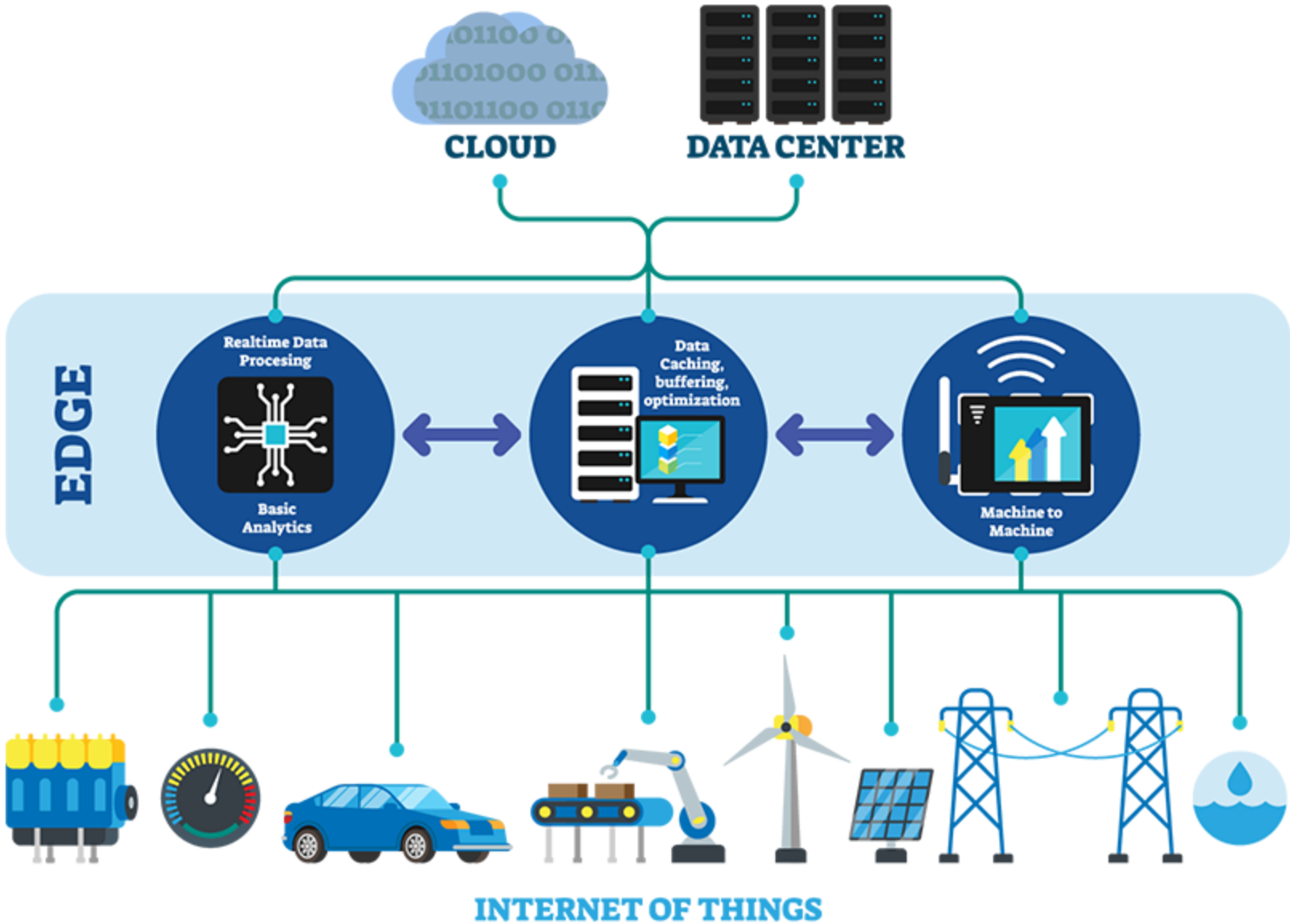
EDGE COMPUTING

EDGE COMPUTING

- Edge computing is an emerging computing paradigm which refers to a range of networks and devices at or near the user. Edge is about processing data closer to where it’s being generated, enabling processing at greater speeds and volumes, leading to greater action-led results in real time.
- Much of today’s computing already happens at the edge in places like hospitals, factories and retail locations, processing the most sensitive data and powering critical systems that must function reliably and safely.

