20EC52I IIOT Vth SEM

You can add or delete points to further improve your answers and CO's are mentioned as per my knowledge.You can change CO's also.

126.ABB Pvt Limited company manufactures industrial machines and distributed all over the world. The company faces difficult in repair and maintenance services. How these issues are solved with the help of IoT technology and justify the answer. CO1 L3

Internet of Things (IoT) technology can help ABB Pvt Limited address challenges with repair and maintenance services in a number of ways. One of the key ways is through remote monitoring. With IoT sensors and devices embedded in the industrial machines, the company can collect data on the machines' performance and usage in real-time. This data can be analyzed to detect potential issues before they become major problems, allowing for proactive maintenance and repairs.

Another way IoT can help is through predictive maintenance. By using machine learning algorithms on the data collected by the IoT sensors, the company can predict when a machine is likely to fail and schedule maintenance before the failure occurs. This can reduce downtime and improve the overall efficiency of the machines.

IoT-enabled devices can also provide real-time information about the machine's status, location and to automatically order replacement parts when needed. This eliminates the need for manual monitoring and helps reduce the time required for repair and maintenance.

Additionally, IoT devices can provide better insights into machine usage patterns, and in the long run, that data can help the company improve its products and services.

Overall, IoT technology can significantly improve ABB Pvt Limited's repair and maintenance services by allowing for remote monitoring, predictive maintenance, and better insights into machine usage, which in turn leads to proactive maintenance and reduced downtime.

127.Government of India planning to lunch welfare schemes to Indian citizen using cloud storage service. For this scheme government needed Aadhar details and bank account details of the Indian citizen. What kind of cloud deployment models is suitable for this application and justify your answer.CO3 L4

For a government welfare scheme that requires the storage of sensitive personal information such as Aadhaar and bank account details, a cloud deployment model that provides a high level of security and control would be most suitable. One such model is the private cloud deployment.

A private cloud is a cloud computing environment that is dedicated to a single organization. The infrastructure is owned, managed, and operated by the organization or a third-party service provider on the organization's behalf. This provides the government with full control over the data and the ability to configure and implement the security measures necessary to protect sensitive information.

In a private cloud deployment, the government would have complete control over the data and the infrastructure, which would ensure that the security of citizens' sensitive personal information is maintained at all times. They can also set up different level of access to the data, enabling only authorized personnel to access it.

Another benefit of private cloud deployment is that it offers a good level of compliance and regulatory requirements. This would ensure that the government is able to comply with all laws and regulations related to the storage and handling of personal information.

In addition to private cloud, government can also use Hybrid cloud deployment which is a combination of both private and public cloud. With hybrid, the government can keep sensitive data on the private cloud and keep less sensitive data on public cloud, thus providing the best of both worlds.

Overall, private cloud deployment is the most suitable for this application as it provides the government with the necessary level of security, control, and compliance required for the storage of sensitive personal information such as Aadhaar and bank account details.

128.Cyber attack on All India Institute of Medical Sciences (AIIMS) Delhi's servers data locked for the access, what kind of the cyber treats is it.CO4 L4

The type of cyber attack you describe, where the data on the servers of the All India Institute of Medical Sciences (AIIMS) in Delhi has been locked and is not accessible, is likely a ransomware attack.

Ransomware is a type of malicious software that encrypts the data on a victim's computer or servers, making it inaccessible to the victim. The attackers then demand a ransom payment in exchange for the decryption key or a solution to regain access to the locked data.

In this type of attack, the attackers typically gain initial access to the victim's network through a phishing email, a weak point in the network's security, or a vulnerability in the software being used. Once they have access, they will then deploy the ransomware and encrypt the targeted data.

It's important to note that this type of attack can have a significant impact on the affected organizations, and it's critical to have a robust disaster recovery and business continuity plan in place, as well as to ensure that the software and hardware used by the organization is regularly updated with security patches.

It's also very important to regularly backup the data and have off-site backup. As soon as the organization recognizes a ransomware attack, it's essential to disconnect the affected devices from the network, to limit the spread of the malware, and to contact a cybersecurity expert for help in resolving the issue.

129.Oil & gas Company produce crude oil using industrial control system in the automate production operation. If this company implement IOT in industrial control system, how IOT implementation transforms industrial control system in Oil & Gas Company? CO1 L3

The implementation of Internet of Things (IoT) technology in an industrial control system (ICS) can have a significant impact on the operations of an oil and gas company. Some of the ways in which IoT can transform the ICS in such a company include:

Real-time monitoring and control: By using IoT sensors and devices to collect data on the operations of the industrial control system in real-time, the company can monitor and control the process more effectively. This can help to improve efficiency, reduce downtime, and optimize production.

Predictive maintenance: With IoT data and machine learning algorithms, the company can predict when equipment is likely to fail, allowing them to schedule maintenance before the failure occurs. This can help to reduce downtime and increase the overall efficiency of the production process.

Remote monitoring and control: IoT technology can enable remote monitoring and control of the industrial control system, allowing the company to remotely monitor and control the production process from a remote location. This can improve the responsiveness of the control system and reduce the need for on-site personnel.

Real-time data analytics: By collecting and analyzing data from the ICS in real-time, the company can gain insights into the production process and identify areas for improvement. This can help to optimize the production process, reduce costs, and improve the overall efficiency of the company.

Automation of production operations: IoT can enable automation of many production operations, helping to reduce human intervention and increasing accuracy, productivity and safety.

Overall, the implementation of IoT technology in the industrial control system of an oil and gas company can help to improve efficiency, reduce downtime, and optimize production, providing a range of benefits for the company such as increase in revenue, cost reduction, and operational excellence.

130.Bangalore international airport support both passenger and cargo aeroplane services, what are all application can use IOT and how IOT will transform present service model.CO1 L3

The Internet of Things (IoT) can be used in various applications at Bangalore International Airport to improve services for both passengers and cargo services. Some examples of how IoT can be used include:

Smart Baggage Handling: IoT-enabled baggage handling systems can track the location of baggage in real-time, reducing the likelihood of lost or delayed baggage and making the baggage handling process more efficient.

Predictive Maintenance: IoT sensors and devices can be used to monitor the condition of airport equipment and infrastructure in real-time, allowing for predictive maintenance and reducing downtime.

Intelligent Lighting and Energy Management: IoT-enabled lighting and energy management systems can be used to optimize energy usage and improve overall operational efficiency at the airport.

Smart Parking: IoT-enabled smart parking systems can help to optimize the use of parking spaces, reducing congestion and improving the overall passenger experience.

Real-time Flight Information: IoT-enabled systems can provide real-time flight information to passengers, reducing the need for staff assistance and improving overall passenger experience.

Air Quality Monitoring: IoT-enabled devices can monitor the air quality in the airport, helping to improve overall health and safety for passengers and staff.

IoT implementation will transform the present service model by introducing automation, more efficient service delivery, cost reduction, better customer experience and real-time monitoring and decision making.

Overall, the implementation of IoT technology can help to improve the overall efficiency and passenger experience at Bangalore International Airport, by reducing downtime, optimizing the use of resources and infrastructure, and providing real-time information and assistance to passengers and staff.

131.A 20 years old manufacturing company planning to implement IOT in the field level and control level. During Implementation Company faces one big problem is data connectivity and interoperability for both horizontal and vertical data communications. How this problem can be solved and explain CO2 L4

Implementing IoT in a manufacturing company can present challenges when it comes to data connectivity and interoperability, particularly at the field and control levels. One way to address this issue is through the use of a middleware solution.

Middleware is software that sits between the IoT devices and the backend systems and facilitates communication and data flow between them. It acts as a translator, allowing different systems and devices to communicate with each other, even if they use different protocols or standards.

A good middleware solution can provide several benefits for the manufacturing company:

It can provide connectivity between different devices and systems, enabling data to flow seamlessly between them.

It can enable data filtering and normalization, allowing data to be collected and processed in a consistent format.

It can enable integration with existing systems, allowing the company to leverage existing investments in technology.

It can provide real-time data processing capabilities and intelligence

It can also provide security and authentication of devices and data

One good example of middleware is the Platform of Things (PoT), is a technology platform that allows devices and systems to connect, communicate, and share data with each other. PoT provides a flexible, scalable and secure middleware layer that allows devices and systems to connect to the IoT solution regardless of the device's connectivity or the device's data protocol.

In addition to middleware, a company can also use the MQTT protocol which is a lightweight publish-subscribe protocol that enables efficient and low-bandwidth communication between IoT devices and backend systems. The protocol is well suited for resource-constrained devices and networks, and it can help to reduce data transmission costs.

It is also important to note that, It should be a security first approach when implementing IoT, with proper data encryption and secure network communication protocols in place to protect against data breaches and hacking.

Overall, implementing a middleware solution, such as Platform of Things (PoT) can help to solve the problem of data connectivity and interoperability by providing a flexible and scalable platform that enables seamless communication between different devices and systems.

132.Apollo hospital limited adapted to Industrial Internet technology to connect entire hospitals located in different part of country. This transformation improves overall efficiency. If all the different hospitals located in India are adopted industrial internets. How this transformation will impact on this sectors and justify.CO1 L3

The implementation of Industrial Internet technology across all hospitals in India would likely have a significant impact on the healthcare sector. Here are some ways in which the transformation could improve overall efficiency:

Real-time monitoring and control: With Industrial Internet of Things (IIoT) technology, hospital staff can monitor and control medical equipment, such as X-ray machines, CT scanners and ventilators, remotely in real-time. This can help to improve the efficiency and accuracy of diagnostic procedures, and reduce downtime for equipment maintenance.

Predictive maintenance: IIoT technology can help to predict when medical equipment will need maintenance, allowing hospital staff to schedule repairs and maintenance before equipment failure occurs, thus reducing the downtime and increasing the availability of the equipment.

Improved patient care: With the help of IIoT technology, doctors and nurses can access patient data from all the different hospitals located in the country remotely in real-time, allowing them to make better-informed decisions about patient care. This can help to improve patient outcomes and reduce the length of hospital stays.

Remote monitoring and control: IIoT technology can enable remote monitoring of patients in remote areas through telemedicine, and thus can provide access to medical care to rural areas.

Data analytics: With the help of IIoT technology, healthcare organizations can collect and analyze large amounts of data from multiple hospitals, which can help to identify trends, patterns and areas for improvement in the healthcare system.

Automation: IIoT technology can automate many tasks in the hospital, such as inventory management, patient scheduling and medical record keeping, helping to reduce administrative burdens on hospital staff and improving overall efficiency.

Overall, the implementation of Industrial Internet technology across all hospitals in India could have a significant impact on the healthcare sector by improving overall efficiency, reducing downtime, and enhancing the quality of patient care through remote monitoring, real-time data analysis and automation. This will lead to more efficient service delivery, cost reduction, and better patient outcomes.

133.Cyber security avoids unauthorized access of data in the any organization. Explain the various part of the cyber security in any organization. CO4 L4

Cyber security in an organization typically includes several different components:

Network security: This includes measures to protect the organization's computer networks and infrastructure from unauthorized access, attacks, and other threats.

Endpoint security: This involves securing individual devices such as computers, laptops, and mobile phones that connect to the organization's network.

Application security: This focuses on protecting the organization's software and applications from vulnerabilities and attacks.

Cloud security: This is the protection of data, applications and infrastructure associated with cloud computing.

Data security: This involves protecting the organization's sensitive data from unauthorized access, breaches, and other threats.

Identity and access management: This is the management of user identities and their access to resources.

Disaster recovery: This involves planning and implementing measures to restore operations in the event of a security incident or other disruption.

Compliance: This involves ensuring that the organization adheres to relevant laws, regulations, and industry standards related to cyber security.

These are the main components of cyber security in any organization, but other measures such as employee training, incident response planning, and penetration testing may also be included.

134.A smart home has a bunch of devices connected using Internet. A hacker unauthorized access the toilet flusher and turned on and off for every 2 minutes. How you will solve this problem and what are the other vulnerabilities can damage the smart homes devices which are connected to internet and explain.CO4 L4

To solve the problem of a hacker unauthorized accessing a toilet flusher in a smart home, several steps can be taken:

Change the default login credentials for the toilet flusher device. Many IoT devices come with pre-set login credentials, which can be easily guessed by hackers. By changing the login credentials to a strong, unique username and password, it will be more difficult for hackers to gain access.

Use a firewall to block unauthorized access to the device. A firewall can be used to block incoming traffic from known malicious IP addresses or sources.

Use a VPN (Virtual Private Network) to encrypt communications between the toilet flusher device and other devices on the network.

Keep the device software and firmware updated. Manufacturers often release updates that patch security vulnerabilities.

Use an intrusion detection system (IDS) or intrusion prevention system (IPS) to detect and prevent unauthorized access.

Some other vulnerabilities that can damage smart home devices connected to the internet include:

Insecure communication protocols: Smart home devices often use proprietary communication protocols that can be easily hacked.
Inadequate security controls: Smart home devices may not have sufficient security controls, such as encryption, to protect against hacking.
Weak authentication: Many smart home devices do not have strong authentication mechanisms, making it easy for hackers to gain access.
Lack of software updates: Many smart home devices are not regularly updated, which can leave them vulnerable to known security vulnerabilities.
It is important to be aware of these vulnerabilities and take steps to protect smart home devices from unauthorized access and other security threats.

135.Is cloud is secure? Do you agree justify your answer, and what are the working principles of cloud security? CO4 L4

Cloud security is generally considered to be secure, but like any technology, it has its own set of risks and vulnerabilities. The security of cloud services depends on the implementation and management of the service provider, as well as the configuration and usage of the service by the customer.

One of the main advantages of cloud security is the ability to leverage the expertise and resources of the cloud service provider, who may have more robust security measures in place than an individual organization could afford. Additionally, cloud providers are often subject to strict regulatory compliance requirements, which can add an extra layer of security for customers.

However, there are some risks associated with using cloud services, such as:

Data breaches: Cloud services may be subject to data breaches, which can result in sensitive information being compromised.
Compliance: Cloud services may not be compliant with certain industry or governmental regulations.

Data loss or corruption: Cloud services may be subject to data loss or corruption, which can be caused by a variety of factors such as natural disasters, human error, or software bugs.

To mitigate these risks, cloud security typically employs the following principles:

Data Encryption: Data is encrypted both in transit and at rest to protect against unauthorized access.

Access Control: Users are granted access to cloud resources based on their roles and responsibilities.

Multi-Factor Authentication: Users are required to provide multiple forms of authentication, such as a password and a fingerprint, to access cloud resources.

Security Monitoring: Cloud service providers continuously monitor their systems for potential security threats.

Compliance: Cloud service providers comply with relevant laws, regulations, and industry standards related to security.

Incident management: Cloud service providers have incident management plans in place to respond to security incidents in a timely and effective manner.

It is important to note that while cloud security is generally considered to be secure, it is not foolproof. Customers should conduct a thorough risk assessment and due diligence when choosing a cloud service provider and implement best practices for securing their own cloud environment.

136.Hampli University is planning to make an intelligent robot to assist the students and visitors. The robot is capable to response to questions about campus map in audio and visual guide. To design this robot using ML and AI, what are the basic requirements needs for ML & AI.CO5 L4

To design an intelligent robot using machine learning (ML) and artificial intelligence (AI) for Hampli University, the following basic requirements would be needed:

Data: The robot would require a large amount of data to be trained on, such as maps of the campus, information about the location of buildings, and answers to frequently asked questions.

Algorithms: The robot would need to be trained using machine learning algorithms such as supervised learning, unsupervised learning, and reinforcement learning, to be able to understand the questions and provide accurate responses.

Computing power: The robot would require a significant amount of computing power to process the data and perform the complex calculations required by ML and AI algorithms.

Hardware: The robot would need specialized hardware such as sensors, cameras, and microphones to be able to navigate the campus and understand speech, as well as a powerful processor to run the AI algorithms.

Software: The robot would require specialized software such as libraries for machine learning and computer vision, as well as an operating system that can handle the demands of running AI algorithms in real-time.

Human expertise: The robot would require a team of experts in fields such as machine learning, computer science, and robotics to design, build, and maintain it.

Testing and validation: It is important to test and validate the robot to ensure that it is working correctly and providing accurate responses, before deploying it to assist students and visitors.

Security: It is important to make sure that the robot is secure and protected against hacking, unauthorized access and data breaches.

Maintenance and Updating: The robot would need to be regularly maintained and updated to ensure that it continues to function correctly and improve its performance over time.

137.Google Glass devices that assist people with reduced mental intelligence. What technologies are used in this application and how this work explains?CO1 L3

Google Glass devices are a type of wearable technology that can assist people with reduced mental intelligence, also known as cognitive impairment. The device uses a combination of technologies to help people with cognitive impairments perform tasks and communicate more effectively.

Augmented Reality (AR): The Google Glass device uses AR technology to display information such as text, images, and videos in the user's field of view. This allows users to access information and perform tasks without having to look away from their surroundings.

Speech Recognition: The device uses speech recognition technology to understand spoken commands and respond accordingly. This allows users with cognitive impairments to interact with the device using natural language, rather than having to memorize complex commands.

Computer Vision: The device uses computer vision technology to recognize and track objects in the user's field of view. This allows users to interact with their environment in a more natural way, for example, by looking at an object to select it.

Natural Language Processing (NLP): The device uses NLP technology to understand the intent of the user's speech and respond accordingly. This allows users to interact with the device using natural language, rather than having to memorize specific commands.

Machine Learning: The device uses machine learning algorithms to improve its performance over time. For example, it can learn the user's preferences and adjust its responses accordingly.

In summary, Google Glass devices for people with reduced mental intelligence utilize several technologies such as Augmented Reality, Speech Recognition, Computer Vision, Natural Language Processing and Machine Learning to provide an easy and intuitive interface for the user to interact with the device and perform the tasks they want.

138.A large machine manufacturing industry facing difficult to train new employees on the field with safety. What are the technologies are required to develop effective training with 100% safety on the field and justify your answer CO4 L4

There are several technologies that can be used to develop effective training for new employees in a large machine manufacturing industry with 100% safety on the field:

Virtual Reality (VR): VR technology can be used to simulate the factory environment and provide hands-on training for new employees. This allows them to practice operating machinery and following safety procedures in a safe and controlled environment.

Augmented Reality (AR): AR technology can be used to overlay virtual information and instructions onto the real-world environment. This can help new employees to understand the proper procedures for operating machinery and following safety protocols.

Simulation Software: Simulation software can be used to model the factory environment and the behavior of machinery. This allows employees to practice operating machinery in a virtual environment that closely mimics the real-world conditions.

Machine Learning: Machine learning algorithms can be used to analyze data from the factory floor and identify potential safety hazards. This information can be used to develop training programs that focus on the most pressing safety concerns.

Remote Monitoring: Remote monitoring technology can be used to monitor the performance of employees during training. This can provide feedback on areas where employees need additional training or where safety protocols are not being followed properly.

These technologies can provide an effective and safe way to train new employees on the field. For example, by using VR and AR technologies, employees can practice in a safe and controlled environment, where they can make mistakes without any real-world consequences. Additionally, by incorporating machine learning and simulation software, the training program can be tailored to the specific needs of the employees and the factory environment, and by remote monitoring, the progress of each employee can be tracked and evaluated.

139.A Raymond showrooms located in the India and global market to sell Textile & Apparel. The company planning to improve the businesses with robust solutions to visually interpret cloths/textile on the customers on screen without wearing it and customer can visualize how this cloth will look. And also technologies recommend clothes based on the customers physical appearances. What technologies are required to implement this solution and how this technology will help to improve businesses and justify answer?CO1 L3

There are several technologies that can be used to implement a solution for visually interpreting cloths/textile on customers' screens without them needing to wear it, and for recommending clothes based on customers' physical appearances:

Computer Vision: Computer vision technology can be used to analyze images of the textiles and create 3D models of the clothes. This allows customers to see how the clothes will look on them, without needing to physically try them on.

Augmented Reality (AR): AR technology can be used to overlay virtual images of the clothes on a customer's body. This allows customers to see how the clothes will look on them in real-time, and to make more informed purchasing decisions.

Machine Learning: Machine learning algorithms can be used to analyze customers' physical appearances, such as body shape, height, and skin tone. This information can be used to recommend clothes that are most likely to fit and flatter the customer.

Natural Language Processing (NLP): NLP technology can be used to understand customers' preferences and needs, such as the type of event they are dressing for, their personal style, and their budget. This information can be used to recommend clothes that are most likely to meet the customer's needs.

Cloud Computing: Cloud computing can be used to store and process large amounts of data, and to provide customers with access to the virtual try-on and recommendation features from any device with internet access.

This technology can help improve businesses by providing customers with a more engaging and personalized shopping experience. By using computer vision, AR, and machine learning technologies, customers can visualize how clothes will look on them, without needing to physically try them on. Additionally, by using NLP and machine learning, the system can recommend clothes that are most likely to fit and flatter the customer, which can lead to increased customer satisfaction and sales. Furthermore, by using cloud computing, the solution can be scaled and accessed by customers globally, which can increase the reach of the business and reduce the costs associated with maintaining physical stores.

140.Medical students studying for a surgeon's degree or physician's degree require a more practical approach in their learning and also to learn from experts available in different hospitals around global. How IOT and AR technologies will help medical students for better learn and explain.CO1 L3

IoT and AR technologies can help medical students studying for a surgeon's degree or physician's degree by providing a more practical approach to learning and allowing them to learn from experts located in different hospitals around the world.

IoT-enabled Medical Devices: IoT-enabled medical devices such as surgical robots and diagnostic equipment can provide medical students with hands-on experience operating the latest technology used in the medical field. This can help them to develop the skills they need to become proficient surgeons or physicians.

Remote Monitoring: IoT-enabled medical devices can be remotely monitored by experts located in different hospitals around the world. This can provide medical students with access to real-world data and expert guidance, which can help them to develop a deeper understanding of how the devices are used in practice.

AR-based Training: AR technology can be used to provide medical students with immersive, interactive training experiences. For example, AR can be used to overlay virtual anatomy and surgical procedures on real-world patients, allowing students to practice procedures in a safe and controlled environment.

Remote Expert Assistance: AR-enabled smart glasses can be used to provide remote expert assistance to medical students during surgeries and procedures. This can allow students to receive guidance and feedback from experienced surgeons and physicians, regardless of their physical location.

Patient Simulation: IoT and AR technologies can be used to create realistic patient simulations. This allows students to practice their diagnostic and treatment skills in a safe and controlled environment, which can help to improve their confidence and skills before treating real patients.

These technologies can help medical students to develop the practical skills they need to become proficient surgeons or physicians, and to learn from experts located in different hospitals around the world. By providing hands-on experience with the latest medical technology, access to real-world data, and expert guidance, these technologies can help students to develop a deeper understanding of the medical field and to improve their skills.

141.A large machine manufacturing industry sell product to India, Europe, German and America. The company provides remote maintenance services by experts are located in one place to the customers in real time around global. What technologies are required for this solution and explain the working.CO1 L3

There are several technologies that can be used to provide remote maintenance services to customers in different regions, such as India, Europe, Germany, and America:

Remote Access: Remote access technology such as virtual private networks (VPNs) and remote desktop protocols (RDPs) can be used to establish a secure connection between the expert and the customer's machines. This allows the expert to remotely access and control the machines, in order to perform maintenance and troubleshoot issues.

Remote Monitoring: Remote monitoring technology can be used to collect data from the customer's machines, such as sensor readings, machine usage, and performance metrics. This data can be analyzed by the expert to identify potential issues, and to optimize the machines' performance.

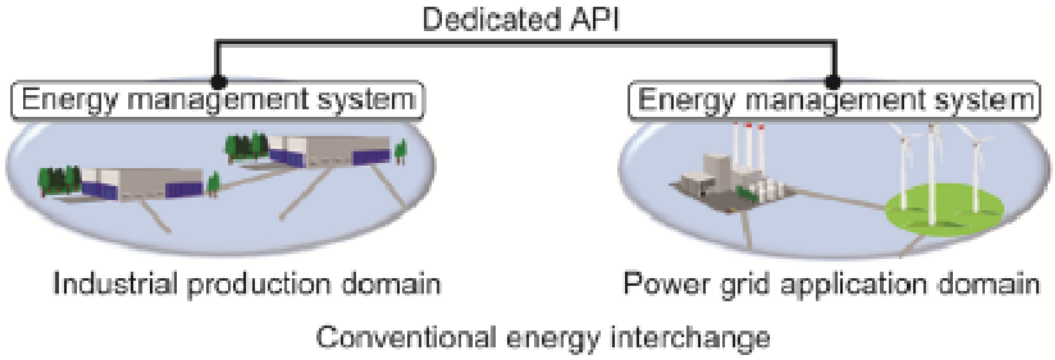
Augmented Reality (AR): AR technology can be used to provide remote expert assistance to customers, by overlaying virtual instructions and guidance on the customer's view of the machine. This allows the expert to guide the customer through the maintenance process, even if the expert is located in a different region.

Machine Learning: Machine learning algorithms can be used to analyze the data collected by the remote monitoring technology and identify patterns and trends. This can be used to predict potential issues and schedule maintenance accordingly, to optimize the performance of the machines and reduce downtime.

Cloud Computing: Cloud computing can be used to store and process large amounts of data, and to provide remote access to the monitoring and maintenance tools from any device with internet access.

This technology can help to improve the efficiency and effectiveness of the remote maintenance services. For example, by using remote access, monitoring and AR technologies, the expert can quickly identify and troubleshoot issues, even if the expert is located in a different region. Additionally, by using machine learning, the system can predict potential issues and schedule maintenance accordingly, which can help to reduce downtime and optimize the performance of the machines. Furthermore, by using cloud computing, the solution can be accessed from any device with internet access, which allows customers to access the service from any location.

142.A conventional energy interchange system between Smart Manufacturing domain and Smart Grid domain as shown in the figure. How this system can be optimized for allocation of energy consumption and supply and justify answer.CO1 L3



A conventional energy interchange system between Smart Manufacturing domain and Smart Grid domain can be optimized for allocation of energy consumption and supply by utilizing several technologies, such as:

Real-time Data Monitoring: By using real-time data monitoring, the system can track the energy consumption and supply in real-time. This allows the system to adjust the energy allocation in response to changes in demand.

Predictive Analytics: Predictive analytics can be used to analyze historical data and predict future energy consumption and supply. This allows the system to anticipate changes in demand and adjust the energy allocation accordingly.

Advanced Metering Infrastructure (AMI): AMI technology can be used to accurately measure and track energy consumption and supply. This allows the system to make more informed decisions about energy allocation.

Demand Response (DR): DR programs can be used to encourage customers to shift their energy consumption to times when energy supply is abundant, which can help to balance energy demand and supply.

Energy Storage: Energy storage systems can be used to store excess energy generated by the Smart Manufacturing domain and release it when energy demand is high. This can help to balance energy demand and supply and reduce the need for expensive energy imports.

Microgrids: Microgrids can be used to create a localized energy market, which allows the Smart Manufacturing domain to sell excess energy to the Smart Grid domain. This can help to balance energy demand and supply and increase the overall efficiency of the energy interchange system.

By using these technologies, the energy interchange system can optimize the allocation of energy consumption and supply. For example, by using real-time data monitoring, predictive analytics and AMI, the system can track and anticipate changes in demand and adjust energy allocation accordingly. Additionally, by using demand response and energy storage, the system can balance energy demand and supply and reduce the need for expensive energy imports. Furthermore, by using microgrids, the system can create a localized energy market and increase the overall efficiency of the energy interchange system.

143.A manufacturing industry use PLM concept for manufacturing product having objectives such as shorter Time to Market, improve effectiveness and answer the changing demands of the customers. What are the challenges are faced by the company in PLM.CO1 L3

There are several challenges that a company may face when implementing a Product Lifecycle Management (PLM) system in a manufacturing industry. These include:

Data integration: Integrating data from various sources, such as CAD, ERP, and supply chain management systems, can be a complex and time-consuming process.

Data quality: Ensuring the accuracy and completeness of data is a critical aspect of PLM, and it can be a challenge to maintain high levels of data quality.

User adoption: Getting all stakeholders to use the PLM system consistently and effectively can be difficult, especially if they are not properly trained or motivated.

Scalability: As the company and product portfolio grow, the PLM system must be able to scale and handle the increased complexity and volume of data.

IT support: Ensuring that the PLM system is properly maintained and supported by IT can be a challenge, especially if the company does not have the necessary resources or expertise.

Customization: Many PLM systems are not customizable and may not meet the unique needs of a manufacturing company.

Cost: Implementing a PLM system can be a significant financial investment, and it is important to ensure that the benefits outweigh the costs.

144.The ONGC oil and gas industry is highly prone to risk due to the oil exploration sites.which is the real time monitoring protocol to be deployed in IOT system to secure the industry CO2 L4

In the oil and gas industry, real-time monitoring is critical for securing operations and minimizing risks. In an IoT system, several protocols can be deployed for real-time monitoring, including:

MQTT (Message Queuing Telemetry Transport): This is a lightweight messaging protocol that is well-suited for remote monitoring and control of IoT devices.

CoAP (Constrained Application Protocol): This is a specialized web transfer protocol designed for IoT devices that have limited resources.

AMQP (Advanced Message Queuing Protocol): This is an open standard for messaging that supports secure and reliable real-time data transfer.

XMPP (Extensible Messaging and Presence Protocol): This is an open standard for real-time communication that is used in IoT systems for device control and data transfer.

Zigbee: This is a low-power wireless protocol that is widely used in IoT systems for monitoring and control of devices.

Ultimately, the choice of protocol will depend on the specific requirements of the oil and gas industry and the type of devices and systems that are being monitored.

145.Sam an IOS app developer searching for a good application programming interface(API) suggest a cloud service model .with an example list advantages. CO3 L3

A cloud service model that is commonly used for developing iOS apps is the Platform as a Service (PaaS) model. One example of a PaaS provider for iOS app development is Firebase by Google.

Advantages of using Firebase PaaS for iOS app development include:

Easy integration: Firebase provides a wide range of services that can be easily integrated into an iOS app, such as authentication, real-time databases, and hosting.

Scalability: Firebase is built on Google's infrastructure and can handle large amounts of traffic and data, making it easy to scale an app as needed.

Cost-effective: Firebase offers a free plan and a pay-as-you-go pricing model, which makes it a cost-effective option for app development.

Real-time synchronization: Firebase provides real-time synchronization of data between the app and the server, allowing for a seamless user experience.

Analytics: Firebase provides detailed analytics for an iOS app, making it easier to track user behavior and improve the app's performance.

Push Notifications: Firebase Cloud Messaging allows developers to send notifications to their users on both iOS and Android platforms.

Machine Learning: Firebase offers several machine learning-based services, such as image and text recognition, which can be integrated into iOS apps.

Offline support: Firebase offers offline support for the iOS app, so that the users can access the app even in the absence of internet connection.

Overall, Firebase is a comprehensive PaaS solution that can provide a wide range of services to aid iOS app development, and it is a good choice for developers looking for a cloud service model.

146.A milk processing plant has control systems from different manufacturers. In order to exchange information seamlessly and lead to increase in performance, reliability and safety of the systems, which technology to use? Explain? CO2 L4

One technology that can be used to seamlessly exchange information between control systems from different manufacturers in a milk processing plant is OPC-UA (OPC Unified Architecture).

OPC-UA is a communication protocol that allows for the seamless exchange of data between different control systems, regardless of their manufacturer. It is an open standard, which means that it is vendor-neutral, and it can be used to connect a wide range of devices and systems.

OPC-UA has several features that make it well-suited for use in a milk processing plant:

Interoperability: OPC-UA allows for the seamless exchange of data between different control systems, even if they are from different manufacturers.

Security: OPC-UA uses advanced security mechanisms, such as encryption and authentication, to ensure that data is protected from unauthorized access.

Scalability: OPC-UA can handle large amounts of data and can be easily scaled to support the growth of the plant.

Real-time: OPC-UA allows for real-time data transfer, which is critical for monitoring and controlling the systems in a milk processing plant.

Publish-Subscribe model: OPC-UA allows for a publish-subscribe model, where devices can publish their data and other devices can subscribe to that data, allowing for real-time monitoring and control.

Flexibility: OPC-UA is flexible enough to work with different types of devices, from PLCs, DCS, sensors, and actuators.

By using OPC-UA, the milk processing plant can improve the performance, reliability, and safety of its control systems by ensuring that data is exchanged seamlessly and in real-time between different systems.

147.The true importance of IOT data from smart objects is realized only when the analysis of the data leads to actionable business intelligence and insights.Do you agree?Justify by explaining types of data analysis results CO4 L4

I agree that the true importance of IoT data from smart objects is realized only when the analysis of the data leads to actionable business intelligence and insights.

IoT data contains a vast amount of information that can be analyzed to provide valuable insights for decision making. The types of data analysis results that can be obtained from IoT data include:

Predictive analytics: By analyzing historical data, predictive analytics can be used to make predictions about future events or trends, such as equipment failures or changes in customer behavior.

Real-time analytics: Real-time analytics can be used to monitor and analyze data in near real-time, allowing for quick and efficient decision making, for example, in the case of detecting any anomaly in the process.

Descriptive analytics: Descriptive analytics can be used to summarize and describe the characteristics of data, such as identifying patterns and trends, which can be used to improve the understanding of the data.

Prescriptive analytics: Prescriptive analytics can be used to recommend actions or decisions, based on the insights and predictions obtained from the data analysis, for example, in the case of optimizing the process.

Machine Learning: Machine learning algorithms can be used to identify patterns and relationships in the data that are not immediately visible, which can provide insights that can be used to improve operations and decision making.

In conclusion, the value of IoT data is realized when it is analyzed to provide actionable business intelligence and insights, which can be used to make informed decisions and improve operations.

148.The city of Dublin is hosting the Olympics for public facilitation the sports complex has one big car park for the citizens attending any of the sport events.The car park is facilitated with automated ticketing system which displays the number of vehicles parked and number of vacancies available.These number are automatically updated on entrance or exit of any vehicle.Even though at the main entrance it is shown that vacancies are available, every driver has to drive for very long time to find suitable empty space resulting in waste of time and money.What may be the solution CO5 L4

The solution to the problem of drivers having to spend a long time searching for an empty parking space despite vacancies being displayed at the main entrance could be to implement a smart parking system.

A smart parking system can use IoT technology to provide real-time information on the occupancy of individual parking spaces, allowing drivers to quickly and easily find an empty space. This can be done in several ways, such as:

Sensors: Install sensors in each parking space that can detect when a vehicle is parked or when a space is empty, and use this information to update the parking occupancy information in real-time.

Smartphone App: Provide a smartphone app that allows drivers to view the real-time occupancy of parking spaces and navigate to the nearest empty space.

Smart Signage: Use smart signage to display real-time occupancy information for each parking area, which can help drivers to quickly find an empty space.

Predictive analytics: Use predictive analytics on the historical data to predict the number of vehicles that will be parked on a specific day and time, and use this information to guide drivers to the least occupied area.

Integration with other systems: Integrate the parking system with other transportation systems such as public transportation, bike-sharing, and ride-sharing to encourage people to use alternative modes of transportation, thus reducing the number of cars on the road.

Overall, a smart parking system can greatly improve the experience of drivers and make it much easier for them to find an empty parking space, reducing the waste of time and money.

149.Is ThingSpeak an open source cloud IoT platform that allows users to collect and store sensor data, as well as analyze and visualize that data in real-time? Justify with its applications CO3 L3

Environmental monitoring: ThingSpeak can be used to collect and analyze data from sensors that measure temperature, humidity, air quality, and other environmental factors.

Industrial automation: ThingSpeak can be used to monitor and control industrial processes and equipment, such as machine temperature, vibration, and energy consumption.

Smart agriculture: ThingSpeak can be used to collect and analyze data from sensors that measure soil moisture, temperature, and light levels, which can be used to optimize crop growth and improve crop yields.

Smart city: ThingSpeak can be used to collect and analyze data from sensors that measure traffic, air quality, and noise levels in cities, which can be used to improve the quality of life for citizens.

Home automation: ThingSpeak can be used to monitor and control home appliances, lighting, temperature, and other environmental factors, which can be used to improve the energy efficiency of homes.

Health monitoring: ThingSpeak can be used to collect and analyze data from wearable devices and other health sensors, which can be used to monitor vital signs, physical activity, and sleep patterns.

Remote monitoring: ThingSpeak can be used to remotely monitor and control devices and systems, such as security cameras, alarm systems, and energy usage.

Overall, ThingSpeak is a versatile platform that can be used in a wide range of applications, from environmental monitoring to industrial automation, and from smart agriculture to health monitoring.

150. ThingSpeak is an open source cloud IoT platform that allows users to collect and store sensor data, as well as analyze and visualize that data in real-time.How does the level of humidity in the air affect the energy consumption of my air conditioning system?Explain using Thingspeak CO4 L4

Collect data: Use sensors to measure the humidity level and energy consumption of your air conditioning system, and upload the data to ThingSpeak for storage and analysis.

Visualize the data: Use the visualization tools provided by ThingSpeak to create charts and graphs of the humidity level and energy consumption data over time. This will allow you to see the general trends and patterns in the data.

Analyze the data: Use the analysis tools provided by ThingSpeak, such as correlation and regression analysis, to identify the relationship between humidity level and energy consumption. These tools can help you determine the strength and direction of the relationship between the two variables.

Draw conclusions: Use the insights obtained from the data analysis to answer the question and identify a relationship between humidity level and energy consumption.

Make decisions: Use the conclusions obtained from the data analysis to make decisions and take actions, such as adjusting the air conditioning system settings to optimize energy consumption.

Monitor in real-time: ThingSpeak allows you to monitor the data in real-time, which means that you can see the results in near real-time, which can help you take actions if needed.

Overall, ThingSpeak provides an easy-to-use platform that enables you to collect, store, analyze and visualize data, which can help you to answer complex questions, such as the relationship between humidity level and energy consumption of your air conditioning system.

1."Distributed system is easy to scale, more secure and have good data backup compare to centralized network system". Do you agree? Justify your opinion with proper reasons. CO1 L3

It is generally true that distributed systems can be easier to scale and offer better data backup compared to centralized systems. However, the claim that distributed systems are more secure is not necessarily true.

One advantage of distributed systems is that they can be easier to scale. Because distributed systems involve multiple servers or devices working together, it is relatively straightforward to add more servers or devices as needed to handle increased traffic or workload. This can allow for greater scalability compared to centralized systems, which may be more limited in terms of their ability to handle increased traffic or workload.

Distributed systems also often provide better data backup compared to centralized systems. Because data is stored on multiple servers or devices, there is a lower risk of data loss due to a single point of failure. If one server or device goes down, the data can still be accessed from other servers or devices.

However, it is not necessarily true that distributed systems are more secure than centralized systems. Security depends on various factors, including the overall design and implementation of the system, the measures taken to protect against attacks and breaches, and the level of access and privileges granted to different users. A poorly designed or implemented distributed system could be less secure than a well-designed and implemented centralized system.

2.Chose most appropriate suitable network for below application provides reasons for selecting that network over other

a.One college server which have multiple nodes from their students (a smaller number of requests/response)

b.All colleges' data can access multiple nodes (nodes are PDAs from students) all overworld

CO1 L4

For the first scenario, where there is a single college server with multiple nodes from students, a centralized network would likely be the most appropriate choice. A centralized network involves a single server or device

that manages all of the network's resources and handles all requests. This type of network can be relatively simple to set up and manage, and it may be sufficient for a smaller number of requests and responses.
For the second scenario, where multiple nodes from colleges all over the world need to be able to access data, a distributed network would likely be the most appropriate choice. A distributed network involves multiple servers or devices working together to share resources and handle requests. This type of network can be more complex to set up and manage, but it is well-suited for handling a large number of nodes and requests, and it allows for greater scalability and resilience.

There are other types of networks that could potentially be suitable for these scenarios, such as a client-server network or a peer-to-peer network. However, a centralized network would be the most appropriate choice for the first scenario, and a distributed network would be the most appropriate choice for the second scenario, based on the specific needs and constraints of each application.

3.In Katakana all polytechnic colleges decided to make smart campus using IOT, implementer s decided to use Wi-Fi applications for IOT communication. Can you explain possible reasons to choose Wi-Fi over Bluetooth? Also, implementer s now confused over which type of Wi-Fi they can use among multiple types, they need high data rate, security, Large covering area, Scalable and less expensive. Analyze various types of Wi-Fi suggest possible type of Wi-Fi which will be suitable for above said features with proper justifications. CO2 L4

There are several reasons why Wi-Fi might be a better choice than Bluetooth for an IoT (Internet of Things) communication system in polytechnic colleges:
Data rate: Wi-Fi is generally faster than Bluetooth, with data rates ranging from 11 Mbps to several Gbps, depending on the specific Wi-Fi standard being used. This makes it well-suited for applications that require high data rates, such as streaming video or transferring large files.
Security: Wi-Fi includes a number of security features, such as encryption and authentication, that can help to protect against unauthorized access and data breaches.
Coverage area: Wi-Fi has a longer range than Bluetooth, which makes it well-suited for covering a large area, such as a campus.
Scalability: Wi-Fi can be easily scaled to support a large number of devices and users, making it well-suited for applications with a high degree of scalability.
Cost: Wi-Fi is generally less expensive to implement than other wireless technologies, such as cellular, which makes it a cost-effective choice for many applications.
There are several types of Wi-Fi available, including IEEE 802.11b, 802.11g, 802.11n, and 802.11ac. The most suitable type of Wi-Fi for the polytechnic colleges' IoT communication system will depend on the specific needs and constraints of the application. For example, if the colleges need a high data rate, good security, a

large coverage area, scalability, and a low cost, then Wi-Fi 802.11ac might be the best choice. This standard supports data rates up to several Gbps, includes advanced security features, has a range of several hundred feet, is easily scalable, and is relatively inexpensive to implement. It is important to note that Wi-Fi 802.11ac is not compatible with older devices that use 802.11b or 802.11g, so it may not be suitable if the colleges have a large number of older devices that need to be supported.

4. Increasing in the population in the metropolitan city corresponds to increase in traffic, Air pollution,Healthcare,public transport and waste etc to have a smooth and sustainable life of people, how to make use of IOT technology to convert Bangalore city into smart city CO1 L3

The Internet of Things (IoT) can play a significant role in helping to transform Bangalore into a smart city. Here are a few ways that IoT technology can be used to address some of the challenges that has been mentioned:

Traffic management: IoT sensors and smart traffic systems can be used to monitor and control traffic flow, reducing congestion and improving safety. This can be done through the use of smart traffic lights, intelligent transport systems, and real-time traffic monitoring systems.

Air pollution: IoT sensors can be used to monitor air quality and identify sources of pollution. This information can be used to develop strategies for reducing air pollution and improving public health.

Healthcare: IoT devices can be used to monitor the health of individuals and track the spread of diseases. This can help to improve public health outcomes and reduce the burden on healthcare systems.

Public transport: IoT sensors and smart ticketing systems can be used to improve the efficiency and convenience of public transportation. This can include real-time tracking of buses and trains, as well as the integration of different modes of transportation.

Waste management: IoT sensors and smart waste management systems can be used to optimize waste collection and recycling processes, reducing the environmental impact of waste.

Overall, the key to using IoT technology to transform Bangalore into a smart city will be to develop a comprehensive and integrated approach that addresses the various challenges facing the city. This will require the collaboration of government, private industry, and other stakeholders to develop and implement effective solutions.

5. Dell Technologies realized significant cost savings from the use of a predictive maintenance application run in the Dell IT data lake. The company saved more than $100 million due to this change. Explain the technology of predictive maintenance used in detail. CO1 L3

Predictive maintenance is a maintenance strategy that uses sensors, data analytics, and machine learning algorithms to predict when equipment is likely to fail, so that maintenance can be scheduled in advance. This can help to prevent unplanned downtime, improve equipment reliability, and reduce maintenance costs.

In the case of Dell Technologies, they likely used sensors to collect data on various aspects of their equipment, such as temperature, vibration, and usage patterns. This data was then fed into a data lake, where it was analyzed using machine learning algorithms to identify patterns and trends that indicated when equipment was likely to fail. Based on this analysis, the predictive maintenance application was able to generate recommendations for when maintenance should be performed, allowing Dell Technologies to schedule maintenance in advance and avoid unplanned downtime. This approach allowed the company to realize significant cost savings, as it reduced the need for reactive maintenance and minimized the impact of equipment failures on business operations.

ADVANTAGES:

- Reduction of unscheduled equipment downtime caused by equipment failure
- Increased labor utilization.
- Increased production capacity.
- Reduced maintenance costs.
- Increased equipment lifespan.

6.Researchers decided to monitor one area Siachen Glacier using IOT for that they need low power consumption wireless communication system for interconnection of things as in that location frequent charging as not possible and communication range will be less than 10 meters. Choose best wireless system for above requirements and explain its operation CO2 L3

One wireless system that would be well-suited for the research team's needs is Bluetooth Low Energy (BLE). BLE is a wireless communication standard that is designed for low power consumption and short-range communication (up to around 30 meters). It is often used for IoT applications that require long battery life and a low-power, low-bandwidth connection.

BLE operates on the same frequency as classic Bluetooth (2.4 GHz), but it uses a different protocol that is optimized for low power consumption. BLE devices can operate for months or even years on a single coin cell battery, making it an ideal choice for applications where frequent charging is not possible.

In terms of operation, BLE uses a star topology, in which a central device (such as a smartphone or a gateway) communicates with multiple peripheral devices (such as sensors or actuators). The central device establishes a connection with each peripheral device and exchanges data with them. BLE also supports connection less communication, in which devices can send and receive data without establishing a direct connection.

BLE is widely supported by many types of devices, including smartphones, tablets, laptops, and dedicated IoT devices. It is a relatively simple and inexpensive technology to implement, making it a good choice for many IoT applications.

7.To meet the needs of Globalization it is very much necessary to implement industry 4.0. Justify this by mentioning its issues and benefits CO1 L4

Industry 4.0 is also known as the Fourth Industrial Revolution, refers to the current trend of automation and data exchange in manufacturing technologies, including the Internet of Things (IoT), artificial intelligence (AI), and machine learning. There are several issues and benefits to implementing Industry 4.0:

Issues:

High initial cost: Implementing Industry 4.0 technologies can be expensive, as it requires significant investments in new equipment and infrastructure.

Lack of skilled labor: There may be a shortage of skilled workers who are able to work with these technologies, which can make it difficult to find the talent needed to implement Industry 4.0.

Security risks: The use of connected devices and the exchange of data can create potential security risks, such as the possibility of cyber attacks or data breaches.

Benefits:

Increased efficiency: Industry 4.0 technologies can help to improve the efficiency of manufacturing processes by automating tasks and providing real-time data on production.

Enhanced quality: The use of AI and machine learning can help to improve the quality of products by detecting and correcting errors in real-time.

Greater flexibility: Industry 4.0 technologies can make it easier to adapt production to changing demand or to produce customized products, which can help to increase competitiveness.

Improved sustainability: The use of smart technologies can help to reduce energy consumption and waste, making manufacturing more sustainable.

Overall, the benefits of implementing Industry 4.0 are significant, but it is important to carefully consider the issues and challenges that may arise in the process. It will be important for businesses to invest in the necessary infrastructure and training to ensure that they are able to take full advantage of these technologies.

8. In the digital transformation of the energy sector, smart grids and smart meters will be key drivers for a successful digitalization. Explain the necessity of adopting loT technology in the energy sector. CO1 L3

The adoption of Internet of Things (IoT) technology in the energy sector is necessary for the successful digitalization of the industry, as it enables the deployment of smart grids and smart meters, which are key drivers of this transformation.

Smart grids are modern, digital electricity grids that use advanced sensors, data analytics, and machine learning algorithms to optimize the flow of electricity and improve the reliability, security, and efficiency of the grid. Smart meters, on the other hand, are advanced metering devices that can measure and report on electricity usage in real-time, providing utilities with detailed data on customer energy consumption patterns.

By using IoT technology, smart grids and smart meters can be connected and controlled remotely, enabling utilities to gather real-time data on grid performance, identify problems, and take corrective action. This can help to improve the reliability and efficiency of the grid, reduce energy waste, and lower operating costs.

In addition, the deployment of smart grids and smart meters can also benefit consumers, as it enables them to monitor their own energy usage, identify ways to reduce their energy consumption, and potentially save money on their energy bills.

Overall, the adoption of IoT technology in the energy sector is essential for the successful digitalization of the industry, as it enables the deployment of advanced, data-driven systems that can improve the performance, reliability, and efficiency of the energy grid.

9.Abc Pharmacy Company manufactures medicines. The company like to automate production operation to improve productivity and quality control. What are the important technical parameters should consider for implementing automation in operation process? CO1 L3

There are several important technical parameters that the Abc Pharmacy Company should consider when implementing automation in its production operations:

Safety: Automation can help to improve safety by reducing the need for human intervention in hazardous tasks, such as handling hazardous chemicals or operating heavy machinery. It is important to ensure that the automation system is designed and implemented in a way that minimizes the risk of accidents or injuries.

Accuracy: Automation can help to improve the accuracy and consistency of production processes, which can lead to higher quality products. It is important to ensure that the automation system is designed and implemented in a way that minimizes the risk of errors or deviations from the desired output.

Efficiency: Automation can help to improve the efficiency of production processes by reducing the need for manual labor and increasing the speed and throughput of the process. It is important to ensure that the automation system is designed and implemented in a way that maximizes efficiency and minimizes waste.

Flexibility: Automation should be flexible enough to handle changes in demand or production requirements. It is important to ensure that the automation system can be easily modified or reconfigured as needed to meet changing conditions.

Scalability: Automation should be scalable enough to handle increased production volume as the company grows. It is important to ensure that the automation system can be easily expanded or upgraded as needed to meet increasing demand.

Cost: Automation should be cost-effective, with a reasonable return on investment. It is important to carefully consider the costs of implementing and maintaining the automation system, as well as the potential benefits it will provide.

10.Predictive maintenance is an effective solution to avoid unnecessary downtime in the production line. Do you agree? Justify your answer with an example from energy sector. CO1 L4

Yes, I agree that predictive maintenance is an effective solution to avoid unnecessary downtime in the production line. Predictive maintenance involves using sensors and other technologies to monitor the condition of equipment and predict when it is likely to fail or require maintenance. This allows maintenance to be scheduled in advance, rather than waiting for equipment to fail and disrupting production.

One example of predictive maintenance in the energy sector is the use of sensors to monitor the condition of wind turbine blades. Wind turbines are a key source of renewable energy, but their blades can suffer from wear and tear over time. By monitoring the condition of the blades, it is possible to predict when they are likely to need maintenance or replacement. This allows maintenance to be scheduled in advance, reducing the risk of unexpected downtime and ensuring that the wind turbines are operating at maximum efficiency.

Overall, predictive maintenance can be an effective way to improve the reliability and efficiency of production systems, and it is increasingly being used in a variety of industries. By proactively addressing potential maintenance issues, companies can reduce the risk of unexpected downtime and improve the overall performance of their operations.

11.In health care sector, loT has brought significant changes to improve the facilities and information system during COVID-19 Pandemic. Justify your answer how loT has helped in digitization of medical processes and proper management in hospitals CO1 L3

The Internet of Things (IoT) has played a significant role in the digitization of medical processes and proper management in hospitals, particularly during the COVID-19 pandemic. Some examples of how IoT has helped in this regard include:

Telemedicine: IoT devices, such as wearable devices and smart devices, have enabled the remote monitoring of patients, allowing doctors to remotely diagnose and treat patients from a distance. This has been particularly important during the pandemic, as it has allowed hospitals to reduce the number of in-person visits and minimize the risk of infection transmission.

Remote patient monitoring: IoT devices, such as smart watches and smart sensors, have also enabled the remote monitoring of patients' vital signs, such as heart rate, blood pressure, and oxygen levels. This has allowed hospitals to monitor patients remotely and take prompt action if their condition deteriorates.

Inventory management: IoT devices, such as RFID tags and sensors, have been used to track the movement of medical equipment and supplies within hospitals. This has helped hospitals to better manage their inventory, ensuring that the right equipment is available in the right place at the right time.

Asset tracking: IoT devices, such as GPS trackers, have been used to track the movement of hospital assets, such as ambulances and medical equipment. This has helped hospitals to better manage their resources and respond more quickly to patient needs.

Overall, the adoption of IoT technology in the healthcare sector has brought significant changes to improve facilities and information systems, and has played a vital role in the digitization of medical processes and proper management in hospitals.

12.Abc Pharmacy Company manufactures medicines using industrial control system in the automate production operation. If this company implement IOT in industrial control system, how IOT implementation transforms industrial control system?CO1 L3

Implementing the Internet of Things (IoT) in an industrial control system (ICS) can transform the system in several ways:

Increased automation: IoT sensors and devices can be used to automate various aspects of the production process, such as monitoring and controlling equipment, collecting and analyzing data, and adjusting production parameters in real-time. This can help to improve the efficiency, accuracy, and consistency of the production process.

Improved data collection and analysis: IoT devices can generate a large volume of data that can be used to optimize the production process and improve quality control. By analyzing this data, the company can identify trends, detect potential problems, and make informed decisions about how to improve the process.

Enhanced connectivity: IoT devices can be connected to the Internet, allowing them to communicate with each other and with other systems in real-time. This can enable the company to monitor and control the production process remotely and in real-time, and to share data with other systems and stakeholders.

Increased efficiency and productivity: By automating various aspects of the production process and optimizing it based on data analysis, the company can increase the efficiency and productivity of the process. This can help to reduce costs and increase profits.

Improved maintenance: IoT sensors and devices can be used to monitor the condition of equipment and identify potential problems before they occur. This can help to reduce downtime and improve the reliability of the production process.

Overall, implementing IoT in an industrial control system can help to improve the automation, efficiency, and productivity of the production process, and enable the company to make more informed decisions about how to optimize the process.

13.Industrial control system is very much necessary for real time monitoring and controlling the process. Mention the OT components that are used to achieve this and explain any one in detail .CO1 L3

Industrial control systems (ICS) are used to monitor and control industrial processes in real-time. These systems are typically divided into two main categories: operational technology (OT) and information technology (IT). OT components are responsible for directly interacting with the process and controlling it, while IT components are used to manage and analyze data related to the process.

Some common OT components used in industrial control systems include:

Sensors: These are used to gather data from the process, such as temperature, pressure, flow, and other parameters.

Actuators: These are used to control the process, such as by opening or closing valves, starting or stopping motors, or adjusting other process variables.

Controllers: These are used to interpret sensor data and use it to control the process. This can be done through the use of programmable logic controllers (PLCs), which are specialized computers designed for industrial control applications.

Industrial networks: These are used to connect the various OT components and transmit data between them. This can include local area networks (LANs), wide area networks (WANs), and other types of networks.

One example of an OT component that is used in industrial control systems is a programmable logic controller (PLC). PLCs are specialized computers that are used to control industrial processes. They are designed to be rugged and reliable, and can be programmed to perform a wide range of control functions. PLCs are often used in manufacturing, oil and gas, and other industries where real-time control is critical. They can be programmed using specialized software and can be connected to sensors and actuators to monitor and control various process variables.

SCADA (supervisory control and data acquisition) is a type of industrial control system that is used to monitor and control industrial processes in real-time. SCADA systems typically use a combination of hardware and software components to gather data from the process, analyze it, and use it to control the process. Some common SCADA OT components include:

Sensors: These are used to gather data from the process, such as temperature, pressure, flow, and other parameters.

Actuators: These are used to control the process, such as by opening or closing valves, starting or stopping motors, or adjusting other process variables.

Controllers: These are used to interpret sensor data and use it to control the process. This can be done through the use of programmable logic controllers (PLCs), which are specialized computers designed for industrial control applications.

Industrial networks: These are used to connect the various OT components and transmit data between them. This can include local area networks (LANs), wide area networks (WANs), and other types of networks.

Human-machine interfaces (HMIs): These are used to provide a user interface for operators to interact with the SCADA system. This can include displays, keyboards, and other input/output devices.

Data historians: These are used to collect and store data from the process, enabling analysis and trending of process variables over time.

Overall, these OT components work together to enable real-time monitoring and control of industrial processes using a SCADA system. By gathering data from the process and using it to control the process, SCADA systems can help to improve the efficiency and reliability of industrial operations.

DCS

A distributed control system (DCS) is a type of control system that is used to monitor and control industrial processes. It is called a "distributed" control system because it consists of multiple, interconnected components that are distributed throughout the process being controlled.

A DCS typically includes a central computer, called the controller, which is responsible for processing data and issuing control commands. The controller is connected to a network of field devices, such as sensors and actuators, which are used to measure and control the process. The field devices are connected to the controller

through input/output (I/O) modules, which translate the signals from the field devices into a form that the controller can understand and vice versa.

One of the main advantages of a DCS is its ability to handle large, complex processes with many variables. A DCS can be programmed to control multiple process variables simultaneously and can be configured to handle a wide range of process control applications. Additionally, a DCS can be easily expanded or modified to accommodate changes in the process being controlled, making it a flexible and scalable solution for industrial control.

In summary, a DCS is an OT component that is used in industrial control systems to monitor and control complex industrial processes in real-time. It consists of a central controller, a network of field devices, and I/O modules that connect the controller to the field devices.

14.Manufacturing enterprises are seeking to leverage IT/OT convergence to achieve gains in productivity and reduction in cost, inspite of inherent risks of convergence. Discuss the challenges of "IT/OT convergence" in the Manufacturing Industry CO1 L3

The convergence of Information Technology (IT) and Operational Technology (OT) in the manufacturing industry refers to the integration of IT systems, which handle data and communications, with OT systems, which control and monitor physical processes. This convergence can enable manufacturers to achieve gains in productivity and cost reduction by enabling the integration and analysis of data from both IT and OT systems. However, there are several challenges that manufacturers must consider when pursuing IT/OT convergence:

Security risks: The integration of IT and OT systems can create new security vulnerabilities, as it exposes OT systems to the potential risks associated with IT systems, such as cyber attacks and data breaches. Manufacturers must therefore invest in robust security measures to protect their systems and data.

Compatibility issues: IT and OT systems may use different technologies, protocols, and standards, which can make it difficult to integrate them. Manufacturers must ensure that their systems are compatible and can communicate with each other effectively.

Integration complexity: Integrating IT and OT systems can be complex and time-consuming, as it requires the integration of different systems, data sources, and processes. Manufacturers must ensure that they have the resources and expertise to effectively manage the integration process.

Change management: Converging IT and OT systems can require significant changes to processes and procedures, which can be difficult for manufacturers to manage. It is important that manufacturers have a clear plan in place to manage the transition to IT/OT convergence and ensure that all stakeholders are on board.

Overall, IT/OT convergence in the manufacturing industry can bring significant benefits, but it also presents a range of challenges that manufacturers must carefully consider and address in order to realize these benefits.

15.Indian government uses one server to store and manage entire Aadhar data of Indian citizen, is there any issue with this setup, if yes justify your answer and suggest solution for issue.CO1 L4

There are several potential issues with the Indian government using a single server to store and manage the entire Aadhar data of Indian citizens:

Security: Storing all of the Aadhar data on a single server presents a single point of failure, which could make it more vulnerable to data breaches or attacks. If th

e server is compromised, the entire Aadhar data of Indian citizens could be at risk.

Scalability: A single server may not be able to handle a large volume of requests and transactions if the number of users and the amount of data increases significantly over time. This could lead to delays or errors in the system.

Reliability: A single server is more prone to failure compared to a distributed system with multiple servers. If the server goes down, the entire Aadhar data of Indian citizens would be unavailable until the server is restored.

To address these issues, the Indian government could consider implementing a distributed system that stores and manages the Aadhar data across multiple servers. This would improve security by reducing the risk of a single point of failure, and it would improve scalability and reliability by allowing the system to handle a larger volume of requests and transactions and providing redundancy in case of server failure.

Other potential solutions could include implementing robust security measures to protect the server and the data, and implementing a backup and recovery system to ensure that the data is preserved in case of server failure. It may also be helpful to implement a system for monitoring and managing the server to detect and address any potential issues before they become critical.

16.Message queuing telemetry support (MQTT) is light weight machine-to-machine protocol that helps IoT devices communicate with each other, with minimal code requirements . Can this protocol be used in fire detection from remote monitoring? Justify your answer with working principle of this protocol.

CO2 L3

Yes, the Message Queuing Telemetry Transport (MQTT) protocol can be used in fire detection from remote monitoring. MQTT is a lightweight, publish-subscribe messaging protocol that is designed to be used in machine-to-machine (M2M) and Internet of Things (IoT) applications where bandwidth and resources are limited. It is commonly used in applications where devices need to send and receive data over a network, such as in remote monitoring systems.

The working principle of the MQTT protocol is based on the publish-subscribe model. In this model, devices that want to send data (publishers) send it to a central server (broker), which then forwards the data to any devices that are subscribed to receive it (subscribers). This allows devices to communicate with each other without the need for a direct connection.

To use MQTT in a fire detection system, sensors could be installed in various locations to detect the presence of fire. These sensors could then publish data to the broker indicating the presence of fire. Subscribers, such as a control panel or monitoring station, could then receive this data and take appropriate action, such as activating an alarm or sending a notification to emergency services.

Overall, the MQTT protocol is well-suited for use in remote monitoring applications like fire detection due to its lightweight design and ability to handle large numbers of connected devices with minimal resources.

17.There are a variety of sensors that can be used in a smart car to enable various features and capabilities.Which is the most preferred protocol for car sensors? It should support event- driven message transfer and queuing through wireless networks. Explain its working principle. CO2 L3

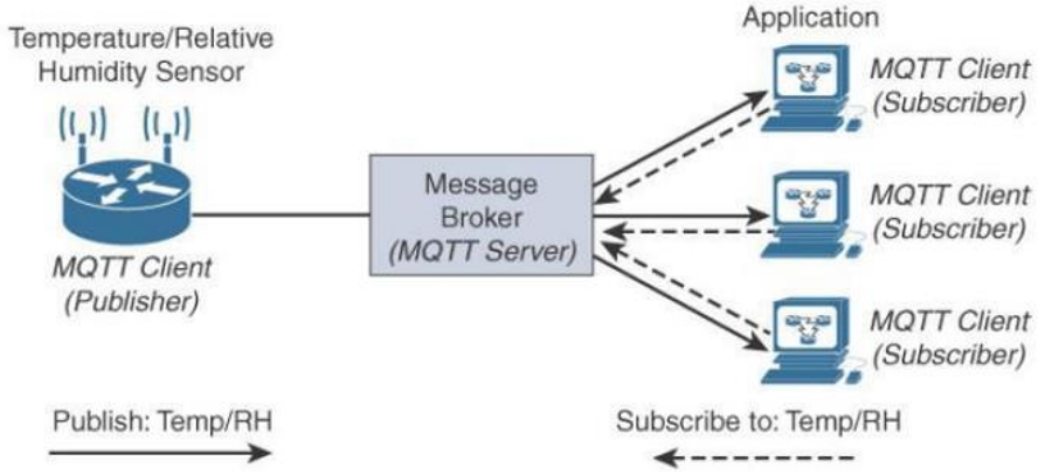
One of the most commonly used protocols for car sensors is the Message Queue Telemetry Transport (MQTT) protocol. MQTT is a lightweight, event-driven messaging protocol that is designed to support the transfer of data over wireless networks.

The working principle of MQTT involves the use of a publish-subscribe model, in which "publishers" (i.e., sensors) send data to a central "broker," and "subscribers" (i.e., applications or devices) receive the data from the broker. The broker is responsible for routing the data from the publishers to the appropriate subscribers, based on pre-defined "topics" that the publishers and subscribers subscribe to.

MQTT is particularly well-suited for use in car sensors, as it has a small footprint and is designed to support event-driven messaging, which means that it can efficiently transmit data only when there is a change in the data (e.g., a sensor reading exceeds a certain threshold). This can help to reduce the amount of data transmitted and minimize the impact on network resources.

In addition, MQTT supports queuing, which means that it can store data in a queue if the network is unavailable or the broker is not reachable. This ensures that data is not lost and can be transmitted as soon as the network becomes available again.

Overall, MQTT is a popular choice for car sensors due to its lightweight, event-driven design, and its ability to support efficient, reliable data transfer over wireless networks.



18.A 20 years old

19.

18.manufacturing company planning to implement IOT in the field level and control level. During Implementation

Company faces one big problem is data connectivity and interoperability for both horizontal and vertical data communications. How this problem can be solved and explain CO2 L4

There are several strategies that the manufacturing company can use to solve the problem of data connectivity and interoperability for both horizontal and vertical data communications during the implementation of IoT at the field and control levels:

Standardization: One of the key challenges with data connectivity and interoperability is the lack of standardization. By adopting standard protocols and technologies, the company can ensure that different devices and systems can communicate with each other seamlessly. For example, the company could adopt industry-specific standards such as OPC UA or Industry 4.0, or more general standards such as HTTP, MQTT, or CoAP.

Gateway devices: Gateway devices can be used to bridge the gap between different devices and systems that use different protocols or technologies. For example, the company could use a gateway device to connect a field device that uses a proprietary protocol to a control system that uses a standard protocol. This would allow the two systems to communicate with each other without the need for direct connectivity.

Middleware: Middleware can be used to facilitate communication between different devices and systems. Middleware acts as a "glue" layer that sits between different systems and translates data between them. By using middleware, the company can ensure that different devices and systems can communicate with each other, even if they use different protocols or technologies.

Data integration: Data integration tools and platforms can be used to collect, combine, and transform data from different sources. By using data integration, the company can ensure that data from different devices and systems is compatible and can be used in a meaningful way.

Overall, by adopting standardization, using gateway devices, implementing middleware, and leveraging data integration, the company can effectively solve the problem of data connectivity and interoperability for both horizontal and vertical data communications during the implementation of IoT.

19.In order to connect Allen broadly PLC, delta PLC, siemens PLC to HMI, each should have their own drivers. Instead of using individual drivers, which machine to machine communication protocol developed by OPC foundation that is a common architecture for all the PLC's, can be used to resolve this problem. CO2 L4

The OPC Foundation developed the OPC Unified Architecture (OPC UA) as a machine-to-machine communication protocol that can be used to connect different types of programmable logic controllers (PLCs) to a human-machine interface (HMI). OPC UA is a common architecture that can be used with Allen Bradley, Delta, Siemens, and other types of PLCs, eliminating the need for individual drivers for each type of PLC.

OPC UA uses a standard data model and communication protocol to enable interoperability between different devices and systems. It can be used to exchange data and control commands between PLCs, HMIs, and other

devices, regardless of the manufacturer or protocol used by the devices. This allows different types of PLCs to be connected to a single HMI without the need for individual drivers.

Overall, the use of OPC UA can simplify the process of connecting different types of PLCs to an HMI, reducing the need for individual drivers and enabling more seamless communication between devices. This can help to improve the efficiency and reliability of industrial systems.

OPC Unified Architecture (OPC UA) is a machine-to-machine communication protocol that is used to exchange data and control commands between devices and systems in industrial and other applications. Here are some key features of OPC UA:

Interoperability: OPC UA is designed to be a common architecture that can be used with a wide range of devices and systems, regardless of the manufacturer or protocol used. This enables interoperability between different devices and systems, allowing them to communicate and exchange data more seamlessly.

Scalability: OPC UA is designed to handle large numbers of connected devices and can scale to meet the needs of different applications.

Security: OPC UA includes built-in security features, such as encryption and authentication, to protect against unauthorized access and data tampering.

Robustness: OPC UA is designed to be reliable and resilient, with features such as error handling and retry mechanisms to ensure that data is delivered reliably.

Extensibility: OPC UA includes a flexible data model that can be extended to support new types of data and devices.

Overall, the features of OPC UA make it a powerful and flexible tool for enabling machine-to-machine communication in a variety of industrial and other applications.

20.Bluetooth offers device control through a smartphone. But, it only allows eight devices to be connected. ZigBee supports up to 65,000 nodes, but there is a fee for every connected device. Compare and explain both the technologies. CO2 L3

Bluetooth and ZigBee are both wireless communication technologies that are commonly used for device control and automation applications. However, they have some key differences in terms of their capabilities and characteristics:

Range: Bluetooth has a shorter range than ZigBee, typically up to 30 meters (100 feet) in open space. ZigBee, on the other hand, has a longer range, up to 100 meters (300 feet) in open space.

Device support: Bluetooth allows up to eight devices to be connected to a single master device, while ZigBee supports up to 65,000 nodes (devices) in a single network.

Data rate: Bluetooth has a higher data rate than ZigBee, typically up to 2.1 Mbps. ZigBee has a lower data rate, typically up to 250 Kbps.

Power consumption: Bluetooth requires more power than ZigBee, as it has a higher data rate and a shorter range. This can make it less suitable for battery-powered devices. ZigBee, on the other hand, is designed for low-power consumption, making it suitable for use in devices that require long battery life.

Cost: Bluetooth is typically free to use, as it is an open standard. ZigBee, on the other hand, charges a fee for every connected device, as it is a proprietary standard.

Overall, Bluetooth and ZigBee are both useful technologies for device control and automation applications, but they have different capabilities and characteristics that make them more suitable for certain applications.

20. An IOT device is attached to wounded tiger to remotely monitor the health condition of the Tiger in Bandipur forest. The limitations are low power, limited bandwidth and remote connection. What IOT data protocol is suitable for this application and explain the working of the protocol. CO2 L4

There are several IoT protocols that might be suitable for this application. Some options to consider include:

Low Range Wireless Protocols: These protocols, such as LoRaWAN, Sigfox, and Weightless, are designed specifically for low power and low bandwidth applications. They are often used in remote or hard-to-reach locations where othe

r wireless technologies may not be viable.

Narrowband IoT (NB-IoT): This is a cellular IoT protocol that is designed for low power, low bandwidth applications. It uses a narrowband frequency spectrum, which allows it to operate efficiently with low power and low data rates.

Bluetooth Low Energy (BLE): This is a wireless protocol that is designed for low power and low data rate applications. It is commonly used in IoT devices for short-range communication, such as for sending data from sensors to a nearby gateway or hub.

Zigbee: This is a wireless protocol that is designed for low power, low data rate applications. It is commonly used in IoT devices for short-range communication, such as for sending data from sensors to a nearby gateway or hub.

The specific protocol that is most suitable for your application will depend on a variety of factors, such as the distance between the device and the monitoring station, the amount of data that needs to be transmitted, and the available power and bandwidth resources.

One IoT data protocol that would be suitable for this application is MQTT (Message Queue Telemetry Transport). MQTT is a lightweight, publish-subscribe protocol that is designed for low-power, low-bandwidth, and unreliable networks. It is commonly used in IoT applications where there are constraints on power, bandwidth, or connectivity.

In terms of operation, MQTT works by using a "publish-subscribe" model in which devices can publish data to a "topic," and other devices can subscribe to that topic to receive the data. The MQTT server (also known as a "broker") acts as an intermediary between the publishing devices and the subscribing devices, forwarding the data from the publishers to the subscribers as needed.

MQTT supports various quality of service (QoS) levels, which determine how the data is delivered to the subscribers. For example, QoS level 0 ensures that the data is delivered at least once, while QoS level 2 ensures that the data is delivered exactly once. This allows the user to customize the trade-off between reliability and efficiency based on the specific needs of the application.

MQTT is a simple and efficient protocol that is well-suited for IoT applications with low power, limited bandwidth, and remote connectivity requirements. It can be used to transmit data from the IoT device attached to the wounded tiger to a remote monitoring system, allowing the health condition of the tiger to be monitored remotely.

22.It is possible to transmit data without internet to many devices using LORAWAN technology. Do you agree?. Justify your answer with its features. CO2 L3

Yes, it is possible to transmit data without the internet to many devices using LoRa WAN (Long Range Wide Area Network) technology. LoRa WAN is a low-power, long-range wireless networking technology that is designed for use in Internet of Things (IoT) and machine-to-machine (M2M) applications. It can be used to transmit data over long distances, even in areas where there is no internet connectivity.

Some key features of LoRa WAN that make it well-suited for use in IoT and M2M applications include:

Long range: Lora WAN can transmit data over distances of up to several kilometers, depending on the environment and antenna used.

Low power: LoRa WAN is designed to be energy-efficient, allowing devices to operate for long periods of time on a single battery.

Low cost: LoRa WAN uses unlicensed spectrum, which makes it relatively inexpensive to implement.

Robustness: LoRaWAN is designed to be resistant to interference and can operate in challenging environments.

One example of an application where LoRaWAN can be used to transmit data without the internet is in remote monitoring systems. For example, sensors could be installed in remote locations to monitor environmental conditions, such as temperature, humidity, and air quality. These sensors could transmit data to a central station using LoRaWAN, allowing the data to be monitored and analyzed in real-time, even in areas where there is no internet connectivity.

Overall, the features of LoRaWAN make it a useful tool for transmitting data without the internet to many devices in a variety of applications.

23.This protocol was not initially created for loT applications except for banking environments. In this protocol delivery is guaranteed, as well as acknowledgment. Explain the features of this Advanced message queuing protocol. CO2 L3

The Advanced Message Queuing Protocol (AMQP) is a messaging protocol that was originally designed for use in banking environments, but has since been adopted for use in a variety of other industries, including the Internet of Things (IoT). Some key features of AMQP include:

Guaranteed delivery: AMQP ensures that messages are delivered reliably, even if the recipient is offline or unavailable. If a recipient is unable to receive a message, the message is stored in a queue until it can be delivered.

Acknowledgment: AMQP allows recipients to acknowledge the receipt of a message, which helps to ensure that the sender knows that the message has been received.

Routing: AMQP allows messages to be routed to specific recipients based on predefined rules, which can help to improve the efficiency of message delivery.

Security: AMQP supports the use of encryption and authentication to secure messages and ensure that they are only delivered to the intended recipients.

Interoperability: AMQP is designed to be interoperable with other messaging protocols, allowing it to be used in a variety of different systems and environments.

Overall, AMQP is a feature-rich messaging protocol that is well-suited for use in IoT applications, due to its ability to ensure the reliable delivery and acknowledgment of messages.

24.A industry want to setup WLAN for connecting the devices and computer to transfer large amount of data. Which protocol is suitable and explain the protocol model. CO2 L3

One protocol that would be suitable for setting up a WLAN (Wireless Local Area Network) to transfer large amounts of data is IEEE 802.11ac. 802.11ac is a wireless networking standard that is designed for high-speed, high-bandwidth applications. It supports data rates up to several Gbps, making it well-suited for transferring large amounts of data.

In terms of its protocol model, 802.11ac uses a client-server architecture, in which a central access point (AP) communicates with multiple client devices. The AP acts as a "hub" that connects the client devices to the network and enables them to communicate with each other. The client devices can be laptops, smartphones, tablets, or other types of devices that are equipped with an 802.11ac wireless adapter.

802.11ac uses a variety of techniques to improve the performance and efficiency of the wireless connection, including multiple-input multiple-output (MIMO) antenna technology, beam forming, and channel bonding. It also includes a number of security features, such as encryption and authentication, to protect against unauthorized access and data breaches.

Overall, 802.11ac is a reliable and high-performance protocol that is well-suited for setting up a WLAN to transfer large amounts of data. It is widely supported by many types of devices and is relatively simple and inexpensive to implement.

25.RFID uses radio waves to transmit signals that activate the tag to automatically identify and track tags attached to objects.It does not make use of line of sight technology.Do you agree?Justify your answer with working principle CO2 L4

Yes, I agree that RFID (radio-frequency identification) uses radio waves to transmit signals that activate and communicate with tags attached to objects, and does not require line-of-sight technology. RFID is a wireless

technology that uses radio waves to transmit data between a reader and a tag. The tag contains a microchip and an antenna, which are used to store and transmit data. The reader, also known as an RFID interrogator, uses an antenna to transmit a radio frequency (RF) signal that activates the tag. The tag then responds by transmitting its data back to the reader, which can then be used to identify and track the tag.

The working principle of RFID is based on the interaction between the reader and the tag. When the reader transmits an RF signal, it activates the tag, which then responds by transmitting its data back to the reader. This data can be used to identify and track the tag, as well as to store and retrieve other information, such as the location or condition of the object to which the tag is attached.

Overall, the ability of RFID to transmit data using radio waves, rather than requiring line-of-sight technology, makes it a useful tool for identifying and tracking objects in a variety of applications, such as inventory management, supply chain tracking, and asset tracking.

26.Amazon Sidewalk is a Io T network that uses LoRa radios to connect devices with Amazon's cloud when they are beyond the reach of traditional home networks .Elaborate the features and concept of the LoRaWAN technology used by Amazon Sidewalk. CO2 L3

LoRaWAN is a long-range, low-power wireless networking technology that is used by Amazon Sidewalk to connect Internet of Things (IoT) devices to Amazon's cloud when they are beyond the reach of traditional home networks. Some key features and concepts of LoRaWAN include:

Range: LoRaWAN has a long range, typically up to 15 km (9.3 miles) in urban environments and up to 40 km (25 miles) in rural environments. This makes it suitable for use in IoT applications where devices may be located at a distance from the network infrastructure.

Low power consumption: LoRaWAN is designed for low-power consumption, making it suitable for use in devices that require long battery life.

Security: LoRaWAN uses advanced encryption and authentication techniques to secure communications and prevent unauthorized access to the network.

Frequency bands: LoRaWAN operates in unlicensed frequency bands, which means that it can be used without the need for a license. However, the specific frequency bands that it uses vary by region.

Network architecture: LoRaWAN uses a star-of-stars network architecture, in which devices communicate with "gateways" that are connected to the network infrastructure. This allows LoRaWAN to support a large number of devices while minimizing the infrastructure required.

Overall, LoRaWAN is a powerful and flexible technology that is well-suited for use in IoT applications, particularly in cases where devices may be located at a distance from the network infrastructure and need to operate for long periods of time on battery power.

27.Identify the connective technology for short range communication within 10meters and 6 devices need to connect without wire and data rate around 10Mbps and good quality of service. Explain the working CO2 L4

One connective technology that would be suitable for short-range communication (within 10 meters) with a data rate of around 10 Mbps and good quality of service is Bluetooth 5.0. Bluetooth is a wireless communication standard that is designed for short-range communication (up to around 30 meters) and low-power consumption. It is widely supported by many types of devices, including smartphones, tablets, laptops, and IoT devices.

In terms of its operation, Bluetooth uses a star topology, in which a central device (such as a smartphone or a gateway) communicates with multiple peripheral devices (such as sensors or actuators). The central device establishes a connection with each peripheral device and exchanges data with them. Bluetooth also supports connectionless communication, in which devices can send and receive data without establishing a direct connection.

Bluetooth 5.0 is the latest version of the Bluetooth standard, and it is designed for high-speed, low-power, and low-latency communication. It supports data rates up to 2 Mbps, making it well-suited for transferring data at a rate of around 10 Mbps. It also includes a number of features to improve the quality of service, such as improved error correction, larger packet sizes, and more efficient use of the radio spectrum.

Overall, Bluetooth 5.0 is a reliable and efficient connective technology that is well-suited for short-range communication with a data rate of around 10 Mbps and good quality of service. It is simple to use and widely supported, making it a good choice for many applications.

28.Netflix is an entertainment platform that started in the United States, but eventually, it expanded to many countries and soon became popular.Is Netflix example of Saas or Paas or Iaas ?Justify your answer with its features. CO3 L4

Netflix is an example of a Software as a Service (SaaS) platform. SaaS is a model of software delivery in which a software application is hosted by a third-party provider and made available to customers over the internet. Customers access the software through a web browser or other client, and the provider is responsible for maintaining and updating the software.

Some key features of SaaS platforms like Netflix include:

Subscription-based pricing: Customers pay a recurring fee to access the software, rather than purchasing it outright.

On-demand access: Customers can access the software anytime, anywhere, as long as they have an internet connection.

Centralized management: The provider is responsible for maintaining and updating the software, which simplifies the management process for customers.

Scalability: SaaS platforms can easily scale to meet the needs of a growing customer base.

Overall, the features of SaaS platforms like Netflix make them an attractive option for companies and individuals looking for an easy and convenient way to access software applications.

29.The organizations today have to constantly evaluate their cloud infrastructure to ensure that the cloud delivers efficient results, because there are different security and management demands in all three cloud models. Explore the features of all the three cloud models in detail.

CO3 L3

There are three main models for cloud computing: public cloud, private cloud, and hybrid cloud. Each of these models has its own unique features and characteristics, and organizations must carefully evaluate their needs and requirements in order to determine which model is the most suitable for their needs.

Public cloud: A public cloud is a cloud computing model in which resources, such as servers, storage, and applications, are provided by a third-party provider and made available to the public over the Internet. Public clouds are typically owned and operated by large companies, such as Amazon Web Services (AWS) and Microsoft Azure. Some key features of public clouds include:

Pay-as-you-go pricing: Public clouds typically charge users on a pay-per-use basis, allowing organizations to only pay for the resources they consume.

Scalability: Public clouds are highly scalable, allowing organizations to easily increase or decrease their resource usage as needed.

No upfront costs: Public clouds do not require organizations to make upfront investments in hardware or software, as all resources are provided by the provider.

Private cloud: A private cloud is a cloud computing model in which resources are dedicated to a single organization and are not shared with other organizations. Private clouds can be owned and operated by the organization themselves, or they can be provided by a third-party provider. Some key features of private clouds include:

Customization: Private clouds can be customized to meet the specific needs of an organization.

Security: Private clouds offer higher levels of security, as resources are not shared with other organizations.

Control: Private clouds give organizations more control over their resources, as they are not subject to the policies and procedures of a third-party provider.

Hybrid cloud: A hybrid cloud is a cloud computing model that combines elements of both public and private clouds, allowing organizations to use a combination of on-premises and off-premises resources. Some key features of hybrid clouds include:

Flexibility: Hybrid clouds allow organizations to choose the resources and services that are best suited to their needs, whether they are provided by a public cloud provider or hosted on-premises.

Cost savings: Hybrid clouds can help organizations to reduce costs by allowing them to take advantage of the pay-as-you-go pricing model of public clouds while still maintaining control over sensitive data and applications through the use of private clouds.

Scalability: Hybrid clouds allow organizations to scale their resources up or down as needed, depending on their changing needs.

Overall, each of the three cloud models has its own unique features and characteristics, and organizations must carefully evaluate their needs and requirements in order to determine which model is the most suitable for their needs.

30.How collaborative platform will help Supply chain optimization in Smart Manufacturing sector and explain. CO1 L3

A collaborative platform can help to optimize the supply chain in the smart manufacturing sector by enabling stakeholders to share information and collaborate in real-time. Some of the ways in which a collaborative platform can help to optimize the supply chain in the smart manufacturing sector include:

Visibility: A collaborative platform can provide visibility into the entire supply chain, allowing stakeholders to see where materials, components, and finished goods are located at any given time. This can help to identify bottlenecks, delays, and other issues that may be impacting the flow of goods through the supply chain.

Coordination: A collaborative platform can help to coordinate the activities of different stakeholders in the supply chain, such as manufacturers, suppliers, logistics providers, and customers. By providing a shared platform for communication and collaboration, the platform can help to ensure that all stakeholders are working together effectively and efficiently.

Collaboration: A collaborative platform can facilitate collaboration among different stakeholders in the supply chain. For example, manufacturers and suppliers can use the platform to collaborate on product design, production planning, and quality control. This can help to improve the efficiency and effectiveness of the supply chain as a whole.

Data-driven decision making: A collaborative platform can provide access to real-time data and analytic s, enabling stakeholders to make data-driven decisions about the supply chain. For example, stakeholders can use data on demand, capacity, and performance to optimize inventory levels, improve forecasting, and optimize production and distribution.

Overall, a collaborative platform can help to optimize the supply chain in the smart manufacturing sector by providing visibility, coordination, collaboration, and data-driven decision making. By enabling stakeholders to share information and collaborate in real-time, the platform can help to improve the efficiency, effectiveness, and agility of the supply chain.

31.In financial sector, the E – payments made by the customer are failing repeatedly. What could be wrong? Explain how gateways are used for data management, local applications and device management in IoT. CO3 L3

There are several potential reasons why electronic payments might fail repeatedly in the financial sector. Some common issues that can cause payment failures include:

- Incorrect payment information: If the customer has entered incorrect payment information, such as an incorrect credit card number or expiration date, the payment may fail.
- Insufficient funds: If the customer's account does not have sufficient funds to cover the payment, the payment may be declined.

Fraud detection: Payment systems may flag transactions as suspicious or fraudulent and decline them to protect the customer and the merchant.

Technical issues: Payment systems can sometimes experience technical issues that can cause payments to fail, such as network outages or system errors.

Gateways are often used in Internet of Things (IoT) applications to manage data, local applications, and device management. A gateway is a device or software application that acts as a bridge between different devices or systems, enabling them to communicate and exchange data. In the context of IoT, gateways can be used to:

Manage data: Gateways can collect data from IoT devices, store it, and transmit it to other systems for analysis or further processing.

Manage local applications: Gateways can host local applications that run on IoT devices, such as software updates or diagnostic tools.

Manage devices: Gateways can be used to remotely manage IoT devices, such as by sending commands or updates to devices or monitoring their status.

Overall, gateways play an important role in enabling the effective management and communication of data, local applications, and devices in IoT applications.

32.An IT company decides to provide free access to a public cloud dedicated to higher education. Explain all the three cloud computing services, it can embrace? CO3 L3

There are three main types of cloud computing services: infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS). An IT company that decides to provide free access to a public cloud dedicated to higher education could embrace any or all of these services, depending on the needs and requirements of the institutions that will be using the cloud.

Infrastructure as a Service (IaaS): IaaS is a cloud computing model in which the cloud provider offers access to a range of infrastructure resources, such as servers, storage, and networking, over the Internet. Higher education institutions could use IaaS to access the computing resources they need for research, teaching, and other activities, without having to invest in their own infrastructure.

Platform as a Service (PaaS): PaaS is a cloud computing model in which the cloud provider offers access to a platform for developing, testing, and deploying applications. Higher education institutions could use PaaS to develop and deploy custom applications for use in research, teaching, and other activities.

Software as a Service (SaaS): SaaS is a cloud computing model in which the cloud provider offers access to software applications over the Internet. Higher education institutions could use SaaS to access a range of applications, such as productivity tools, learning management systems, and research tools, without having to install and maintain the software on their own systems.

Overall, by offering access to IaaS, PaaS, and/or SaaS services, an IT company could provide higher education institutions with a range of cloud computing resources that they can use to support their research, teaching, and other activities.

33.In Indian Air force fighter pilots are trained using latest technologies. There are two technologies AR & VR along with IOT. What technology is best suitable for this application and justify your answers and why not other technology.CO5 L4

Both augmented reality (AR) and virtual reality (VR) technologies, along with IoT (Internet of Things), could potentially be used for training Indian Air Force fighter pilots. However, VR technology is generally considered to be the more suitable technology for this application due to its immersive and interactive nature.

VR technology allows users to experience a fully immersive and interactive simulated environment, which can be particularly useful for training pilots. It allows pilots to practice and rehearse various scenarios and procedures in a realistic and controlled environment, without the risks and costs associated with real-world training. VR technology can also provide pilots with valuable feedback and performance data, allowing them to identify and address any weaknesses or areas for improvement.

AR technology, on the other hand, involves the overlay of digital information on the real world, rather than fully immersing the user in a simulated environment. While AR technology can be useful for providing pilots with real-time data and guidance during training or missions, it may not be as effective as VR technology for immersive and interactive training scenarios.

IoT technology can be used to enhance both AR and VR training systems by providing real-time data and connectivity between different devices and systems. For example, IoT sensors and devices could be used to monitor the performance and behavior of pilots during training, providing valuable data and feedback to trainers and instructors.

Overall, VR technology is generally considered to be the most suitable technology for training Indian Air Force fighter pilots due to its immersive and interactive nature. While AR and IoT technologies can also be useful for providing real-time data and connectivity, they may not be as effective as VR technology for immersive and interactive training scenarios.

34.Over provisioning is the resiliance on extra capacity to satisfy the needs of a large community of users when the average-to-peak resource demand ratio is very high. Give an example of a large-scale system using over provisioning and discuss if over provisioning is sustainable in that case . Justify your answer? CO3 L3

One example of a large-scale system that uses over provisioning is a cloud computing platform eg AWS,AZURE,GOOGLE CLOUD etc. Cloud computing platforms are designed to provide on-demand access to computing resources, such as storage, computing power, and networking, to a large community of users. In order to meet the needs of this large user base, cloud providers typically use over provisioning to ensure that they have sufficient capacity to handle peak demand.

Over provisioning involves building in extra capacity to the system in order to handle periods of high demand. This can be done by adding additional servers, storage, and other resources to the system. By doing this, cloud providers can ensure that their systems have the capacity to handle spikes in demand and provide a consistent level of service to their users.

While over provisioning can help to ensure that a system has sufficient capacity to meet the needs of its users, it can also be unsustainable in some cases. This is because it can be expensive to build and maintain the extra capacity, and it may not be used efficiently if demand does not consistently reach peak levels. As a result, some cloud providers are exploring alternative approaches to scaling their systems, such as using elastic scaling or serverless computing, which can be more cost-effective and efficient in some cases.

Cloud elasticity is the process by which a cloud provider will provision resources to an enterprise's processes based on the needs of that process. Cloud providers have systems in place to automatically deliver or remove resources in order to provide just the right amount of assets for each project. For the cloud user, they will be given enough power to run their workflows without wasting money on any supplied resources they don't need.

To explain elasticity in the cloud, let's look at the example of storing and running an application in the cloud. An application needs a specific environment to run, including computing power, virtual machines (VMs), and storage space. Because the cloud is elastic, you will only be given the assets needed to run that application. If you require more VMs to run different applications, you'll be given those instances when you implement the new applications, but not beforehand.

Overall, over provisioning can be a useful technique for ensuring that a system has sufficient capacity to meet the needs of a large user base, but it may not always be the most sustainable or cost-effective approach in the long term.

35. The best way to ensure card data security is by using a payment gateway while handling card payments. Explain how gateways are used for data management, local applications and device management in loT. CO2 L3

A payment gateway is a service that enables businesses to securely accept and process card payments from customers. In the context of the Internet of Things (IoT), payment gateways can be used for data management, local applications, and device management in several ways:

Data management: Payment gateways can help to ensure the security and integrity of card data by encrypting and storing it securely. This can help to prevent unauthorized access to sensitive data and protect against data breaches.

Local applications: Payment gateways can be integrated with local applications, such as point-of-sale systems, to enable card payments to be processed directly from the application. This can help to streamline the payment process and reduce the risk of errors.

Device management: Payment gateways can be used to manage and secure devices that are connected to the IoT, such as card readers and point-of-sale terminals. This can help to ensure that only authorized devices are able to access the payment gateway and process card payments.

Overall, payment gateways can play a key role in ensuring the security and integrity of card data in IoT applications, as well as supporting the management of local applications and devices.

36.The rapid urbanization of Delhi city leads to environmental problems like air pollution, water pollution and noise pollution are major environmental challenges that the city is facing. What IOT solution you will suggest and justify your answer.CO1 L4

There are several IoT solutions that could potentially be used to address the environmental challenges faced by Delhi due to rapid urbanization such as air pollution, water pollution, and noise pollution. Some potential solutions include:

Air quality monitoring: An Io T-based air quality monitoring system could be used to measure and track levels of air pollution in different parts of the city. The system could use sensors to measure various pollutants, such as particulate matter, carbon monoxide, and sulfur dioxide, and send the data to a central server or platform for analysis and visualization. This could help to identify sources of pollution and inform policy and intervention strategies.

Water quality monitoring: An IoT-based water quality monitoring system could be used to measure and track levels of water pollution in different parts of the city. The system could use sensors to measure various contaminants, such as bacteria, chemicals, and heavy metals, and send the data to a central server or platform for analysis and visualization. This could help to identify sources of pollution and inform policy and intervention strategies.

Noise monitoring: An IoT-based noise monitoring system could be used to measure and track levels of noise pollution in different parts of the city. The system could use sensors to measure decibel levels and send the data to a central server or platform for analysis and visualization. This could help to identify sources of noise pollution and inform policy and intervention strategies.

Overall, IoT-based monitoring systems could be a useful tool for addressing the environmental challenges faced by Delhi due to rapid urbanization. By providing real-time data on air, water, and noise pollution, these systems could help to inform policy and intervention strategies, and contribute to the overall sustainability and livability of the city.

37.In our daily life we use lot of google based application such as google drive,google photos,mail communication,video streaming through you tube.All these google applications can be accessed from the public through Gmail account so what is the cloud storage capacity for individual google account? Which type of cloud deployment model is used and why? CO3 L4

The cloud storage capacity for an individual Google account varies depending on the specific Google service being used.

For example, Google Drive offers 15 GB of free storage for all Google Account holders, which can be used for storing and sharing documents, photos, and other files. Google Photos also offers unlimited storage for

photos and videos, although this is limited to a maximum resolution of 16 megapixels for photos and 1080p for videos.

Google's cloud storage and other services are typically delivered using a hybrid cloud deployment model. This means that Google uses a combination of private and public clouds to deliver its services. Private clouds are used for sensitive data and workloads that require additional security, while public clouds are used for less sensitive data and workloads that do not require as much security.

The hybrid cloud model allows Google to offer scalable, flexible, and secure services to its users, while also allowing it to take advantage of the cost and operational efficiencies of the public cloud.

A hybrid cloud is a cloud computing environment that combines the use of both private and public clouds. It allows organizations to leverage the benefits of both types of clouds and create a customized solution that meets their specific needs.

Here are some key features of a hybrid cloud:

Scalability: Hybrid clouds allow organizations to scale their resources up or down as needed, depending on their workload requirements.

Flexibility: Hybrid clouds allow organizations to choose which workloads to run on which type of cloud, depending on the specific needs of the workload.

Cost savings: Hybrid clouds allow organizations to take advantage of the cost savings and operational efficiencies of the public cloud, while also maintaining control over sensitive data and workloads in a private cloud.

Data security: Hybrid clouds allow organizations to store sensitive data in a private cloud, where it can be better protected from external threats.

Integration: Hybrid clouds allow organizations to easily integrate their existing IT infrastructure with cloud-based resources.

Overall, the use of a hybrid cloud can provide organizations with greater flexibility, scalability, and control over their IT resources.

38.Using AWS application development services, Samsung wanted to provide its customers with the facility to download the applications anywhere without any network traffic. List the applications and features of services provided by AWS. CO3 L3

Amazon Web Services (AWS) provides a wide range of cloud computing services and tools to help businesses and organizations build, deploy, and manage applications at scale. Some of the services and features provided by AWS include:

Compute: Services like Amazon EC2 (Elastic Compute Cloud) and AWS Lambda allow you to run and scale applications in the cloud.

Storage: Services like Amazon S3 (Simple Storage Service) and Amazon EBS (Elastic Block Store) provide scalable and secure storage options for your data.

Databases: Services like Amazon RDS (Relational Database Service) and Amazon DynamoDB provide managed database solutions for your applications.

Networking: Services like Amazon VPC (Virtual Private Cloud) and Amazon Route 53 allow you to create and manage networks in the cloud.

Security: Services like Amazon IAM (Identity and Access Management) and Amazon GuardDuty help you secure your applications and data in the cloud.

Management tools: Services like AWS CloudFormation and AWS CodePipeline allow you to automate the process of deploying and managing your applications.

Analytics: Services like Amazon Athena and Amazon EMR (Elastic MapReduce) allow you to analyze and process large datasets in the cloud.

Machine learning: Services like Amazon SageMaker and Amazon Rekognition allow you to build and deploy machine learning models in the cloud.

Internet of Things (IoT): Services like Amazon IoT Core and Amazon FreeRTOS allow you to build and manage IoT applications in the cloud.

39.A VR Logistics Limited provides goods transport service all over the India; if this company wants to adopt IIOT, suggest which all the IOT application can be adopted by the company and how it will benefit.

CO1 L3

There are several IoT applications that VR Logistics Limited could potentially adopt to improve its goods transport service all over India. Some potential applications include:

Fleet management: An IoT-based fleet management system could be used to track and monitor the location, status, and performance of the company's vehicles in real-time. The system could use GPS, sensors, and other technologies to collect data on factors such as fuel efficiency, maintenance needs, and driver behavior. This could help the company to optimize routes, reduce fuel costs, and improve safety and compliance.

Asset tracking: An IoT-based asset tracking system could be used to track and monitor the movement and status of the goods being transported by the company. The system could use sensors, RFID tags, and other technologies to collect data on factors such as location, temperature, humidity, and vibration. This could help the company to optimize routes, improve the efficiency of its operations, and reduce the risk of damage to goods.

Predictive maintenance: An IoT-based predictive maintenance system could be used to predict and prevent equipment failures and maintenance needs in real-time. The system could use sensors, machine learning algorithms, and other technologies to analyze data on factors such as wear and tear, temperature, and vibration. This could help the company to reduce downtime, improve the efficiency of its operations, and reduce maintenance costs.

Customer service: An IoT-based customer service system could be used to improve the company's interactions with its customers. The system could use chatbots, voice assistants, and other technologies to provide real-time

information on the status of orders, delivery times, and other factors. This could help the company to improve customer satisfaction and loyalty.

Overall, adopting IoT technologies could provide a number of benefits to VR Logistics

40.Many industry applications such as smart electric grid,Oil and gas fields,business intelligence etc benefit from cloud data analytics to improve organizational performance and scalability.Justify your answer CO4 L4

- Cloud data analytics can provide many benefits to industries such as the smart electric grid, oil and gas fields, and business intelligence.
- **In the smart electric grid** cloud data analytics can be used to improve the efficiency and reliability of the grid by analyzing large amounts of data from various sources such as sensors, meter readings, and weather data. This can help identify problems with the grid and optimize its operation to reduce costs and improve customer satisfaction.
- **In the oil and gas industry** cloud data analytics can be used to improve exploration and production by analyzing data from sensors and other sources to identify trends and patterns that can help optimize operations and improve safety.
- **In business intelligence** cloud data analytics can be used to analyze data from various sources such as sales data, customer data, and market data to gain insights that can help improve decision-making and drive business growth.
- Overall, the ability to analyze large amounts of data quickly and cost-effectively in the cloud can provide organizations with valuable insights that can help improve performance and scalability.

41.IoT devices make up 30% of all network-connected endpoints, this leads to companies getting targeted by cyber criminals. Is security support on loT devices essential? State a better way to secure the loT devices CO4 L4

Yes, security support on IoT devices is essential because they are increasingly being targeted by cybercriminals. IoT devices often have limited computing resources and are not designed with security in mind, making them vulnerable to cyber attacks.

One way to better secure IoT devices is to ensure that they are regularly patched and updated with the latest security fixes. It is also important to use strong, unique passwords for each device and to use encryption to protect the data transmitted between the device and the network.

Another important security measure is to implement network segmentation, which involves separating IoT devices from other parts of the network to limit their access and reduce the potential attack surface.

In addition, it is important to use a firewall and intrusion detection/prevention system (IDPS) to protect against network-based attacks and to monitor for unusual activity.

Finally, it is important to educate users about the importance of IoT device security and to provide them with guidelines for securely using and managing these devices.

42.A 10 floor building having two basements GL-1 & GL-2 below the ground level, this basement are used for vehicles parking. To achieve the effectiveness of the parking IOT system deployed across two basements using *licensed* wireless spectrum. Identify the best communication module for this application and explain working of the communication model.CO2 L4

One communication module that would be suitable for this application is a cellular communication module. Cellular communication modules use licensed wireless spectrum, such as the frequencies used by cellular networks (e.g., 2G, 3G, 4G, 5G), to establish a wireless connection between devices. This makes them well-suited for applications that require a reliable, high-bandwidth connection, such as an IoT system for managing parking in a multi-level basement.

In terms of their operation, cellular communication modules use a client-server architecture, in which a central network (such as a cellular network) communicates with multiple client devices (such as IoT sensors or actuators). The client devices use a cellular communication module to connect to the network and exchange data with it. The network acts as an intermediary between the client devices, forwarding data between them as needed.

Cellular communication modules typically use a variety of protocols and technologies to establish and maintain a connection with the network, such as CDMA, GSM, LTE, and 5G. They also include a number of security features, such as encryption and authentication, to protect against unauthorized access and data breaches.

Overall, cellular communication modules are a reliable and high-performance choice for IoT applications that require a licensed wireless spectrum and a reliable, high-bandwidth connection. They are widely supported and relatively simple to use, making them a good choice for many applications.

43.IoT based data acquisition system is a collection of software and hardware that allows one to measure or control physical characteristics of something in the real world. Analyse how physical data is measured and controlled in real world using data acquisition system with a neat block diagram. CO4 L3

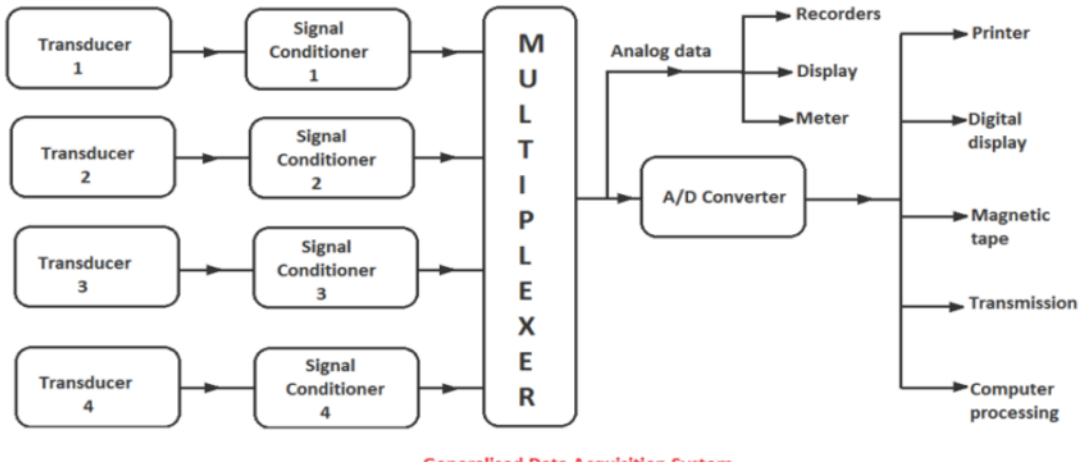
A data acquisition system typically consists of three main components:

Sensors: These are devices that measure a physical characteristic of something in the real world, such as temperature, pressure, or humidity.

Data acquisition hardware: This is the hardware that connects to the sensors and collects the data from them. It may also include components such as amplifiers or filters to enhance the accuracy of the measurements.

Data acquisition software: This is the software that controls the data acquisition hardware and processes the data collected from the sensors. It may also include visualization tools to display the data in a graphical format.

Here is a block diagram of a typical data acquisition system:



□[Sensor] -- [Data Acquisition Hardware] -- [Data Acquisition Software]

□In this diagram, the sensor measures a physical characteristic and sends the data to the data acquisition hardware, which collects and processes the data. The data acquisition software then controls the hardware and processes the data to make it usable for analysis or control purposes.

The Internet of Things (IoT) is a network of physical devices, vehicles, buildings, and other objects that are embedded with sensors, software, and connectivity, allowing them to collect and exchange data. In a data acquisition system, IoT devices can be used to remotely monitor and control physical systems, and to collect and transmit data from remote locations.

For example, an IoT-enabled temperature sensor could be used to monitor the temperature in a remote warehouse, and transmit the data to a central server where it could be analyzed and used to adjust the heating and cooling systems in the warehouse. In this way, IoT technology can be used to improve the efficiency and effectiveness of a data acquisition system by allowing it to operate remotely and in real-time.

Here is a block diagram of a data acquisition system that includes IoT technology:

[Io T Sensor] ---> [Io T Gateway] ---> [Cloud Server] ---> [Computer]

The Io T sensor is a device that measures a physical characteristic such as temperature or pressure, and is equipped with connectivity and software that allows it to transmit data over the internet.

The Io T gateway is a device that acts as a bridge between the sensor and the cloud server. It may be used to filter and process the data from the sensor before forwarding it to the server, and may also be used to control the sensor or other devices.

The cloud server is a remote server that is accessed over the internet. It is used to store and process the data from the Io T sensor, and may also be used to provide access to the data for users or other systems.

The computer is used to access and analyze the data from the cloud server, and may also be used to control the operation of the data acquisition system.

In this example, the Io T sensor and gateway are used to remotely collect and transmit data from the physical system, while the cloud server and computer are used to store, process, and analyze the data. The use of Io T

technology in a data acquisition system can provide many benefits, including the ability to operate remotely and in real-time, and to scale the system to handle large amounts of data.

44. Augmented Reality in loT is one key way companies are digitally transforming: manufacturing processes. From asset locating to tracking real-time data across a factory floor, AR can transform the way manufacturers function. Describe with example (use cases) the role of augmented reality in Industrial loT. CO1 L3

Augmented reality (AR) can play a significant role in Industrial IoT (IIoT) by providing manufacturers with a visual overlay of real-time data and information on top of the physical world. This can enable a range of use cases, such as:

Asset tracking and maintenance: AR can be used to display the location and status of equipment and assets within a manufacturing facility, allowing maintenance teams to quickly locate and repair equipment.

Quality control: AR can be used to display real-time data about the quality of products being manufactured, allowing for timely identification and correction of defects.

Training and onboarding: AR can be used to provide new employees with interactive, immersive training experiences that can be accessed from any location.

Process optimization: AR can be used to display real-time data about the efficiency and effectiveness of manufacturing processes, enabling manufacturers to identify areas for improvement and optimize their operations.

For example, a manufacturer might use AR to display the location and status of equipment on a factory floor, allowing maintenance teams to quickly locate and repair equipment. Or, a manufacturer might use AR to display real-time data about the quality of products being produced, enabling them to identify and correct defects in real time.

45.Amazon wants to build a network system which handles multiple requests at same time without collapse due to heavy load/request to server. Design a network architecture which is best suitable for above said application and justify reasons to choose this network over others. CO5 L4

There are several network architectures that could be suitable for handling multiple requests concurrently without collapsing due to heavy load. Here are a few options:

Load balancer: A load balancer is a device that sits in front of a group of servers and distributes incoming traffic across them. This can help to distribute the load evenly across multiple servers, preventing any one server from becoming overwhelmed. Load balancers can be hardware or software-based, and they can be configured to use various algorithms to determine which server to send a request to.

Clustered architecture: A clustered architecture involves multiple servers working together as a single entity, with each server able to handle requests and share the workload. Clustered architectures can be highly scalable and allow for the addition of new servers as needed to handle increased traffic.

Microservices architecture: A microservices architecture involves breaking down a large application into smaller, independent services that can be developed, deployed, and scaled independently. This can allow for greater flexibility and scalability, as different services can be scaled up or down as needed to meet demand.

Ultimately, the best network architecture will depend on the specific needs and constraints of the application. For example, if Amazon's goal is to handle a high volume of requests with minimal latency, a load balancer or clustered architecture might be the best choice. If the focus is on flexibility and the ability to quickly add or modify features, a microservices architecture might be a better fit.

46.Insecure cloud services is a type of cloud vulnerability. Do you agree? Justify your answer.CO4 L4

Yes, insecure cloud services can be a type of cloud vulnerability. Cloud services refer to the use of remote servers and software to store, process, and manage data and applications. These services are typically accessed over the internet, which can make them vulnerable to security risks.

There are several ways in which cloud services can be insecure, including:

- **Lack of proper security controls:** If a cloud service provider does not have proper security controls in place, it can leave data and applications vulnerable to attacks.
- **Inadequate access controls:** If access controls are not set up correctly or are not strictly enforced, unauthorized users may be able to access sensitive data or systems.
- **Poorly configured systems:** If systems are not configured correctly, they may be vulnerable to attacks or data breaches.
- **Insufficient encryption:** If data is not encrypted properly, it can be vulnerable to interception or theft.
- Overall, it is important for organizations to carefully consider the security measures in place when using cloud services to ensure the protection of sensitive data and systems.

To avoid these vulnerabilities, organizations can take the following steps:

- **Conduct due diligence:** When choosing a cloud service provider, it is important to carefully evaluate their security measures and ensure that they meet the organization's needs.
- **Use strong passwords and implement two-factor authentication:** Strong passwords and two-factor authentication can help prevent unauthorized access to cloud services.
- **Configure systems securely:** Properly configuring systems and using security best practices can help prevent vulnerabilities.
- **Use encryption:** Encrypting data can help protect it from being intercepted or stolen.
- **Regularly update and patch systems:** Keeping systems up-to-date with the latest patches and updates can help prevent vulnerabilities.
- Overall, it is important for organizations to be proactive in addressing potential vulnerabilities in their cloud services to ensure the security of their data and systems.

47.An intelligent irrigation system is a way to deal with all of the issues in a conventional approach of agriculture. Explain the ways (use cases) in which IoT is implemented for reformation in Agriculture. CO1 L4

IoT (Internet of Things) can be used to improve and optimize agricultural practices in a number of ways. Some potential use cases include:

Precision irrigation: IoT-enabled irrigation systems can monitor soil moisture levels and weather conditions to determine the optimal amount of water to apply to crops, reducing water waste and improving crop yields.

Pest and disease detection: IoT sensors and cameras can be used to monitor crops for signs of pests and diseases, allowing farmers to take timely action to prevent outbreaks.

Crop monitoring: IoT sensors can be used to monitor various factors that affect crop growth, such as temperature, humidity, and nutrient levels, allowing farmers to optimize growing conditions and improve yields.

Livestock monitoring: IoT sensors and devices can be used to monitor the health and well-being of livestock, allowing farmers to identify and address any issues early on.

Supply chain tracking: IoT-enabled RFID (Radio-Frequency Identification) tags can be used to track the movement of agricultural products through the supply chain, providing transparency and enabling efficient supply chain management.

Weather forecasting: IoT-enabled weather stations can provide farmers with real-time data about weather conditions, allowing them to make informed decisions about when to plant and harvest crops.

48.A friend of yours sends an e-card to your mail. You have to click on the attachment to get the card. What do you do? Justify your answerCO4 L4

It is generally not recommended to open attachments from unknown or untrusted sources, as they can potentially contain malicious software or links that could compromise your computer or personal information.

If you receive an e-card from a friend and are not expecting it, it is a good idea to reach out to them to verify that they actually sent it to you. You can do this by contacting them through a separate, secure means, such as a phone call or a direct message on a different platform.

If you are unable to verify that the e-card is legitimate, or if you have any doubts about its authenticity, Do not open the attachment. Instead, you can delete the email or mark it as spam to prevent further issues.

It is important to be cautious when it comes to opening attachments and following links, as cybercriminals can use these tactics to try to gain access to your personal information or infect your device with malware. Protecting yourself from these threats requires being vigilant and taking steps to verify the authenticity of emails and attachments before opening them.

49.In the healthcare industry (Medical loT) IoT devices are already being utilized to remotely monitor patient's vital signs and has proven very helpful since the pandemic. What are the possible consequences of loT security attacks in Medical IoT? CO4 L4

The consequences of IoT security attacks in the medical industry can be severe and even life-threatening. For example, if an attacker were to gain access to a patient's medical device and manipulate the data it is sending, this could lead to incorrect treatment decisions being made by the healthcare providers. Additionally, if an attacker were to gain access to a device that is used to administer medication, they could potentially increase or decrease the dosage, which could have serious consequences for the patient. There is also the risk of sensitive patient data being accessed or stolen in a security breach, which could lead to a violation of patient privacy and trust. Overall, it is important for medical IoT devices to have strong security measures in place to protect against these types of attacks and mitigate their consequences.

Incorrect treatment decisions: If an attacker is able to manipulate the data being sent by a medical device, this could lead to incorrect treatment decisions being made by healthcare providers.

Medication errors: If an attacker gains access to a device that administers medication, they could potentially increase or decrease the dosage, which could have serious consequences for the patient.

Patient harm: In general, a security breach or attack on a medical IoT device could potentially lead to harm or injury for the patient.

Patient data breaches: There is also the risk of sensitive patient data being accessed or stolen in a security breach, which could lead to a violation of patient privacy and trust.

Loss of trust in the healthcare system: If patients do not feel that their medical devices and data are secure, they may lose trust in the healthcare system as a whole. This could lead to a decrease in the adoption of medical IoT devices and a reluctance to share personal health information.

50.IIoT is becoming a reality and accepted part of medicine and healthcare systems and it is enhancing the ability to treat patients physically and remotely. The IoT device makes it easier to verify a patient's identity and facilitates more effective tracking of individual patient's information and administer treatment. Elaborate how this IIOT technology finds its application in this field **CO1 L3**

The Internet of Things (IoT) has the potential to transform the way healthcare is delivered, by enabling the integration of devices and systems to collect, analyze, and share data in real-time. This is often referred to as the Internet of Medical Things (IoMT).

One of the main ways that IoT technology is being used in healthcare is through the use of wearable devices and remote monitoring systems. These devices can track a patient's vital signs and other health indicators, such as heart rate, blood pressure, and oxygen levels, and send the data to healthcare providers in real-time. This can help healthcare providers monitor patients remotely and more effectively administer treatment.

IoT technology is also being used to improve patient care in hospitals and other healthcare facilities. For example, IoT-enabled devices can be used to track the location and status of medical equipment, such as beds and ventilators, and to automate the delivery of medication and other supplies.

Overall, the use of IoT technology in healthcare is helping to improve patient care, increase efficiency, and reduce costs. It is enabling healthcare providers to more effectively treat patients both physically and remotely, and is playing a key role in the transformation of healthcare systems.

51.Integrating Artificial Intelligence and IoT devices can lead to enhanced solutions and improvement in the business. Explain the concept of Artificial Intelligence in IoT CO1 L3

Artificial intelligence (AI) can be integrated with IoT devices to enable them to perform tasks that would normally require human intelligence, such as learning, decision-making, and problem-solving. In the context of IoT, AI can be used to analyze and interpret the data generated by connected devices, identify patterns and trends, and make predictions or recommendations. For example, an IoT system with AI capabilities could be used to optimize energy consumption in a building by analyzing real-time data from connected devices and making recommendations on how to adjust lighting and temperature settings.

AI can also be used to improve the performance of IoT devices by enabling them to adapt to changing conditions and learn from their surroundings. For example, an AI-powered IoT system could be used to monitor the condition of equipment in a factory and predict when maintenance is needed, helping to reduce downtime and improve efficiency.

Overall, the integration of AI and IoT has the potential to improve business operations by enabling organizations to make better, more informed decisions based on real-time data and insights generated by connected devices.

52.According to a study, every year, more than 20% of all fleet vehicles get into accidents. Most of these issues are traced to bad driver behaviors, which cause employers in the US a lot of direct and indirect damage. Poor driver behavior includes the following: Driving when drowsy ,Risky driving ,Speeding ,Harsh braking. Explain how Real-time analytics in the supply chain helps to protect drivers and prevent accident. CO5 L3

Real-time analytics can help protect drivers and prevent accidents in the supply chain by providing real-time monitoring and feedback on driver behavior. By using sensors and other technology, real-time analytics can track a variety of driver behaviors, including speeding, harsh braking, and risky driving. This information can then be used to alert drivers to potential dangers and provide them with guidance on how to improve their driving habits.

For example, real-time analytics can alert a driver when they are driving too fast or braking too harshly, and suggest alternative routes or slower speeds to help them avoid accidents. Additionally, real-time analytics can help identify patterns in driver behavior that may indicate fatigue or other issues, and alert managers or dispatchers to take action to prevent accidents caused by drowsy driving.

Overall, real-time analytics can help improve safety in the supply chain by providing drivers with the information and guidance they need to make better, safer driving decisions.

53.In a smart street light system, sensors like LDR, IRsensor ,RADAR sensor etc monitors required system parameters .The data is recorded in the system and historical data can be viewed whenever required using cloud.In order to design this system what are the components required and if the system behaves improperly ,how do you test and trouble shoot to make the system functional. **CO5 L4**

The Internet of Things (IoT) can be used to enhance the functionality and performance of a smart street light system. Here are some steps you can follow to design, test, and troubleshoot a smart street light system using IoT technology:

Define the goals and requirements for the system: This includes determining the desired features and functionality of the street lights, such as automatic dimming, remote control, and integration with other smart city systems.

Choose the technology and components: Select the type of lighting and control technology that will be used, such as LED lights and wireless sensors. Consider the cost and efficiency of the technology, as well as any regulatory requirements.

Design the system: Use a tool such as Auto CAD ,Multi sim,Proteus to create a layout of the street lights and control system, including the placement of sensors and other components.

Integrate the system with IoT technology: This may involve installing IoT sensors and devices on the street lights and control system, as well as setting up a cloud-based platform to collect and analyze data from the sensors.

Test the system: Set up a pilot project to test the system in a real-world environment. This will allow you to identify and address any issues or challenges that arise.

Troubleshoot and refine the system: Use the results of the pilot project to identify and fix any problems that may have occurred. Make any necessary adjustments to the system to improve its performance and reliability.

It is also important to consider ongoing maintenance and support for the smart street light system. This may include regular inspections and repairs, as well as software updates to ensure that the system continues to operate effectively over time.

54.Even though there is reduction in number of air travelers due to pandemic, the IATA Forecast Predicts 8.2 billion Air Travelers in 2037. To handle this exponential growth in the number of passengers in the coming years, Airlines will require the powerful capabilities of Airport Digitization. Discuss the role of loT solutions (use cases) . **CO1 L3**

IoT solutions can play a significant role in the digitization of airports and the management of the growing number of passengers. Some potential applications of IoT in the airport industry include:

Asset tracking: IoT sensors can be used to track the location and condition of assets such as luggage carts, cleaning equipment, and ground support vehicles. This can help to improve the efficiency of airport operations by reducing the time spent searching for these assets and ensuring that they are properly maintained.

Queue management: IoT sensors can be used to track the flow of passengers through security checkpoints, ticketing counters, and other areas of the airport to identify bottlenecks and optimize the allocation of staff and resources.

Environmental monitoring: IoT sensors can be used to monitor environmental conditions such as temperature, humidity, and air quality in the airport to ensure that passengers are comfortable and to identify any potential hazards.

Predictive maintenance: IoT sensors can be used to monitor the condition of equipment such as baggage handling systems, escalators, and elevators to predict when maintenance is needed and prevent downtime.

Overall, the use of IoT solutions can help airports to improve efficiency, reduce costs, and enhance the passenger experience.

55.Here's a situation- You receive the following email from the help desk: Dear XYZ Email user, To create space for more users we're deleting all inactive email accounts. Here's what you have to send to save your account from getting deleted: □

Name (first and last): □

Email Login: □

Password: □

Date of birth: □

lternate email If we don't receive the above information from you by the end of the week, your email account will be terminated. If you're a user what do you do? Justify your answer.CO4 L4

If you receive an email like this, you should be cautious. It is not uncommon for scammers to try to trick people into giving them sensitive personal information, such as their name, login information, password, date of birth, and alternate email.

One way to verify the authenticity of the email is to contact the help desk directly and ask if they sent the email. You can also look for any red flags in the email, such as poor grammar, unfamiliar logos, or suspicious links.

If you are unable to verify the authenticity of the email and are unsure what to do, it is best to err on the side of caution and not provide the requested information. Instead, you can try to find a way to securely contact the help desk to verify the request and discuss any necessary steps to keep your account active.

It is important to be careful with your personal information and to protect yourself from potential scams.

I would not respond to this email and would instead contact the help desk directly to verify the authenticity of the request. It is not uncommon for attackers to send phishing emails that request personal information or login credentials under the guise of a legitimate request. Providing this information to an attacker could compromise the security of my email account and potentially other accounts if I use the same password for multiple accounts.

It is important to be vigilant and cautious when receiving emails that request personal information or login credentials, especially if the request seems unusual or unexpected. It is always a good idea to independently verify the authenticity of the request before providing any sensitive information.

56.Amazon is using the smart warehouse at the beginning stage Explain the deployment and operational view, resources, services, virtual entities, users in an IoT system by considering a smart warehouse as an example CO1 L3

A smart warehouse is an IoT system that is designed to optimize the storage, retrieval, and management of inventory in a warehouse setting. In this system, there are several key components:

Deployment: The smart warehouse is typically deployed by installing a network of sensors, RFID readers, and other IoT devices throughout the warehouse. These devices are connected to a central hub or gateway, which is responsible for collecting and transmitting data from the devices to the cloud.

Operational view: The smart warehouse operates by continuously collecting data from the sensors and devices in the warehouse. This data is used to monitor the location, condition, and movement of inventory within the warehouse. The system also uses this data to optimize the storage and retrieval of inventory, by identifying the most efficient routes and methods for accessing it.

Resources: The smart warehouse relies on a variety of resources in order to operate effectively. These include the sensors, RFID readers, and other IoT devices that are installed throughout the warehouse, as well as the central hub or gateway that connects these devices to the cloud. Other resources may include computer servers, storage devices, and networking equipment that are used to store and process data from the warehouse.

Services: The smart warehouse provides a variety of services to its users, including real-time tracking of inventory, optimization of storage and retrieval routes, and automated inventory management. These services are made possible through the use of advanced algorithms and machine learning techniques, which are used to analyze data from the warehouse in real-time.

Virtual entities: The smart warehouse may include a variety of virtual entities, such as software programs or algorithms that are used to analyze and process data from the warehouse. These virtual entities may be responsible for tasks such as tracking inventory, optimizing routes, and predicting demand for particular products.

Users: The users of a smart warehouse may include warehouse employees, logistics personnel, and other stakeholders who are responsible for managing and operating the warehouse. They may use the system to access real-time data about inventory, track the movement of goods within the warehouse, and generate reports and other data-driven insights.

57.A company growth is hindered because of scattered communication,problem in locating data,problem in training new employees and reduced employee satisfaction.How this problem can be solved to improve the efficiency of the company CO1 L3

what is collaborative platform

A collaborative platform is a type of software that enables users to work together and share information in real-time, typically through a web browser or mobile app. Collaborative platforms can be used for a variety of purposes, including project management, document sharing, team communication, and more.

Some common features of collaborative platforms include:

File sharing: Allows users to upload and share documents, images, and other files with each other.

Real-time collaboration: Enables users to edit and work on the same documents or projects at the same time.

Task management: Allows users to create and assign tasks, set deadlines, and track progress.

Communication tools: Provides tools for users to communicate with each other, such as chat, video conferencing, and messaging.

Customizable permissions: Allows administrators to set different levels of access and control for different users.

There are many different collaborative platforms available, each with its own unique features and capabilities. Some popular examples include Google Workspace (formerly known as G Suite), Microsoft Teams, and Asana.

Collaborative Platform – concept,implementation.

A collaborative platform is a type of software that enables users to work together and share information in real-time, typically through a web browser or mobile app. Collaborative platforms can be used for a variety of purposes, including project management, document sharing, team communication, and more.

In terms of implementation, a collaborative platform can be hosted on a company's own servers, or it can be a cloud-based service that is accessed through the internet. A cloud-based collaborative platform is typically easier to set up and requires less maintenance, but it may be less secure and may not offer as much customization as an on-premises solution.

To implement a collaborative platform, an organization will typically need to:

Identify the specific needs and goals of the team or organization. This will help determine which features and capabilities are most important and will inform the selection of a specific platform.

Research and evaluate different collaborative platforms to find the one that best meets the organization's needs. This may involve looking at factors such as pricing, security, integrations, and user reviews.

Set up the platform and configure it to meet the organization's specific requirements. This may involve creating user accounts, setting up project spaces or channels, and customizing permissions and access controls.

Train users on how to use the platform and encourage adoption by making it an integral part of the team's workflow.

By implementing a collaborative platform, organizations can improve communication and collaboration among team members, streamline workflows, and increase productivity.

58.Google cloud is a worldwide cloud service provider. Analyse how google cloud protects its cloud data from security attacks. CO4 L3

Google Cloud takes a number of measures to protect its cloud data from security attacks. Some of the key measures include:

- **Encryption:** Google Cloud encrypts data at rest and in transit using industry-standard encryption algorithms. This helps to protect data from unauthorized access and interception.
- **Access controls:** Google Cloud uses access controls to restrict access to data to only those users who are authorized to view or modify it. This helps to prevent unauthorized access to sensitive data.
- **Security monitoring and incident response:** Google Cloud monitors its systems for potential security threats and has processes in place to respond to and mitigate any incidents that may occur.
- **Compliance:** Google Cloud adheres to a variety of industry standards and regulations to ensure the security and privacy of its data. This includes standards such as ISO 27001, SOC 2, and PCI DSS.
- **Physical security:** Google Cloud has secure data centers that are protected by multiple layers of security, including access controls, surveillance, and physical barriers.

This includes measures such as perimeter fencing, access controls, and video surveillance. In addition, Google Cloud data centers are designed to withstand natural disasters and other threats, and are equipped with redundant systems to ensure the safety and availability of data. Google Cloud also has strict security protocols in place to ensure that only authorized personnel have access to data centers.

- **Network security:** Google Cloud uses network security measures such as firewalls and network segmentation to protect data from external threats.
- By implementing these and other security measures, Google Cloud is able to provide a secure and reliable cloud service to its customers.

59.Novartis is one of the world's largest healthcare companies that provides solutions for patient's well-being. Data Analysts of Novartis are taking advantage of the AWS services and still implementing new solutions for the patients. Recommend the data analysis and AWS technology adopted by Novartis to meet its desired requirements and improve the efficiency.CO4 L4

As a large healthcare company, Novartis likely has a variety of data analysis and technology needs in order to meet the desired requirements of its patients and improve efficiency. Some potential data analysis and AWS technologies that Novartis may be using include:

Data lakes and warehouses: Novartis may be using AWS technologies such as Amazon S3 and Amazon Redshift to create a centralized data lake or data warehouse where it can store and analyze large amounts of structured and unstructured data. This could include data from electronic medical records, clinical trials, research studies, and other sources.

Machine learning: Novartis may be using AWS machine learning services such as Amazon SageMaker to build, train, and deploy machine learning models that can analyze and extract insights from data. These models could be used for a variety of purposes, such as predicting patient outcomes, detecting patterns in large data sets, or identifying trends and anomalies.

Business intelligence and visualization: Novartis may be using AWS tools such as Amazon QuickSight to create interactive dashboards, charts, and reports that help data analysts and decision makers visualize and understand data trends and patterns. These tools can help Novartis gain insights into its operations and make informed decisions.

Data processing and ETL: Novartis may be using AWS technologies such as Amazon Glue and Amazon EMR to extract, transform, and load data from various sources into its data lake or warehouse. These tools can help Novartis clean, enrich, and prepare data for analysis, and automate the data ingestion process.

Cloud computing: Novartis may be leveraging the power and scalability of AWS cloud computing services such as Amazon EC2 and Amazon ECS to run data analysis and machine learning workloads. These services can help Novartis scale its data processing and analysis capabilities as needed, and reduce the cost and complexity of managing on-premises infrastructure.

60.In a smart irrigation system, sensor monitors the parameters like soil moisture, soil nutrients ,humidity , temperature etc.The data is recorded in the system and historical data can be viewed whenever required using cloud.In order to design this system what are the components required and if the system behaves improperly ,how do you test and trouble shoot to make the system functional

CO5 L4

A smart irrigation system using Internet of Things (IoT) technology can use sensors and other IoT devices to automatically control and optimize irrigation for agricultural or landscape applications. Here are some steps you can follow to design, test, and troubleshoot a smart irrigation system using IoT technology:

Define the goals and requirements for the system: This includes determining the desired features and functionality of the irrigation system, such as automatic control based on soil moisture levels or weather conditions, remote monitoring, and integration with other smart agriculture systems.

Choose the technology and components: Select the type of irrigation technology that will be used, such as drip irrigation or sprinklers, and the type of sensors and other IoT devices that will be used to gather data and control the system. Consider the cost and efficiency of the technology, as well as any regulatory requirements.

Design the system: Use a tool such as AutoCAD to create a layout of the irrigation system and control system, including the placement of sensors and other components.

Test the system: Set up a pilot project to test the system in a real-world environment. This will allow you to identify and address any issues or challenges that arise.

Troubleshoot and refine the system: Use the results of the pilot project to identify and fix any problems that may have occurred. Make any necessary adjustments to the system to improve its performance and reliability.

In addition to the above steps, it is important to consider the security of the IoT system. This may include measures such as encryption, secure communication protocols, and secure access controls to protect against cyber threats. Ongoing maintenance and support will also be important to ensure that the system continues to operate effectively over time.

61.Lack of security support on IOT devices deployed in production of a manufacturing plant, including asset management, update management, systems monitoring etc . Is security support on IoT devices essential? Justify your answer. CO4 L4

Yes, security support on IoT devices is essential in a manufacturing plant or any other environment. Lack of security support on IoT devices can expose the system to various security risks, such as unauthorized access, data breaches, and malware attacks. These risks can have serious consequences, including financial losses, reputational damage, and legal liabilities.

Some specific examples of the importance of security support on IoT devices in a manufacturing plant include:

Asset management: Without proper security support, it can be difficult to track and manage the devices that are connected to the network, making it easier for attackers to gain unauthorized access to the system.

Update management: IoT devices may require regular software updates to fix vulnerabilities and improve security. Without proper security support, these updates may not be installed, leaving the devices vulnerable to attacks.

Systems monitoring: Without proper security support, it may be difficult to monitor the system for potential security threats, such as malware or unauthorized access. This can make it harder to identify and respond to security incidents in a timely manner.

Overall, security support on IoT devices is essential to ensure the security and reliability of the system, and to protect against the risks and consequences of security breaches.

62.Product Life cycle Management – concept,

Product life cycle management (PLM) is a process that helps organizations manage the entire life cycle of a product, from the initial concept phase through design, development, production, and retirement. The goal of PLM is to improve efficiency and reduce costs by streamlining and automating product-related processes, and by centralizing and organizing product-related data.

PLM involves the use of specialized software to manage and track the various stages of a product's life cycle. This software may include tools for product design and development, engineering, manufacturing, and quality control. It may also include features for collaboration and communication among team members and for managing external partners and suppliers.

The concept of PLM is based on the idea that a product's lifecycle can be divided into distinct stages, and that different processes and activities are needed to manage each stage. These stages may include:

Idea generation: This is the initial phase of product development, when ideas for new products are generated and analyzed for feasibility.

Design and development: This is the phase where the product is designed and developed, and prototypes are created and tested.

Production: This is the phase where the product is manufactured and made available for sale.

Marketing and sales: This is the phase where the product is promoted and sold to customers.

Service and support: This is the phase where the product is supported and maintained after it has been sold.

Retirement: This is the final phase of the product lifecycle, when the product is no longer being sold or supported and is removed from the market.

By using PLM, organizations can better manage the various stages of a product's lifecycle and make more informed decisions about how to allocate resources and optimize their product development and management processes.

PLM stages. