CHANDIGARH UNIVERSITY

Discover. Learn. Empower.

University Institute of Engineering

AIT-CSE

Privacy and Security in IoT - CSD- 433

Topic –Security in Enabling IoT Technologies

Lecture -1 .3

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Privacy and Security in IoT

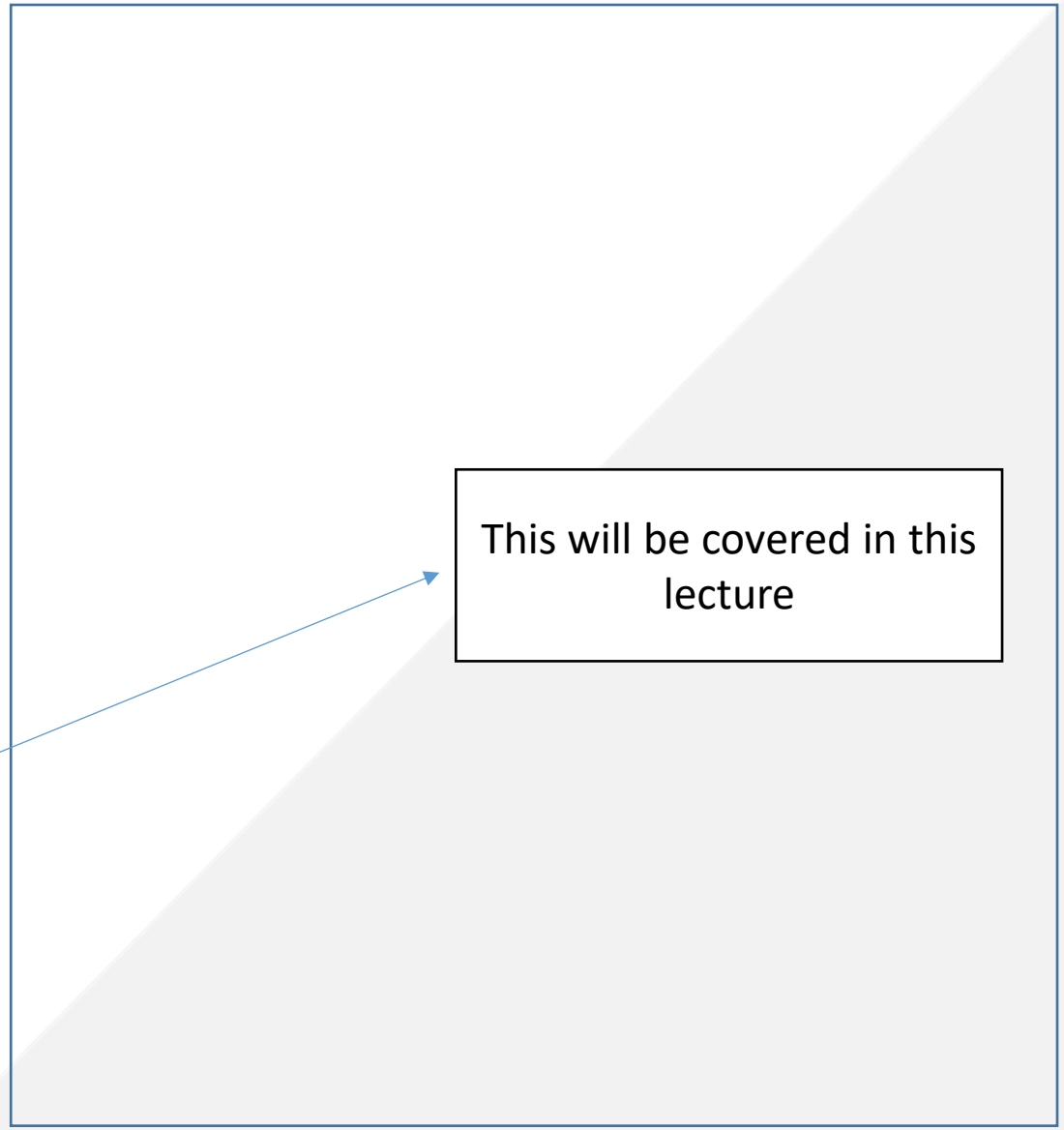
Course Objectives

CO Number	Title
CO1	To identify various privacy and security requirements in Internet of Things
CO2	To learn cryptographic techniques for a secure IoT system
CO3	To understand various Trust Models used in IoT

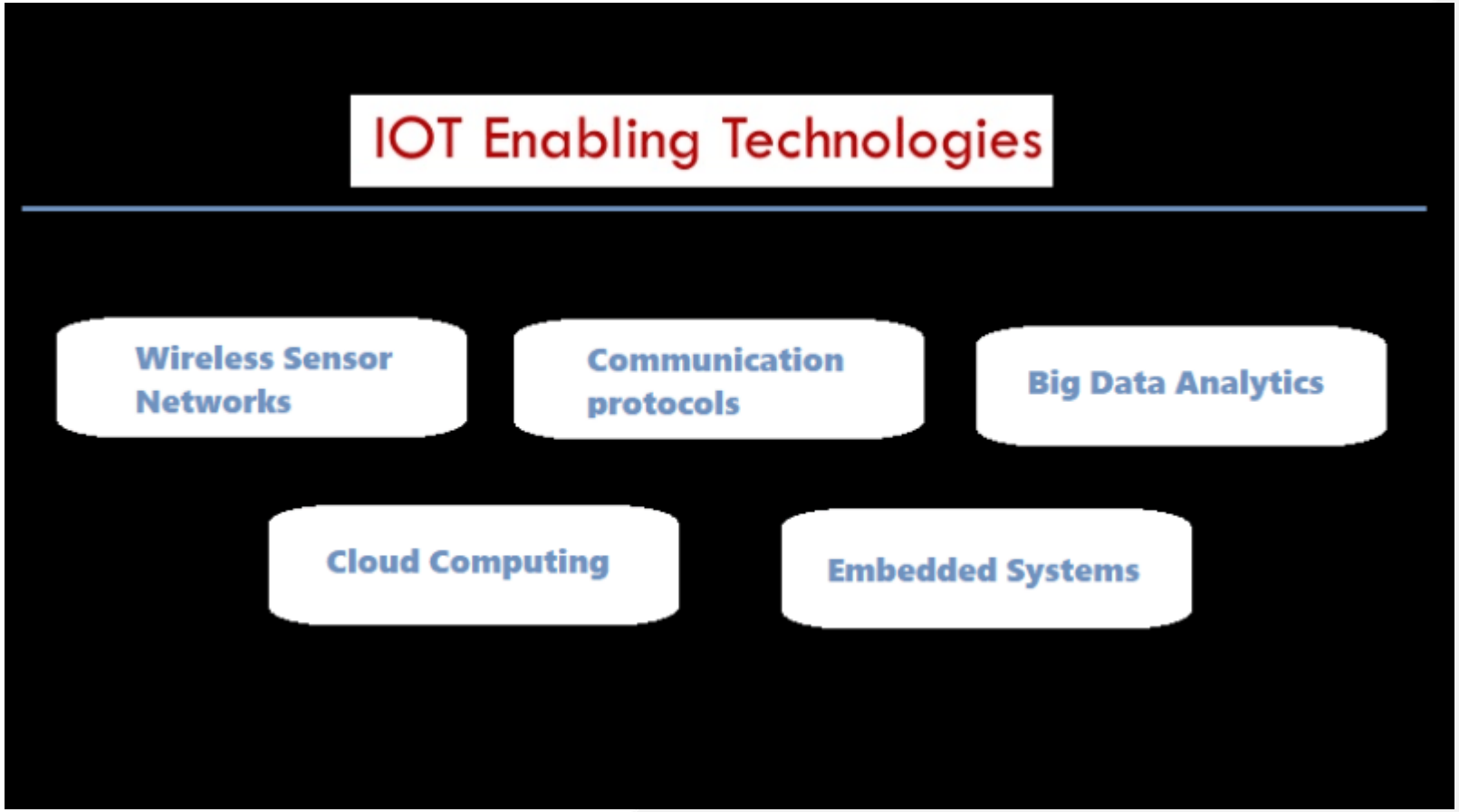
Privacy and Security in IoT

Course Outcome

CO Number	Title	Level
CO1	After successful completion of this course students will be able to understand the security requirements in IoT.	**Understand**
CO2	After successful completion of this course students will be able to understand the authentication credentials and access control.	**Understand**
CO3	After successful completion of this course students will be able to implement security algorithms to make a secure IoT system.	implement



IoT Enabling Technologies



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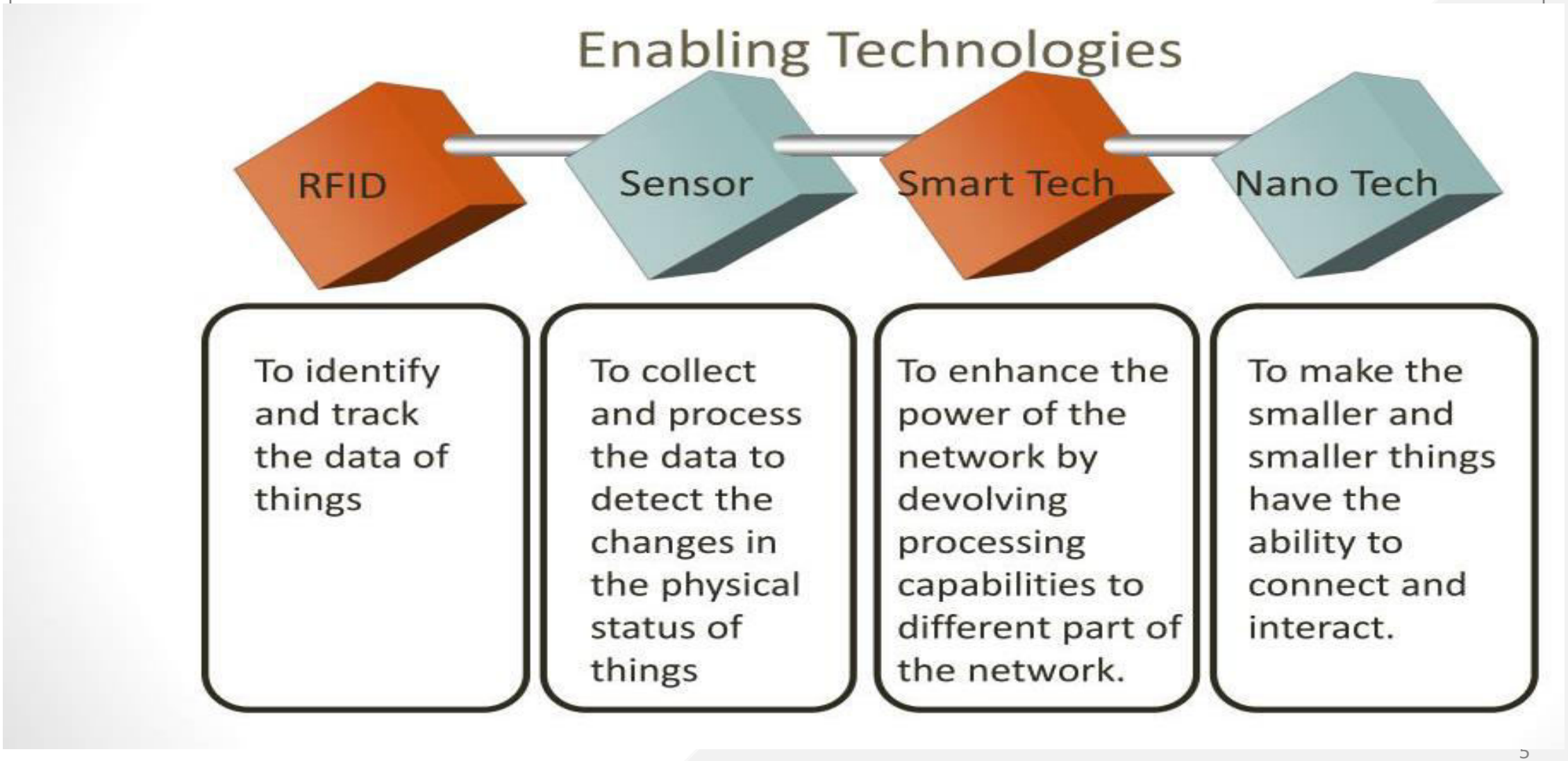

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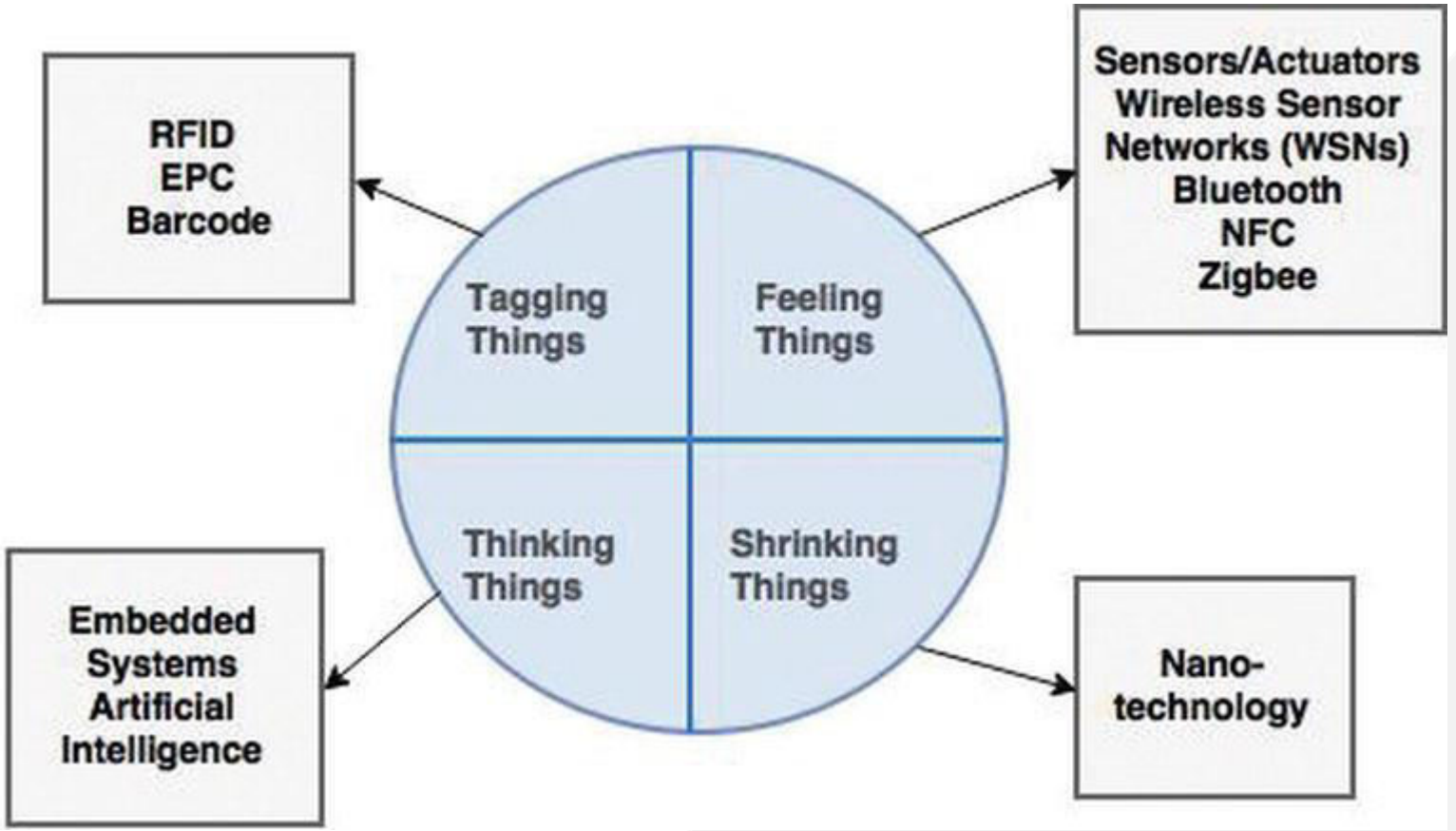


IoT Enabling Technologies

- **Wireless Sensor Network**

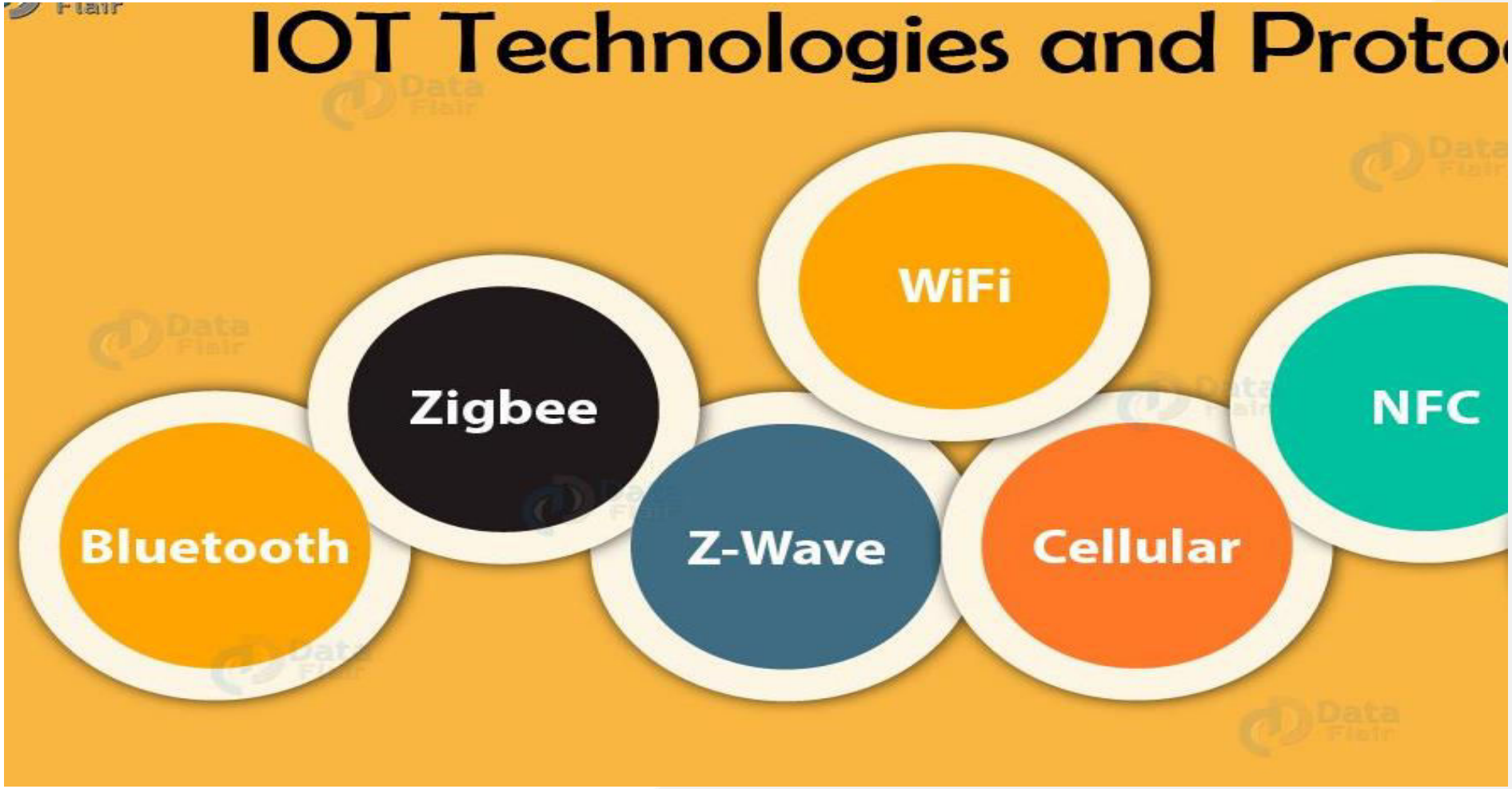
- **Cloud Computing**

- **Big Data Analytics**

- **Communication Protocols**

- **Embedded Systems**

IoT Enabling Technologies

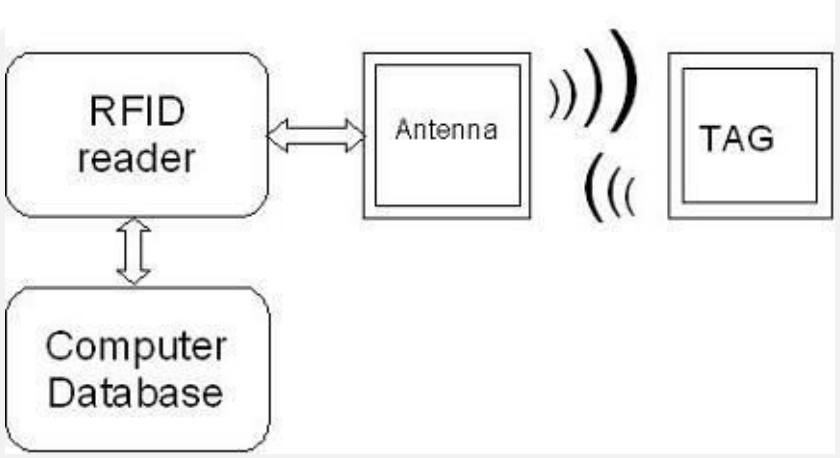


IoT Enabling Technologies

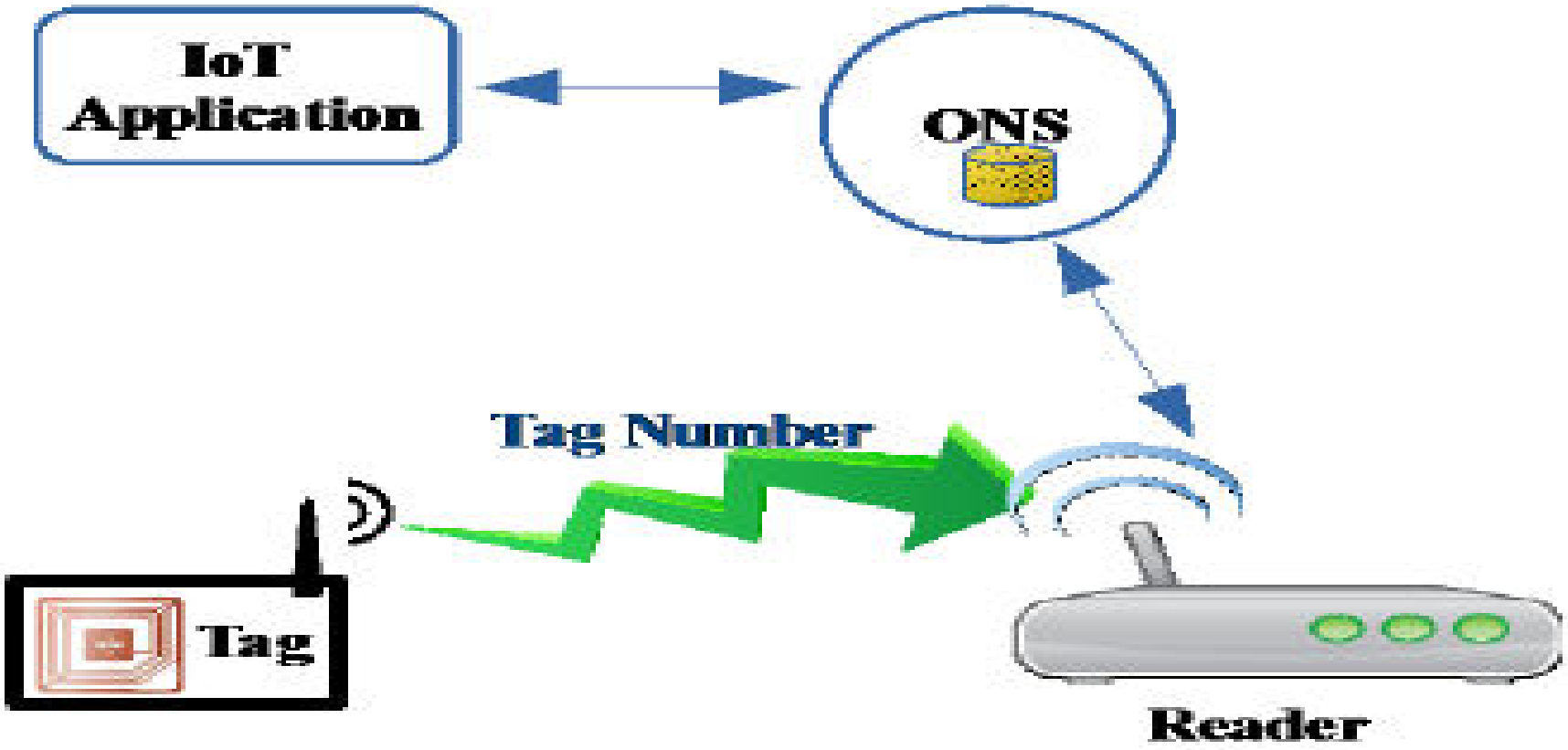
Following are few technologies which makes IoT services enables:

RFID (Radio-Frequency Identification)

- A basic RFID system consists of an RFID reader and RFID tags.
- It has capability for identifying, tracing, and tracking.
- An RFID system could provide sufficient real-time information about things in IoT,



