructed with a finite number of symbols

Digital Signal



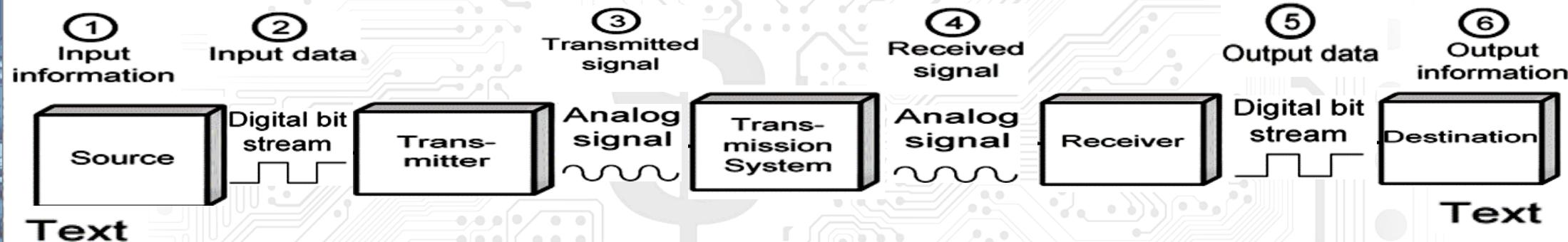
- **Analog messages** are characterized by data that has a continuous range

Analog Signal



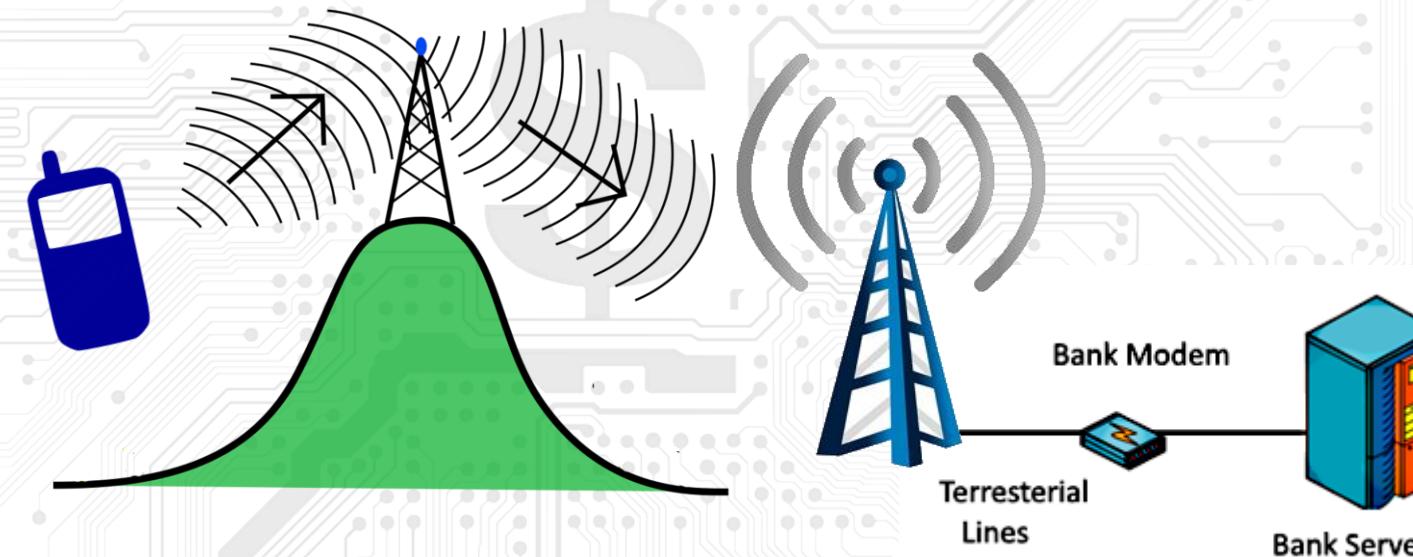
A Typical Digital / Analog Communications Model

Lets assume you wanted to send a “text” message to a friend.



1. You would key that into your phone
2. Which will create a digital stream and send it a cell phone tower
3. A transmitter will convert it to an analog signal and the signal will then travel over terrestrial lines
4. Until it gets to the cell tower closest to you
5. A Receiver will convert it back to digital and send it to your phone
6. Which will then convert into readable text

A Cellphone Financial Communication Model

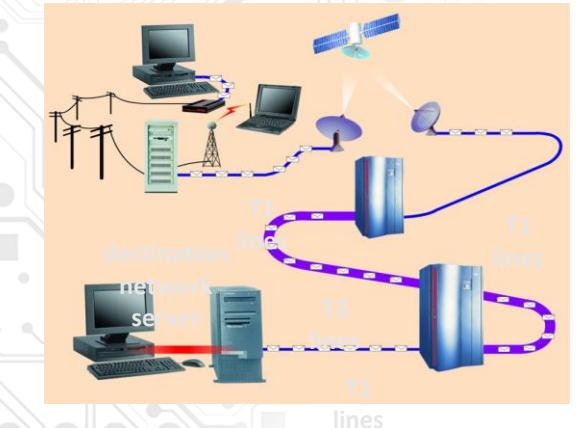


Financial communication models work much the same way except it would go through a bank modem and to a backend server to complete the transaction



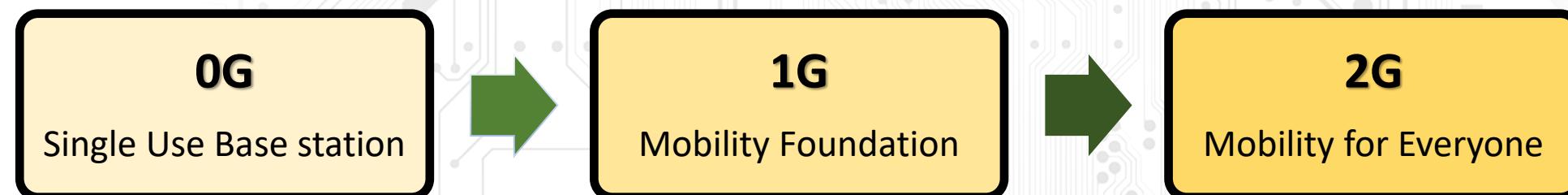
Channel Capacity Matters!

- **Channel capacity:**
 - Also called **channel bandwidth**
 - How much data can be passed through the channel (bit/sec)
 - The smaller the pipe the slower data transfer!
- **Capacity varies by Transmission media**
 - Physical (wire / cable)
 - **Wireless: (air)**



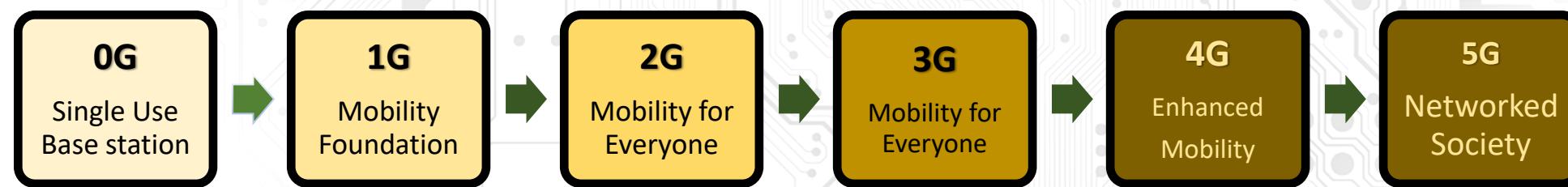
Cellular Networks Explained

- **0G : (1940's)**
 - Single, powerful base station covering a wide area, and each telephone would **effectively monopolize a channel over that whole area** while in use
 - No frequency use or handoff (basis of modern cell phone technology)
- **1G : (1980's)**
 - Fully automatic cellular networks
- **2G : (1990's)**
 - Introduced in Finland on the GSM standard
 - Offered the first data service with person-to-person **SMS text messaging**



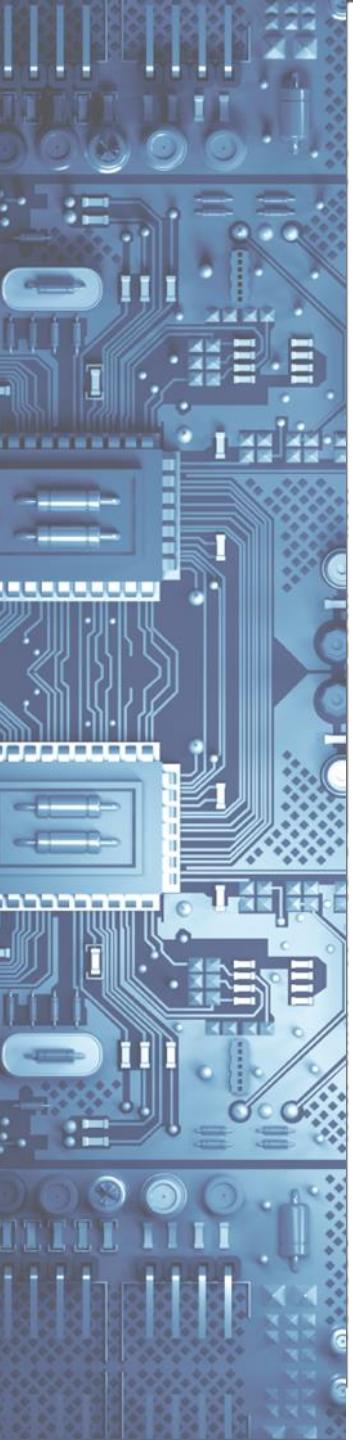
Today's Common Cellular Networks

- **3G: (2000)**
 - Faster than PCS*; Used for multimedia and graphics
 - Allows simultaneous use of speech and data services and higher data rates
- **4G: (2010)**
 - Fourth generation of cellular wireless;
 - providing a comprehensive and secure IP based service to users
- **5G: (2020)**
 - Fifth generation of cellular wireless;
 - Any system using "5G NR" (5G Near Radio)
 - Came into general use by late 2018
 - **It is here, but limited for now!**

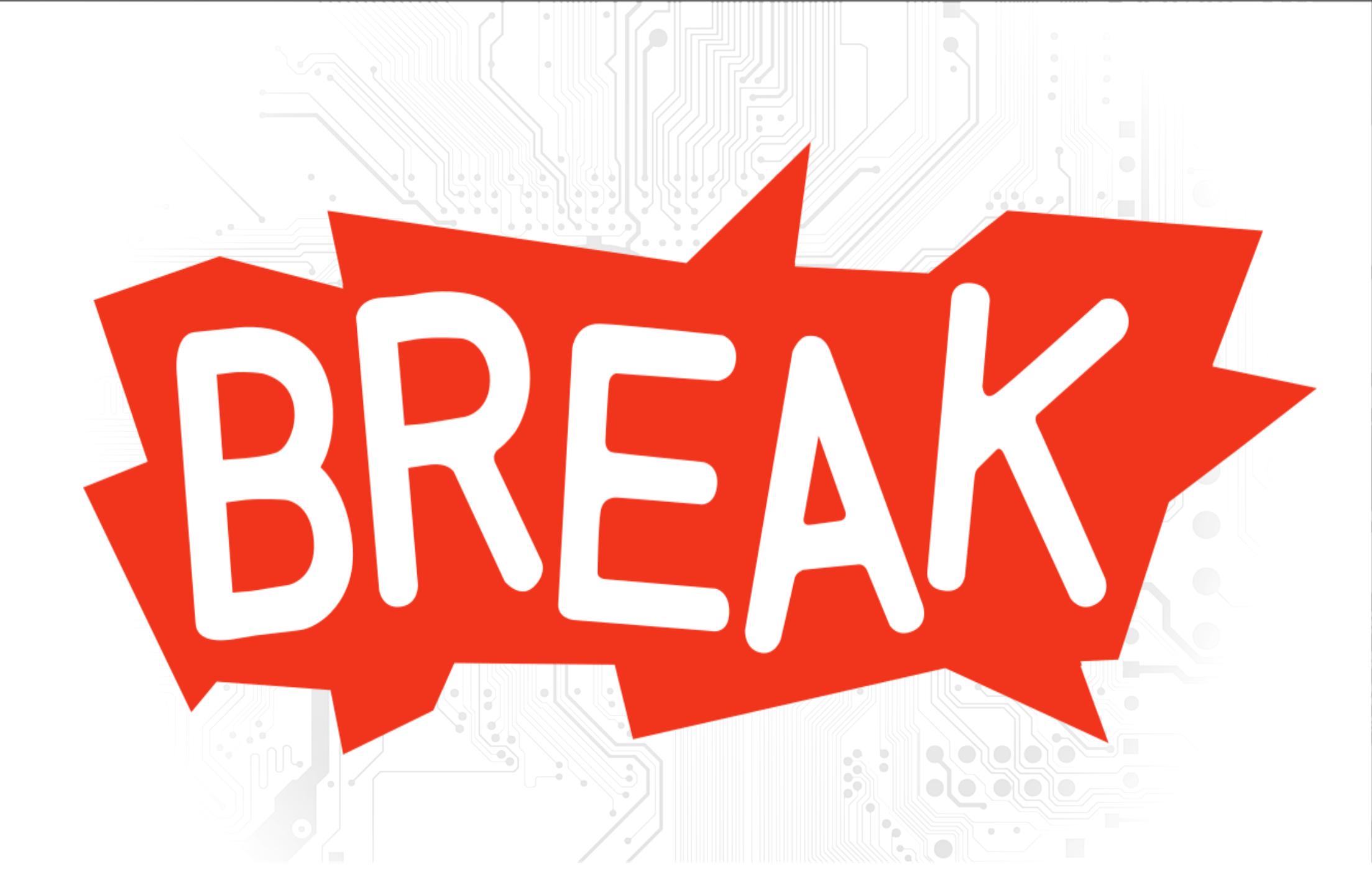


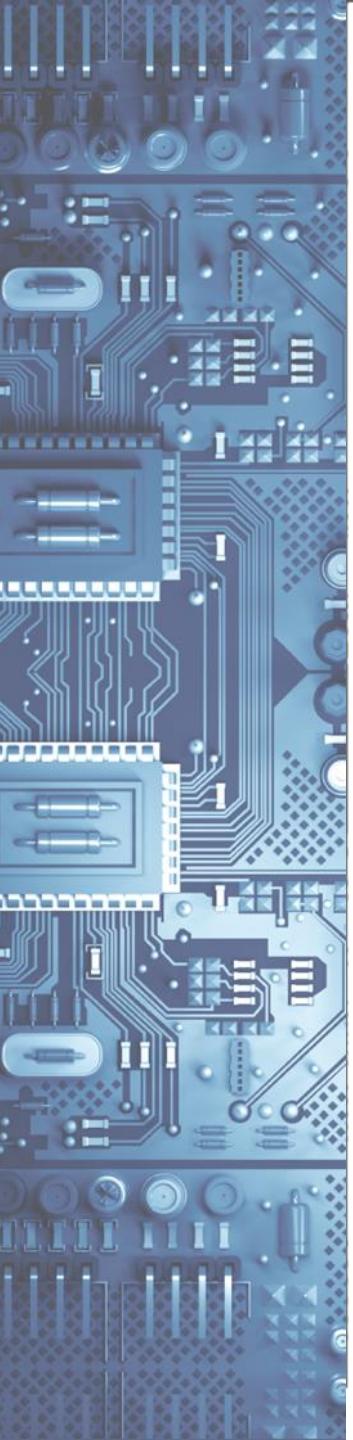
*PCS (personal communications service) is a wireless phone service similar to today's cellular telephone service



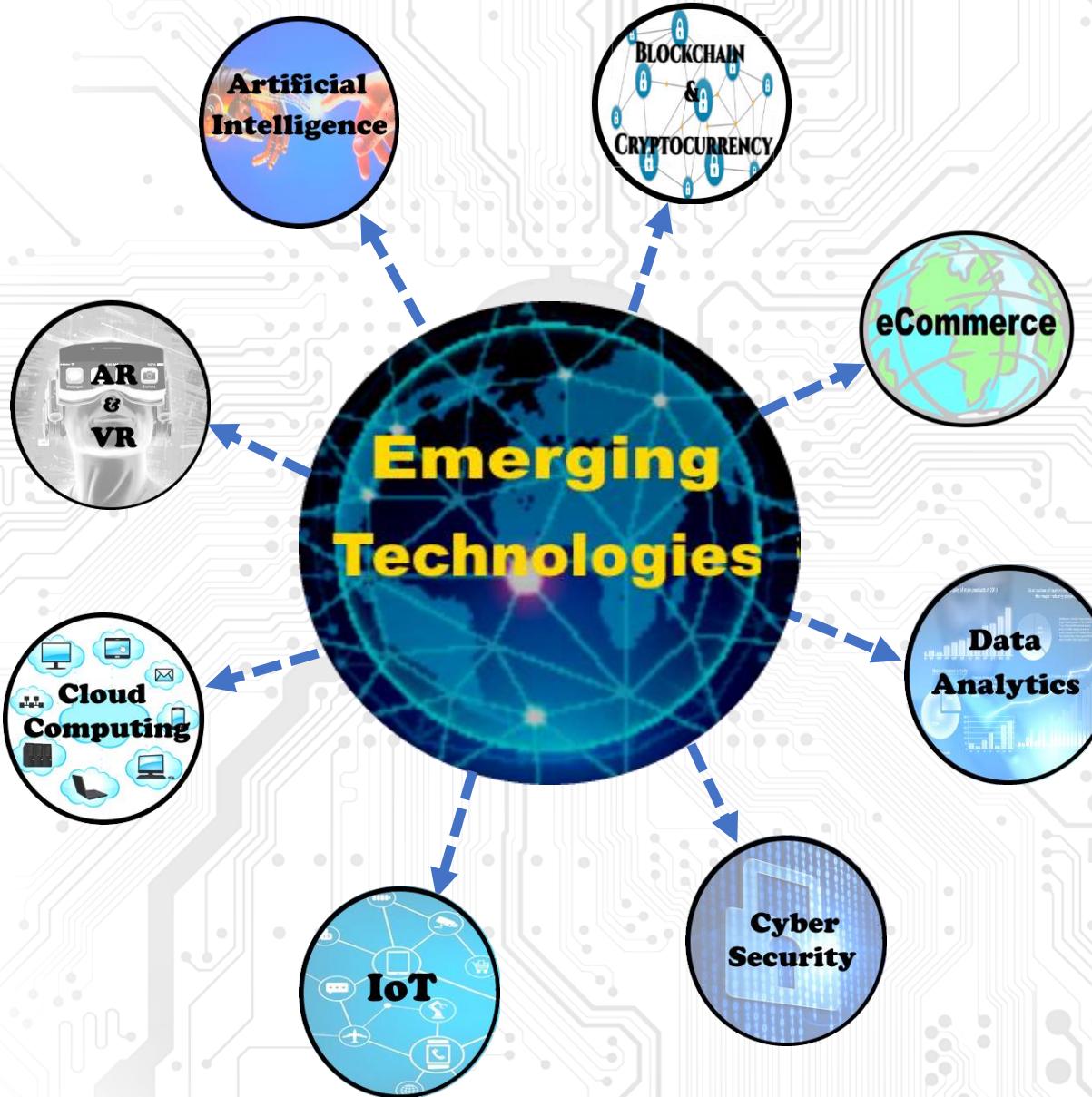
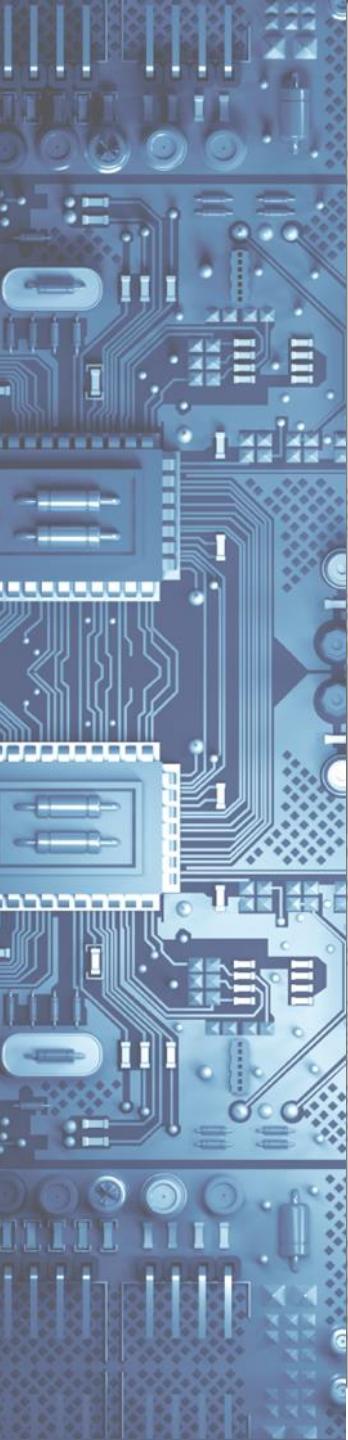


BREAK



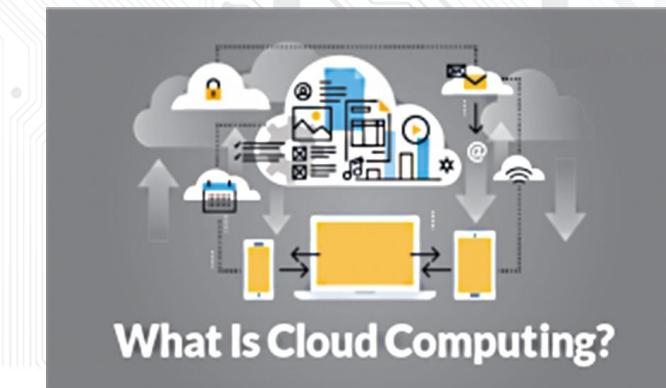


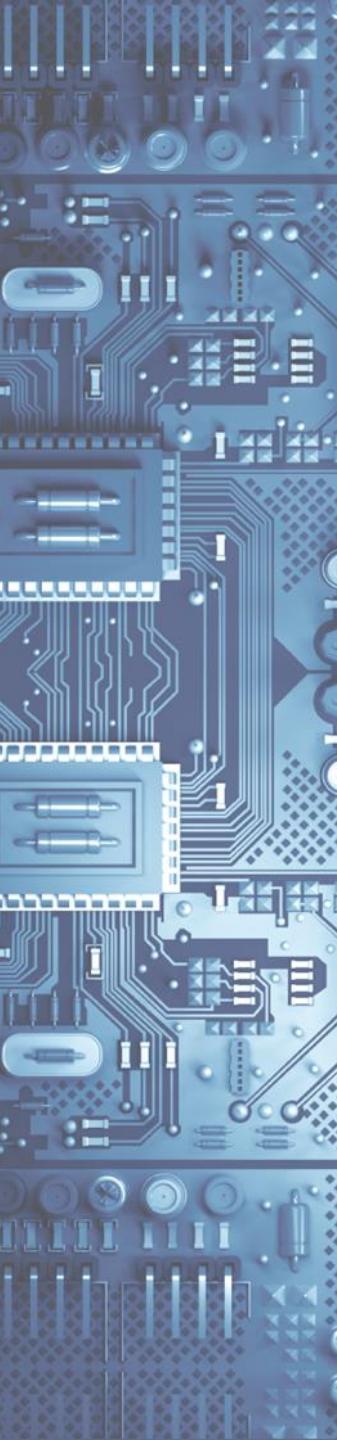
IoT Also
Requires
Wireless Networks



What is Cloud Computing?

- The delivery of computing services over the Internet (“*the cloud*”)
 - Servers
 - Storage
 - Databases
 - Networking
 - Software
 - and more
- Delivered on demand via the internet with **pay-as-you-go pricing**.





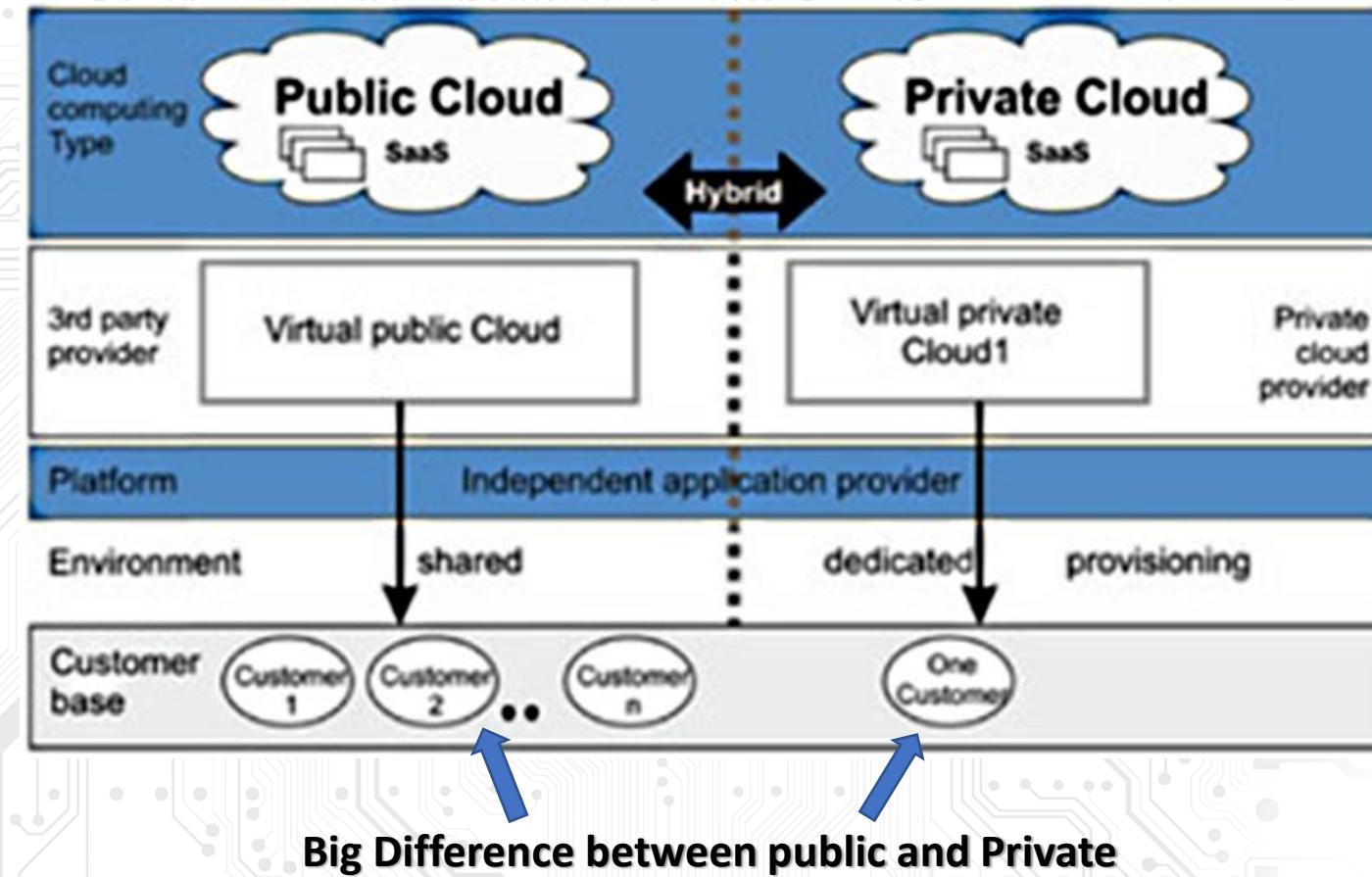
Benefits of Cloud Computing

- Cloud computing has become a one-stop solution for all technology
- Makes things easier like interoperability, secure storage, 24x7 uptime, etc.
- Per [Forbes](#), cloud computing is expected to grow to \$162B in 2021, securing a compound annual growth rate of 19%.



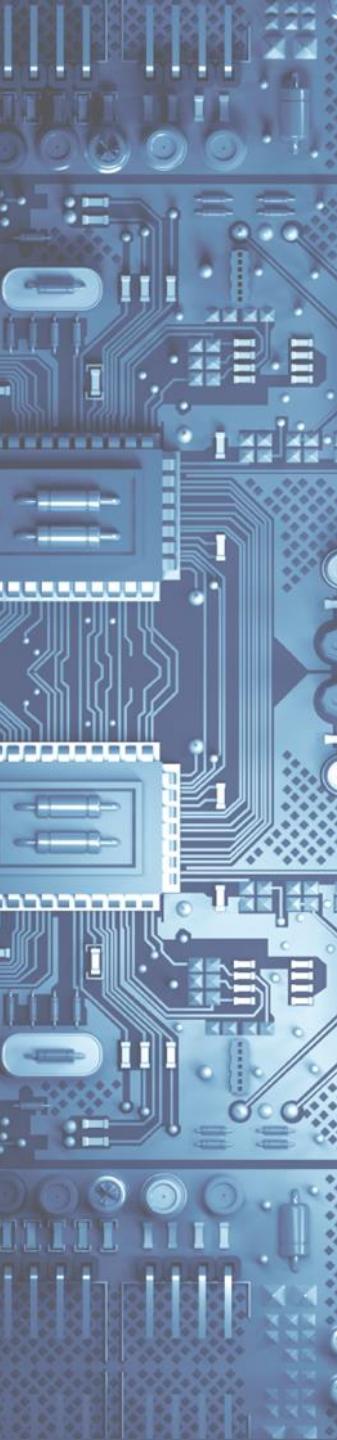
Cloud Types

- Public
- Private
- Hybrid



The main difference between **public** and **private** clouds is that the organization buying the cloud services are not responsible for any of the management of a **public cloud** hosting solution. .





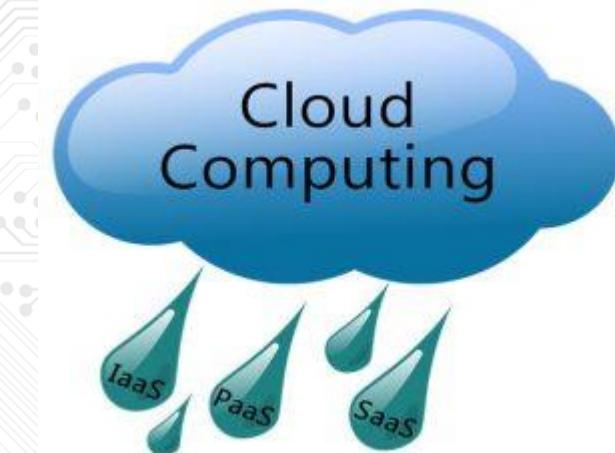
Cloud Broker?

- A third-party that acts as an intermediary between the purchaser of a **cloud computing service** and the sellers of that **service**.
- Use a cloud broker would be if your organization needs a **professional that is well versed in the technology, limitations, and pricing to help negotiate a better deal for your organization.**



Types of Cloud Computing

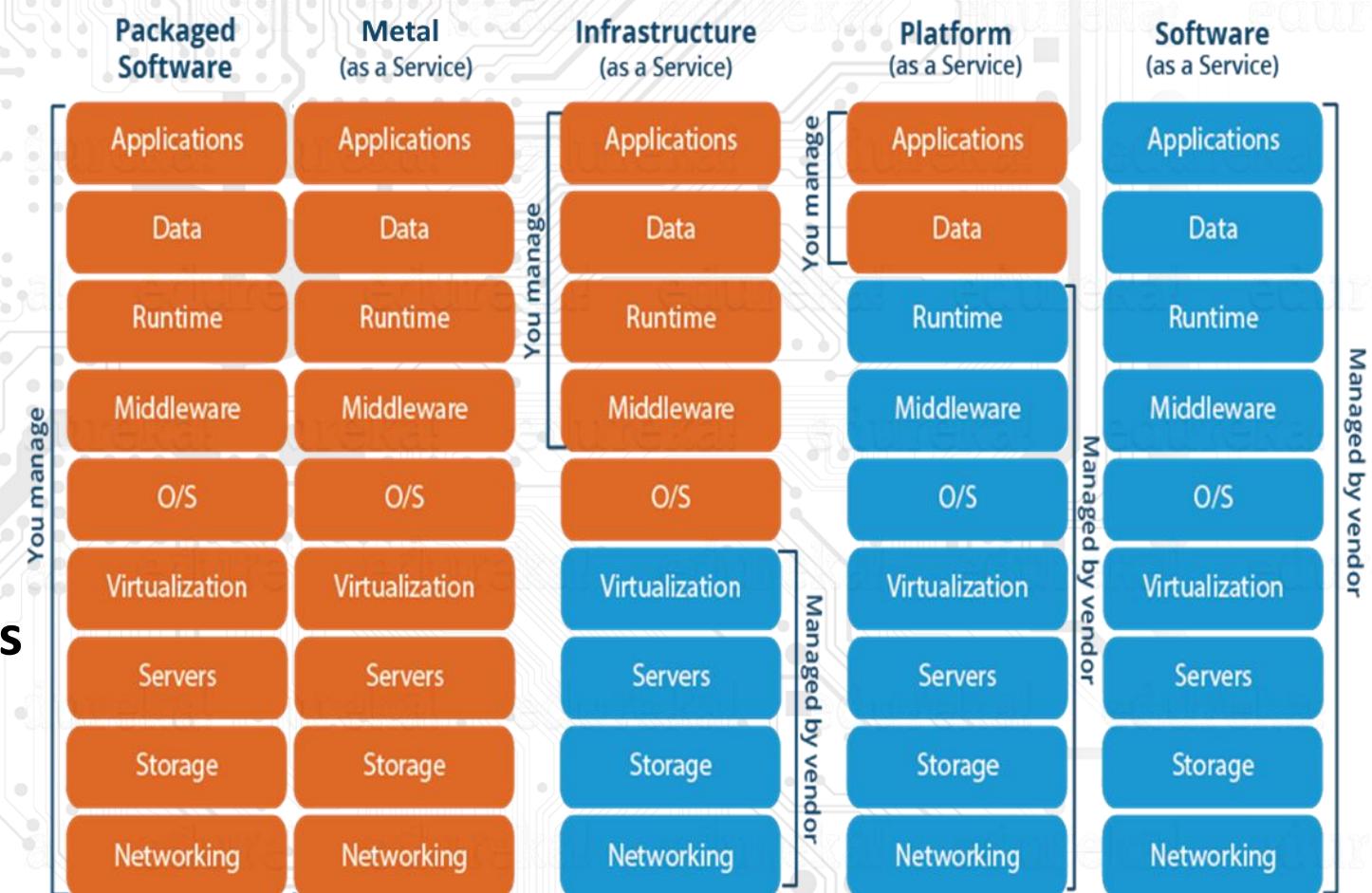
1. **Packaged Software** – Commercial Of The Shelf (COTS)
2. **MaaS-** Metal as a Service
3. **IaaS** – Infrastructure as a Service
4. **SaaS** – Software as a Service
5. **PaaS** – Platform as a Service

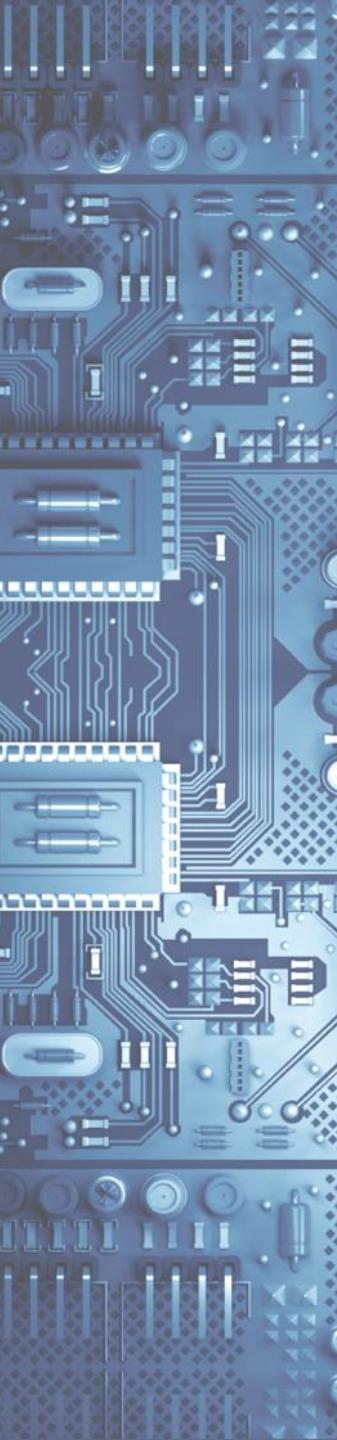


How they are different

= You Manage

= Vendor Manages





Package Software (COTS)

- **Commercial-off-the-shelf (COTS)**
- Packaged solutions adapted to satisfy the needs of the purchasing organization.
- Must be configured and integrated into existing organizational systems.
- Customizing a COTS product is also an option
 - Should be carefully considered due to the long term support and maintenance implications.
 - Customized functionality is not supported by the COTS vendor, so brings its own sets of issues when upgrading the COTS product.

You Manage Everything!

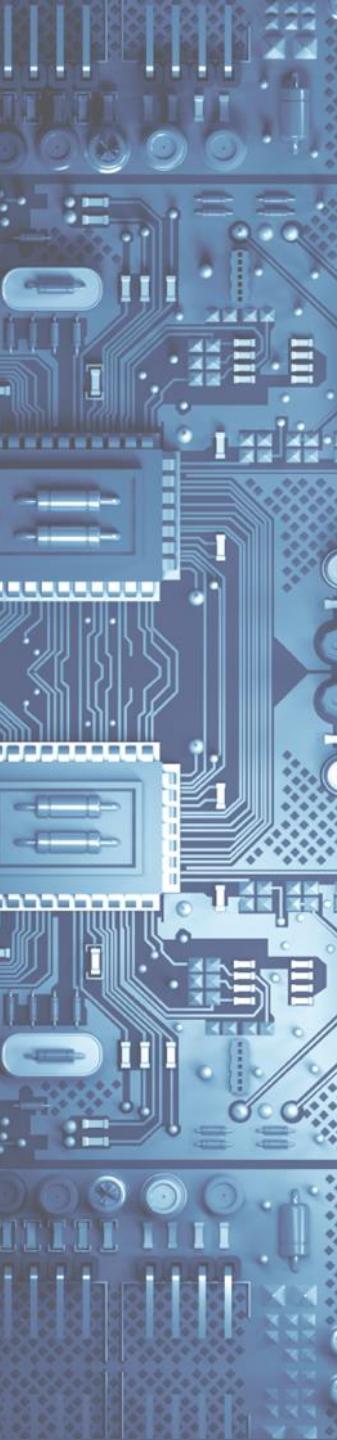


MaaS (Metal as a Service)

You manage Everything
but like a personal Cloud!

- Similar to IAAS "Infrastructure as a Service" as it allows a new machine to be provisioned.
- Difference is that IAAS normally refers to virtual machines, **MAAS is designed to provision bare metal.**
- A bare metal server has no operating system
- **With a simple web interface, you can add, commission, update and recycle your servers at will.**
- As needs change, you can rapidly add new nodes and **dynamically re-deploying them between services.**
- When the time comes, nodes can be retired for use outside the MAAS.





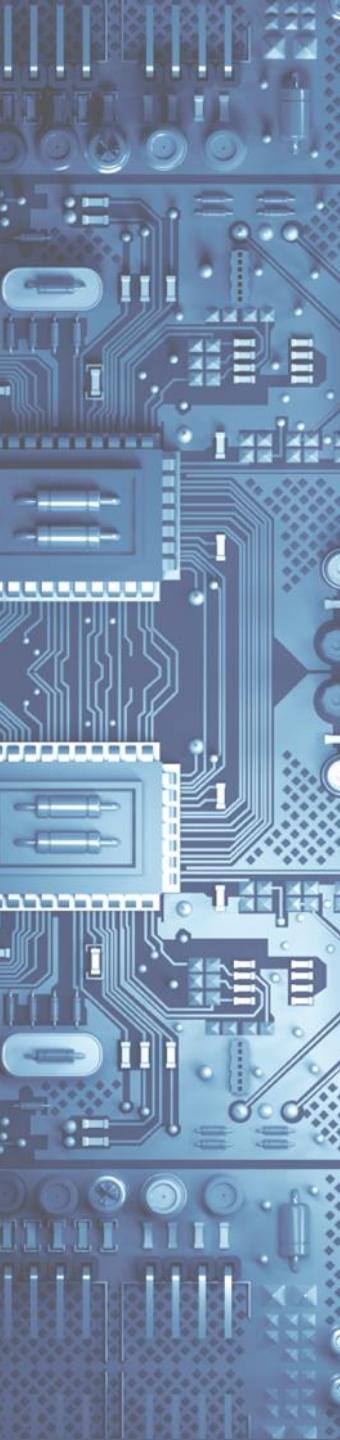
Infrastructure as a Service



 = You Manage
 = Vendor Manages

- Service model that delivers computer infrastructure on an outsourced basis
- IaaS services provide hardware, storage, servers and data center space or network components, may also include software
- IaaS is also known as Hardware as a Service (HaaS)
- Clients usually pay on a per-use or utility computing basis



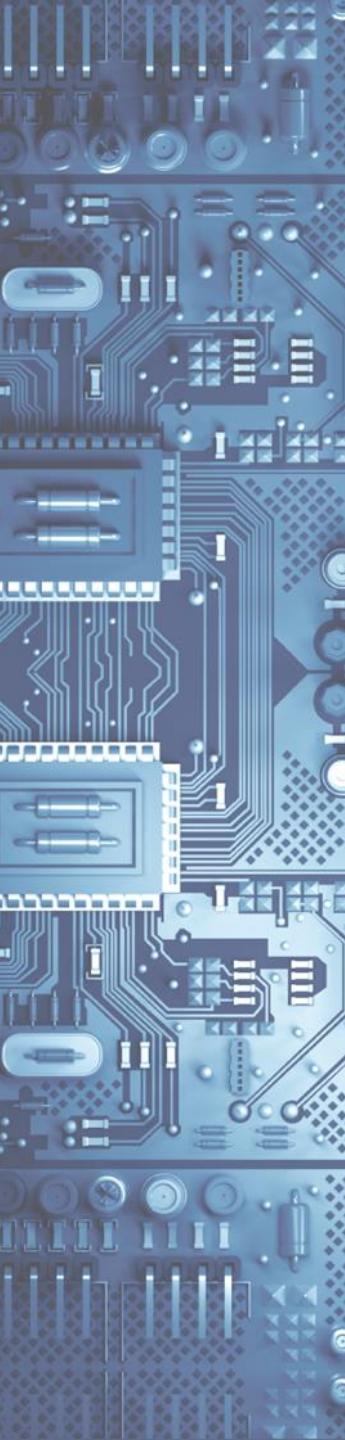


Platform as a Service

- A category of cloud computing services that provides **a platform allowing customers to develop, run, and manage applications without the complexity of building and maintaining the infrastructure**
- Can be delivered in three ways:
 1. As a public cloud service from a provider, where the consumer controls software deployment with minimal configuration options
 2. As a private service behind a firewall.
 3. As software deployed on a public infrastructure

 = You Manage
 = Vendor Manages





**Vendor
Manages
Everything**

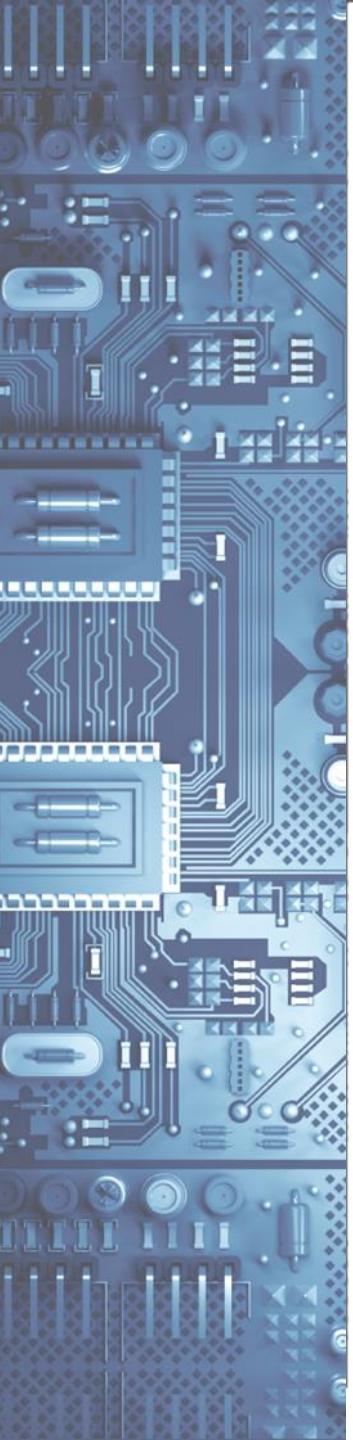


Software as a Service

- A method for delivering software applications over the Internet, on demand and typically on a subscription basis.
- Provides a completed product that is run and managed by the service provider.
- Licenses are typically provided through a pay-as-you-go model
- A common example of a SaaS application is a web-based email(MS365) where you don't have to manage the email product
- Accounting, ERP, CRM, human resource management, invoicing, service desk management, and content management software can be delivered using this model.

Gartner's Cloud Computing Magic Quadrant





Cloud Computing and Fintech



Fintech Opportunities in Cloud

- There are many **opportunities for Fintech organizations to use cloud platforms** to deliver products and services in a robust delivery system.
- But success will depend on several requirements. Fintech Companies must
 - Make sure that they are **using responsible vendors**, providing that service in a highly robust, automated, flexible, scalable, and highly secure manner.
 - Make certain that they cloud services that they create is **meeting compliance and regulatory rules** as set forth in the countries in which they operate.



Fintech Opportunities in Cloud



- Cloud computing is enabling companies to focus more on the **customer-centric model and digitalizing the trading & wealth.**
- Cloud computing creates a **multi-channel relationship with the customers** at every aspect of the service.
- Cloud computing also **increases the processing speed** by integrating cost-effective solutions that are provided by cloud solutions.
- Banks have been slow in adopting cloud computing as there are apprehensions regarding reliability, regulatory and security risks.
- **But slowly, cloud computing is changing the way consumers interact with banks.**

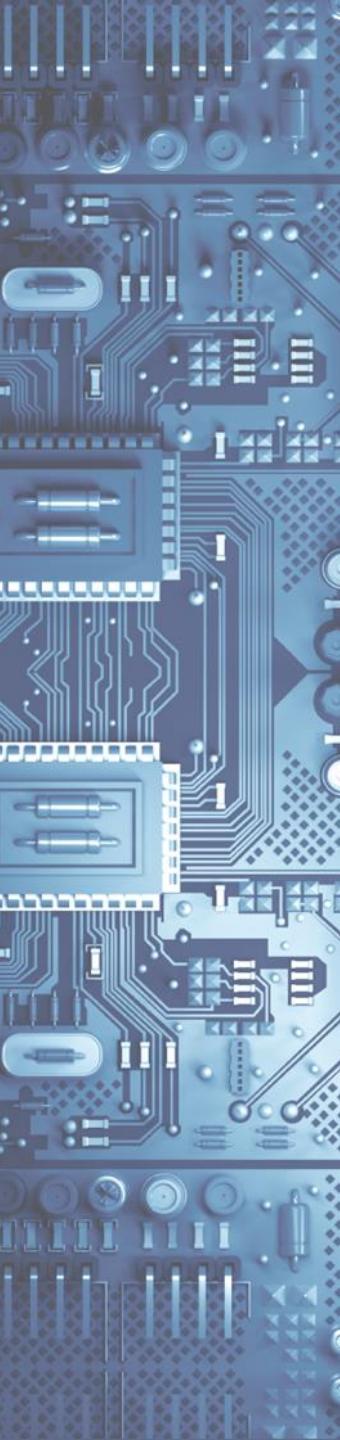


Disadvantages to Cloud in Fintech



1. **Security** –Need to ensure the **sensitive information** which traverses the cloud is safe and secure before they can Trust cloud service providers to put certain business data or processes in the cloud.
2. **Increased dependency on third parties**: Now **relinquish 3rd Party control** on customer and financial data and must be aware of the potential of **Vendor Lock-in**.





Disadvantages to Cloud in Fintech



3. **Integrating existing technology investment into Cloud: Legacy applications may require a large investment to integrate** or migrate to cloud and might also require a substantial re-occurring cash flow to maintain the systems
4. **Location of data:** Regulators across the world have **increasingly been introducing reform to the financial services industry (Regtech)** so fintech's must stay current on the regulations in place in the countries in which they do business.
5. **Reputation risk :** Must keep constant watch on the cloud provider, because to their customer, **it is YOU**. So anything the cloud provider is doing that may impact the customer expectations, must be closely monitored.



Advantages to Cloud in Fintech



1. **Total costs of ownership** (TCO) and asset utilization due to reduced ***Capex*** and moving to ***Opex*** with better ROI will reduce some IT operating costs
2. **Flexible cost structures**: Using Utility-based pricing model, enterprise can use pay-per-Use for **on-Demand Scalability**.
3. **Business Continuity**: **Disaster recovery** is an out-of-the-box bi-product solution provided by the Cloud Service Provider



Advantages to Cloud in Fintech



4. **Big Data Processing** is built for cloud computing and can provide higher volume, real-time data

5. **Customer preference analysis** through social networking interfaces the fintech can now Manage multiple Social Media site integrations, enhancing the organization's agility in the market.