Edge Computing



Example of Edge Computing: Autonomous Vehicles

- **Autonomous vehicles** rely heavily on edge computing to make real-time decisions about driving conditions. These vehicles are equipped with a variety of sensors, cameras, and other devices that generate large amounts of data. By processing this data on-board the vehicle, edge computing enables the vehicle to react quickly to changes in the environment, such as pedestrians, other vehicles, or road conditions. This reduces the need for communication with a remote server or cloud, ensuring a safe and reliable driving experience.

ADVANTAGES OF EDGE COMPUTING

1. Faster response time and lower latency:-

- A company's every millisecond is critical to its success. Downtime or latency might cost them thousands of dollars. Edge computing can reduce latency and hence boost network speed. In addition, processing data closer to the source of information, considerably lowers the distance it must travel.

2. High Security and Less Risk:-

- The data stored in the cloud has a high risk of being hacked. This can be avoided since edge computing only sends the appropriate data to the cloud. In addition, edge computing does not always necessitate the use of a network connection. Therefore, even if hackers gain access to the cloud, not all users' information is at risk.

ADVANTAGES OF EDGE COMPUTING

3. Lesser Transmission Costs:-

- In addition to the possibility of simplifying cloud security approaches, edge computing can also result in significant cost reductions due to lower bandwidth. Because so much data is now processed and stored in localized servers and devices, there is no need for most data to go to data centers. As a result, edge computing requires less bandwidth at the data center level.

4. Scalability and Versatility:-

- Data must be transmitted to a centralized data center in a cloud computing system. Modifying or expanding this data center can be pricey at times. On the other hand, the edge may be utilized to scale your own IoT network without having to worry about storage. Furthermore, IoT devices can be placed here with just one implantation.