IoT Enabling Technologies-RFID

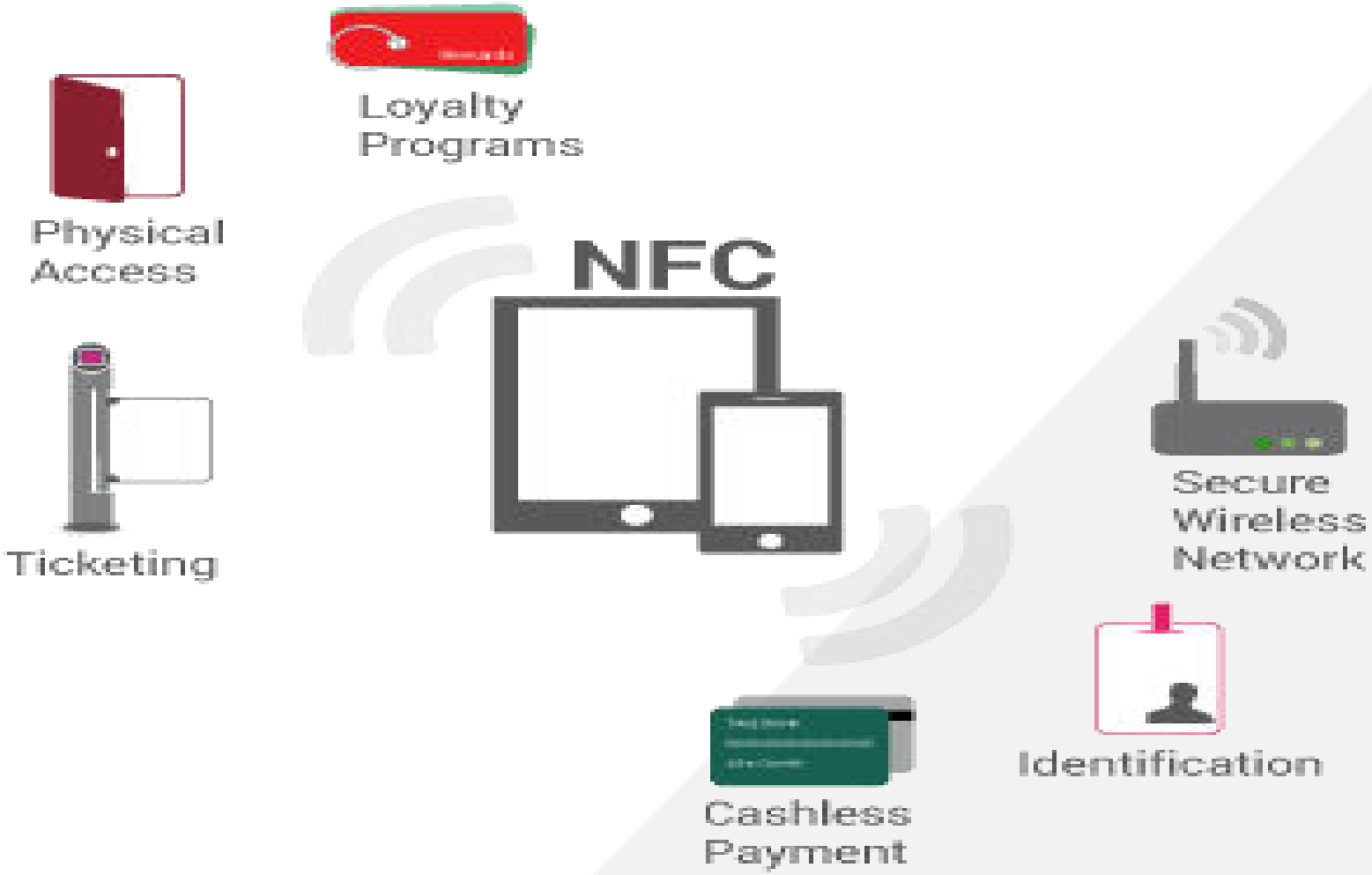


IoT Enabling Technologies-RFID

Seven Types of Security Attacks on RFID Systems

.1. Reverse Engineering
2. Power Analysis
3. Eavesdropping & Replay
4. Man-in-the-Middle Attack or Sniffing
5. Denial of Service
6. Cloning & Spoofing
7. Viruses

IoT Enabling Technologies-NFC



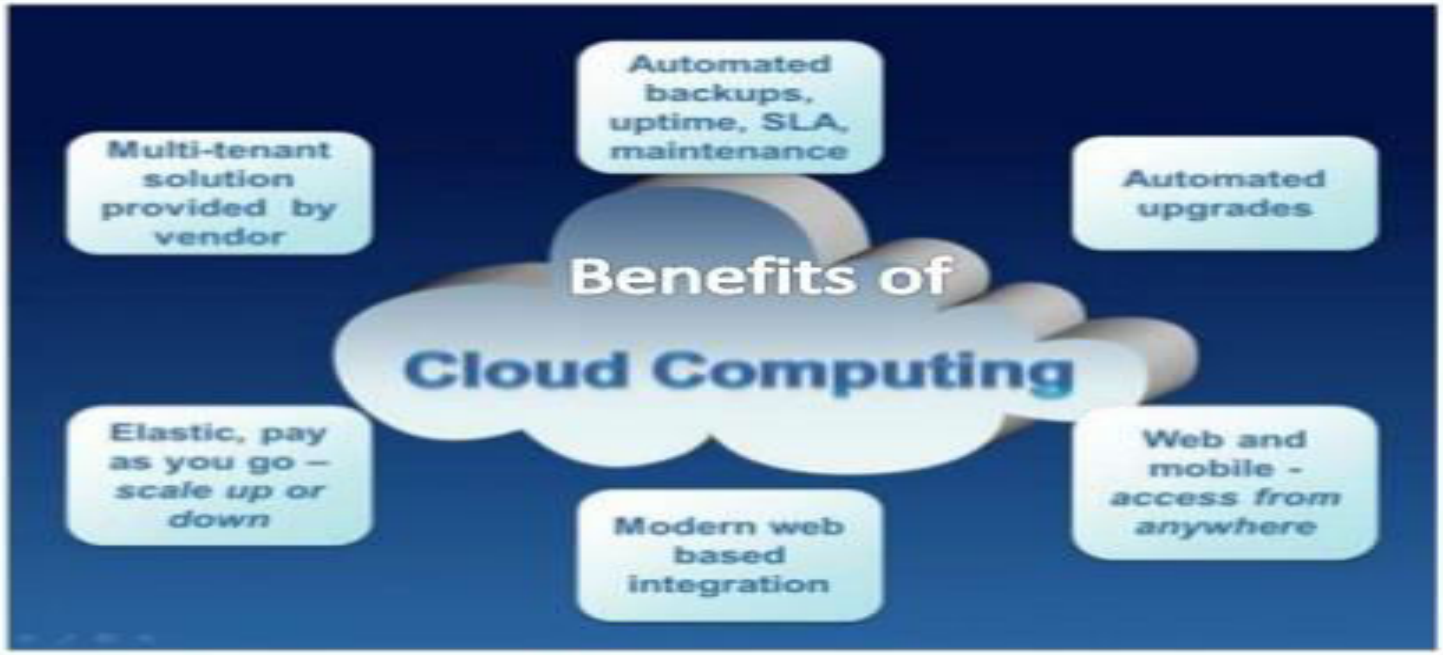
IoT Enabling Technologies-NFC

Types of Security Attacks on NFC Systems

1. **Eavesdropping**
2. **Are You Using An Up-To-Date App?**
3. **Interception Attacks**
4. **Data Corruption**
5. **Data Manipulation**
6. **Data Insertion**

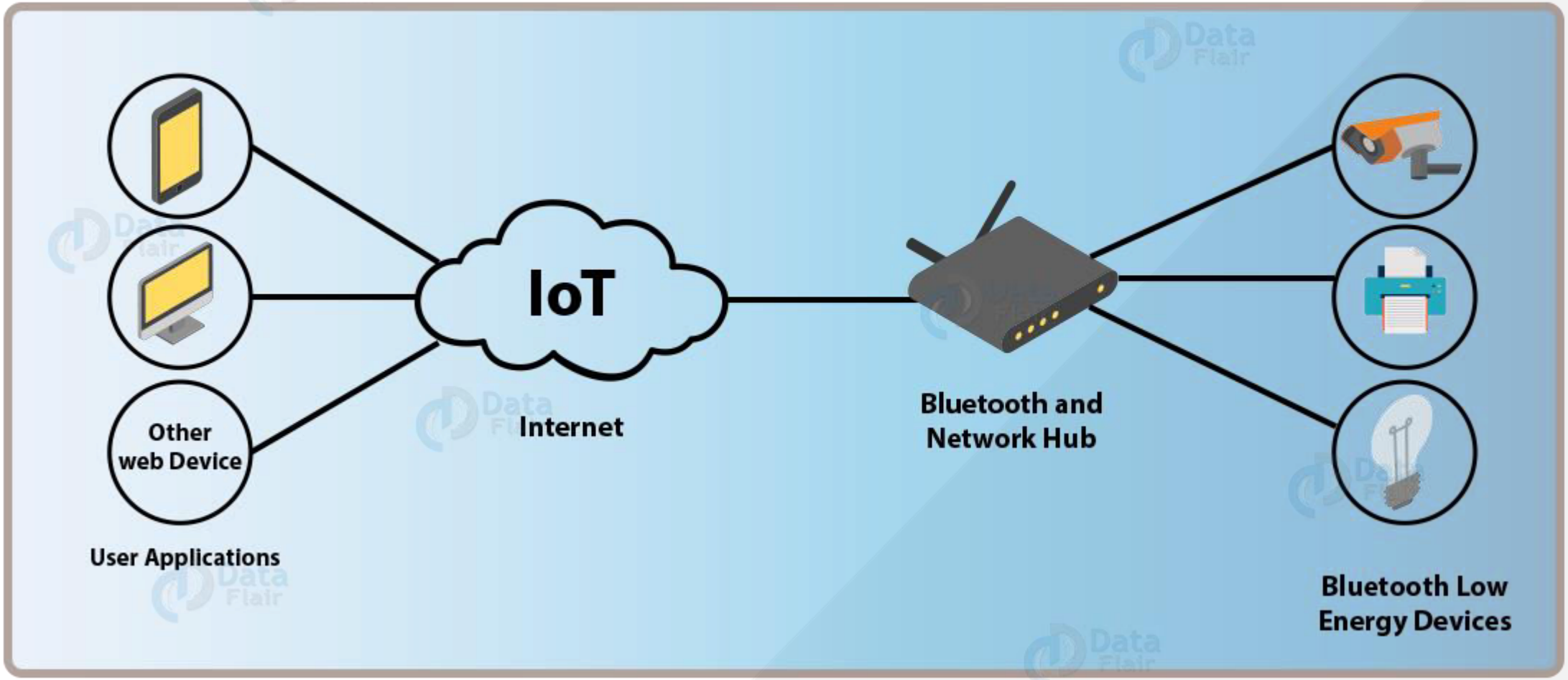
IoT Enabling Technologies

Benefits of Cloud Computing



1. It doesn't require you to maintain or manage it(no need to have an IT expert).
2. Effectively infinite size, so no need to worry about running out of capacity.
3. You can access cloud based applications and services from anywhere(Device independent).

Bluetooth Role in The Future of IoT



IoT Enabling Technologies

Wi-Fi :

- The main intention of Wi-Fi protocol was to replace Ethernet using wireless communication over unlicensed bands and to provide off-the-shelf

ZigBee:

- Zigbee is the technology of transferring the data over wireless networks.
- Distributed nodes can be controlled remotely.
- The frequency used is 2.4Giga hertz worldwide.

IoT Enabling Technologies

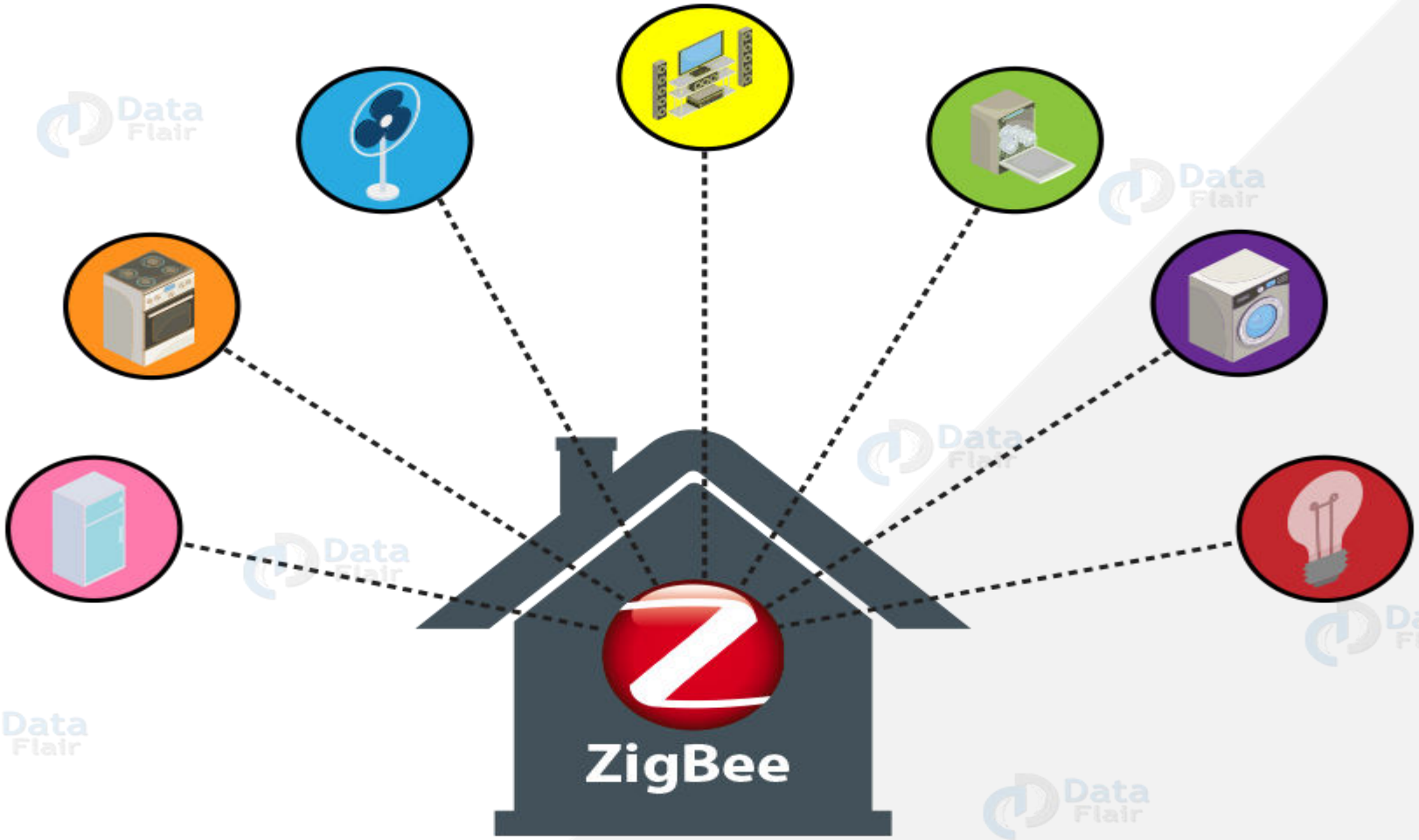
Feature	WiFi (IEEE 802.11b)	Bluetooth (IEEE 802.15.1)	ZigBee (IEEE 802.15.4)
Radio	DSSS[a]	FHSS[b]	DSSS
Data rate	11 Mbps	1 Mbps	250 kbps
Nodes per master	32	7	64 000
Slave enumeration latency	Up to 3 s	Up to 10 s	30 ms
Data type	Video, audio, graphics, pictures, files	Audio, graphics, pictures, files	Small data packet
Range (m)	100	10	70
Extendibility	Roaming possible	No	Yes
Battery life	Hours	1 week	>1 year
Bill of material (US$)	9	6	3
Complexity	Complex	Very complex	Simple

[a] DSSS, Direct Sequence Spread Spectrum
[b] FHSS, Frequency Hopping Spread Spectrum
*Source: Wang et al., 2006

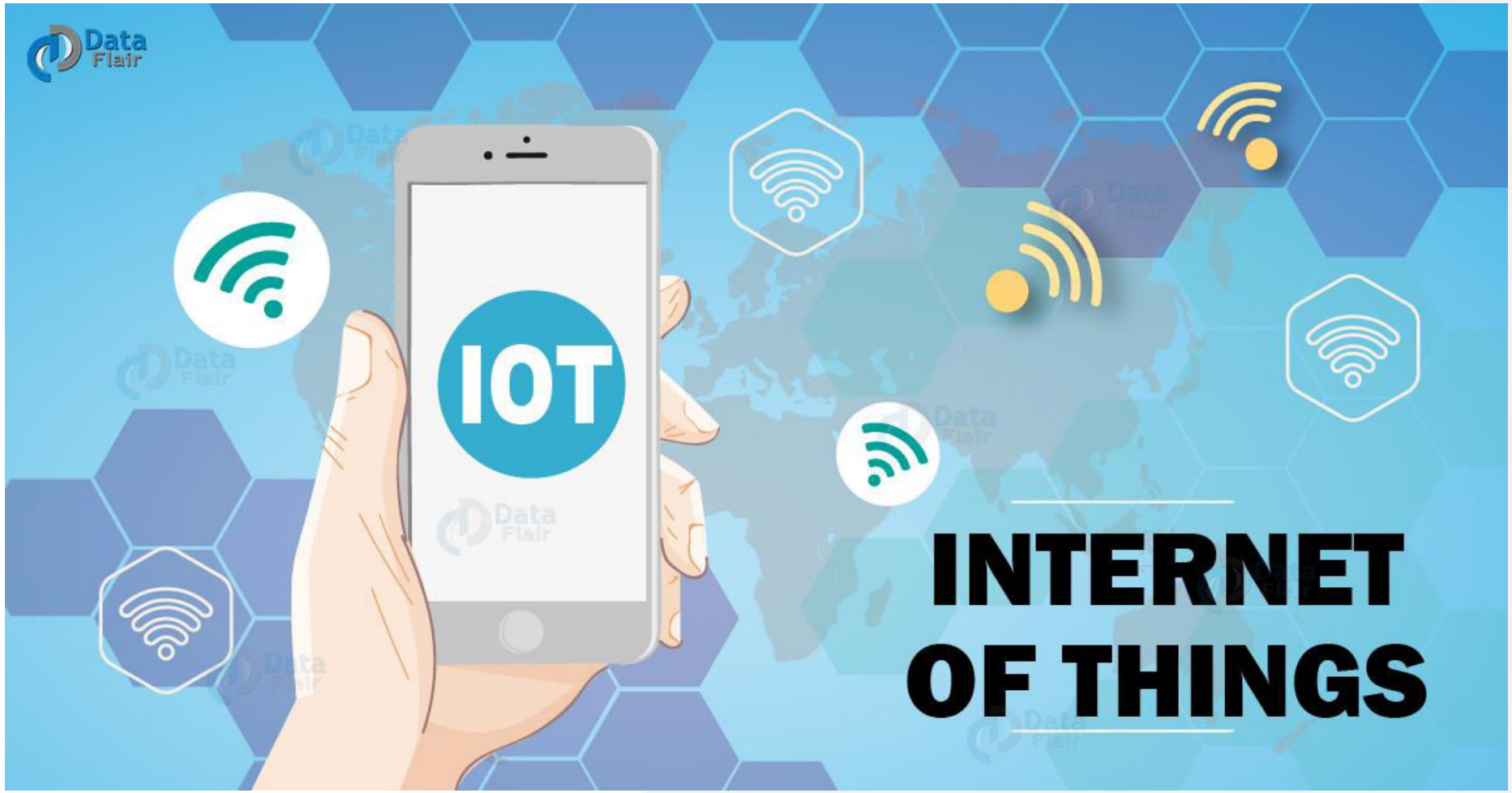
IoT Enabling Technologies

	Z-Wave	ZigBee	WeMo	Thread
Operating range	100 feet	35 feet	100 feet	100 feet (theoretical)
Max no. devices	232	65,000	Router-dependent	250-300
Data rate	9.6-100 kbps	40-250 kbps	Router-dependent	250 kbps
Frequency	908/916 MHz (U.S.)	915 MHz/2.4 GHz	2.4 GHz	2.4 GHz
Network type	Mesh	Mesh	Star	Mesh
Needs hub?	Yes	Yes	No	Yes

IoT Enabling Technologies



IoT Enabling Technologies



IoT Enabling Technologies

4G LTE:

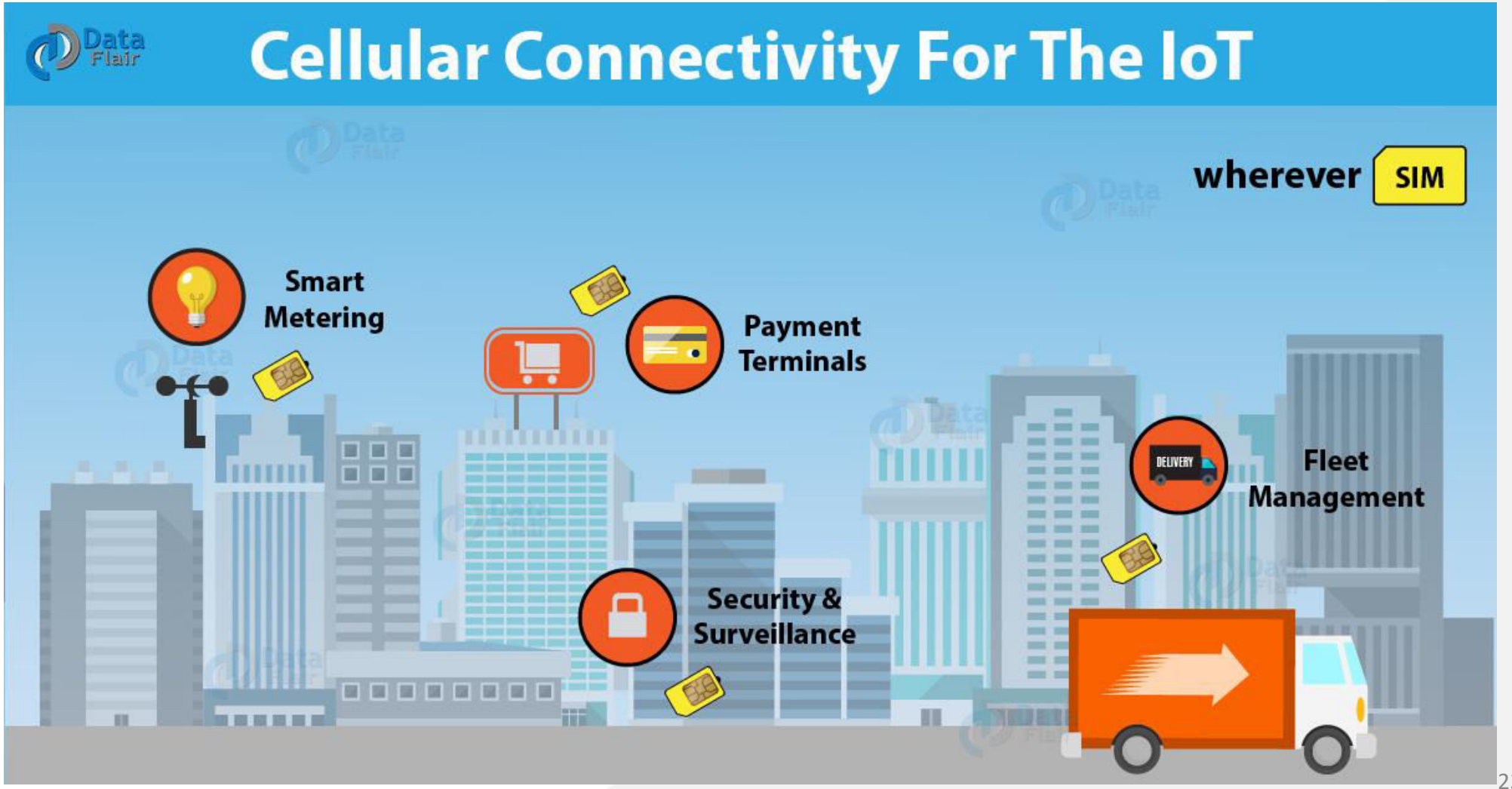
- In IoT, 4G technology is most popularly used technology.
- It has a capacity of handling speeds till 1 gigabytes per seconds.
- Long-term Evolution (LTE) uses orthogonal frequency division multiplexing as its radio access technology together with advanced antenna technologies and is based on GSM technologies used by earlier-generation mobile networks.

IoT Enabling Technologies

Big data:

- Big data is the information gathered by the devices like sensors and actuators connected over internet.
- Fetching the data is as important as storing the data.
- Big data analytics make use of some complex algorithms and patterns to find the data of our interest.
- Managing large amount of data has become a big challenge. So big data has an important role in IoT.

IoT Enabling Technologies



References

1. Li Da Xu, Securing Internet of Things, Algorithms, and Implementations, Elsevier
2. Chintarlapallireddy Yaswanth Simha, “Enabling Technologies for Internet of Things & It’s Security issues” ICICCS 2018

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Home Assignment

1. Explore working of RFID.
2. Explore frequency specification of following technologies?
    - Wifi
    - LTE
    - Zigbee

THANK YOU

For queries
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