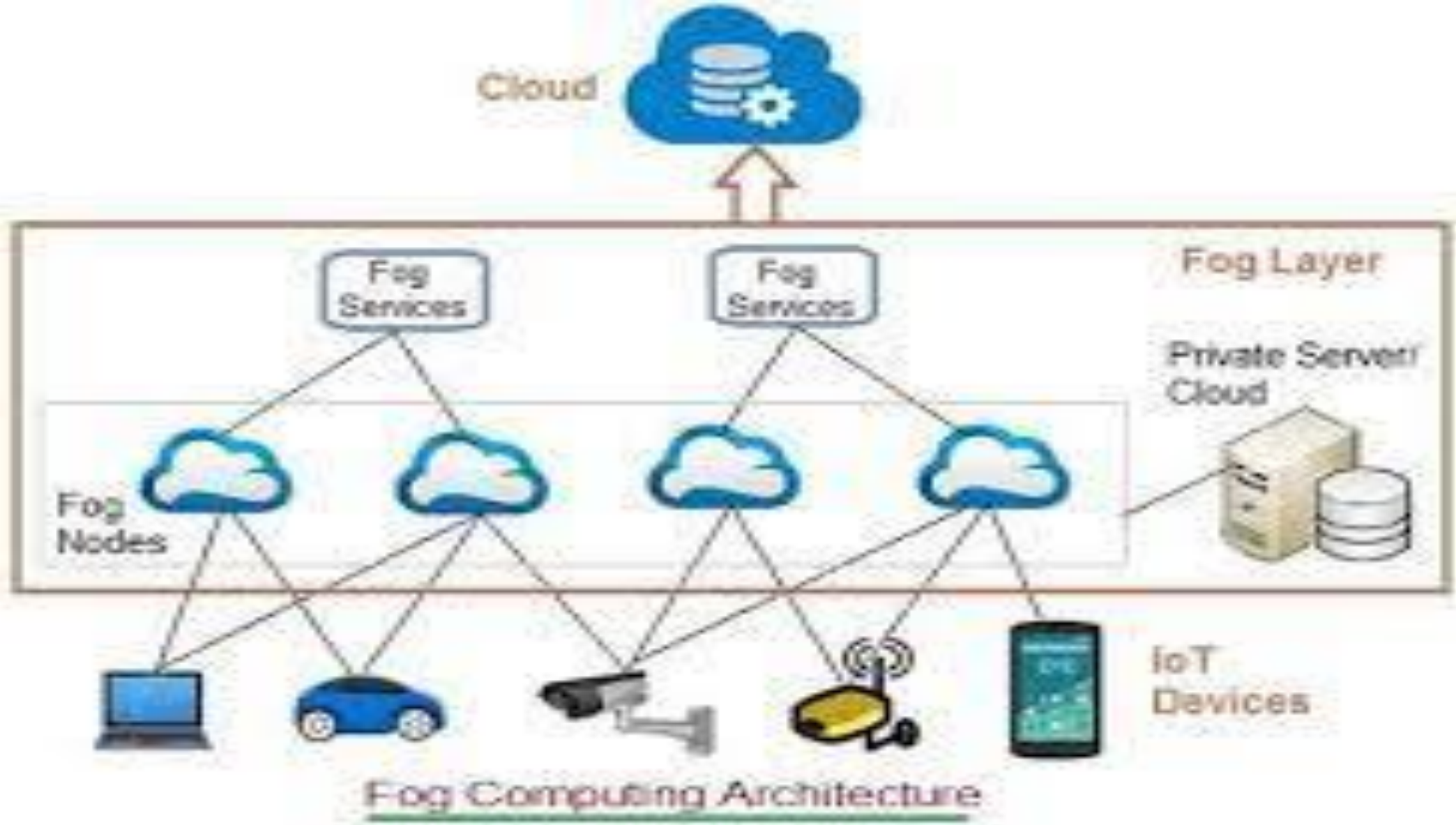
FOG COMPUTING

FOG COMPUTING

Fog is something which we see in between land and cloud .. And when we talk about fog computing we see distributed computing where we relied on distribute network switch and router which work together to compute information. **Fog computing found some where in between data and application..** here in cloud computing we try to compute near data generation in order to decrease data latency and maintain data security and integrity. If we take example of traffic network management.

FOG COMPUTING ARCHITECTURE

- Fog computing architecture consists of three layers: the cloud layer, the fog layer, and the edge layer. The cloud layer provides global services and resources, while the fog layer provides regional services and resources. The edge layer provides local services and resources.
- Each layer has its own set of devices and technologies, such as servers, gateways, routers, and switches. These devices work together to provide seamless connectivity and resource sharing across the layers.


Cloud
Fog Layer
Fog Services
Fog Services
Private Server/ Cloud
Fog Nodes
IoT Devices
Fog Computing Architecture

Example of Fog Computing: Smart Traffic Management

- One example of fog computing in action is smart traffic management. In this scenario, fog nodes are deployed at intersections or along highways to collect and process traffic data in real-time. This includes information about traffic volume, speed, and accidents.
- By analyzing this data locally, the fog nodes can make instant decisions about traffic flow and signal timing, reducing congestion and improving safety. They can also communicate with other fog nodes and the cloud to optimize traffic across a wider area.

Example for Fog Computing

ADVANTAGES OF FOG COMPUTING

1. Bandwidth conversation:-

- Fog computing reduces the volume of data that is sent to the cloud, thereby reducing bandwidth consumption and related costs.

2. Improved response time:-

- Because the initial data processing occurs near the data, latency is reduced, and overall responsiveness is improved.

3. Network-Agnostic:-

- Although fog computing generally places compute resources at the LAN level -- as opposed to the device level, which is the case with edge computing -- the network could be considered part of the fog computing architecture.

DISADVANTAGES OF FOG COMPUTING

1. Physical Location:-

- Because fog computing is tied to a physical location, it undermines some of the "anytime/anywhere" benefits associated with cloud computing.

2. Potential Security Issues:-

- Under the right circumstances, fog computing can be subject to security issues, such as Internet Protocol (IP) address spoofing or man in the middle (MitM) attacks.

3. Startup Costs:-

- Fog computing is a solution that utilizes both edge and cloud resources, which means that there are associated hardware costs.

Applications of Fog Computing

- Fog computing has a wide range of applications in various industries, such as transportation, healthcare, manufacturing, and entertainment. For example, in transportation, fog computing can be used to enable autonomous vehicles to communicate with each other and with the infrastructure in real-time.
- In healthcare, fog computing can be used to monitor patients remotely and provide real-time feedback to doctors and nurses. In manufacturing, fog computing can be used to optimize production processes and reduce downtime. In entertainment, fog computing can be used to deliver immersive experiences to users in real-time.

Future of Fog Computing

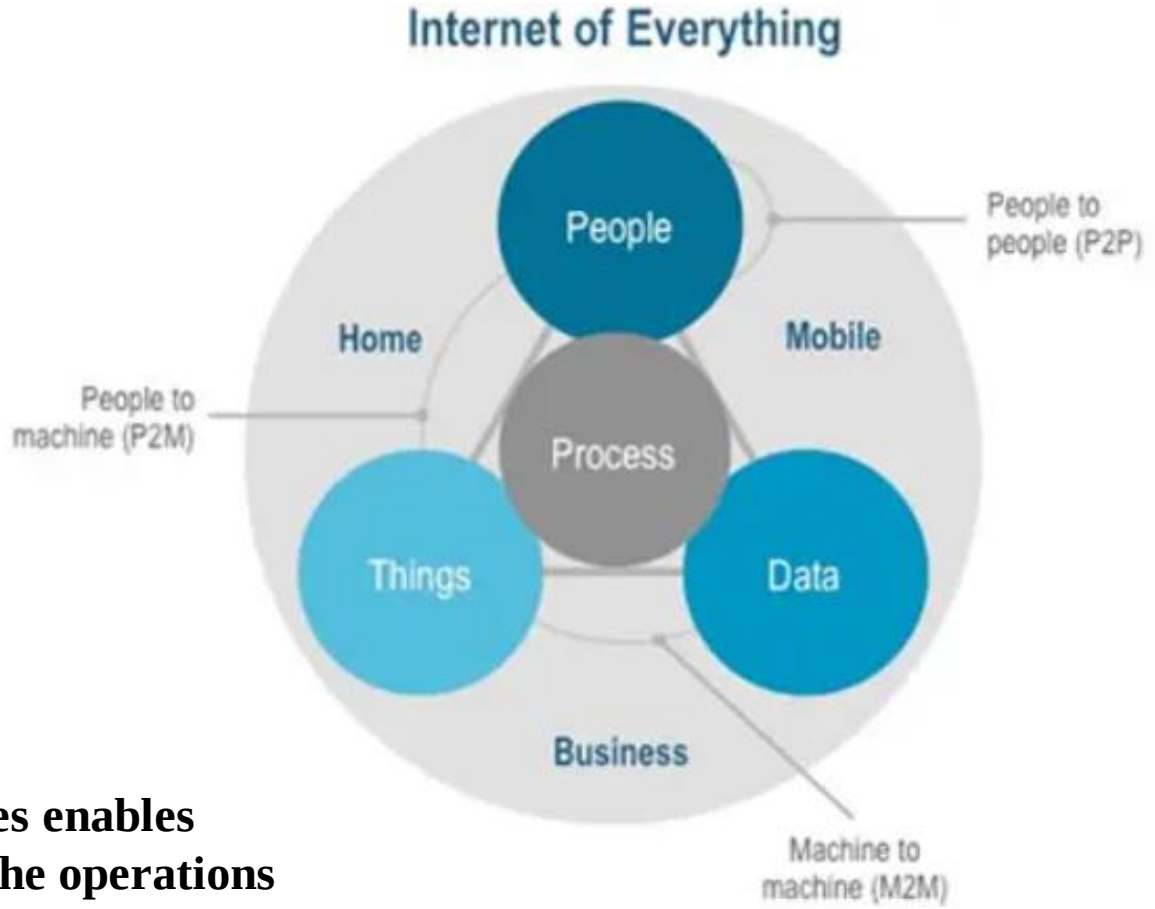
- The future of fog computing looks promising, as more and more devices become connected and generate massive amounts of data. Fog computing is expected to play a key role in enabling the next generation of applications, such as smart cities, autonomous systems, and immersive experiences.
- To realize this vision, however, fog computing needs to overcome its challenges and evolve into a more mature and standardized technology. This requires collaboration and cooperation among industry players, researchers, and policymakers.

Industrial Internet Of Things (IIOT)

What is IIOT ?

Internet of Things or IoT is data-rich: large amounts of data get collected, aggregated and shared in a meaningful way

The Industrial Internet of Things or IIoT is defined as “machines, computers and people enabling intelligent industrial operations using advanced data analytics for transformational business outcomes”.



Why IIOT?

The intelligent communication loop setup between machines enables timely attention to maintenance issues. The safety level of the operations is also boosted by alleviating the risk factors.

Benefits of IIOT:

- Improved and intelligent connectivity between devices or machines
- Increased efficiency
- Cost savings and
- Time savings
- Enhanced industrial safety

Advantages of IIOT

- **Improved efficiency :** The biggest advantage of IIoT is that it gives manufacturers the ability to automate, and therefore optimize their operating efficiency. Robotics and automated machinery can work more efficiently and accurately,boosting productivity and helping manufacturers streamline their functions.
- **Quality control :** By monitoring the condition (speed, vibration, etc.) and calibration of machines responsible for the creation of a certain product, quality control assessment can instantly be undertaken following production.

- **Cost Savings:** By monitoring and optimizing processes, IIoT can help reduce waste, increase energy efficiency, and lower operating costs.

- **Predictive Maintenance:** IIoT can predict when equipment or machines may need maintenance or repairs, reducing unplanned downtime and maintenance costs.

- **Data Analytics:** IIoT generates large amounts of data, which can be analyzed to identify patterns, trends, and anomalies. This can provide insights for optimizing operations and improving decision-making.

Disadvantages of IIOT

- **Security risks:** The increased connectivity of devices and systems creates more potential entry points for cyber attacks, which can compromise sensitive data and operations.

- **Cost:** The deployment of IIoT solutions can be expensive, and may require ongoing investments in maintenance, upgrades, and training.

- **Reliance on connectivity:** IIoT systems depend on stable and reliable connectivity, which can be disrupted by a variety of factors, including network outages, interference, and environmental factors.

Challenges of Implementing IIoT

- While IIoT offers many benefits, there are also challenges to implementing it in an industrial setting.
- These challenges include security concerns, data privacy, interoperability between different systems and devices, and the need for skilled personnel to manage and analyze the data generated by IIoT systems.

Applications of IIOT

- The industrial internet of things (IIoT) refers to the extension and use of the IoT in industrial sectors and applications.
- A strong focus on machine-to-machine (M2M) communication, big data, and machine learning, the IIoT enables industries and enterprises to have better efficiency and reliability in their operations.
- The IIoT encompasses industrial applications, including robotics, medical devices, and software-defined production processes.

Thank You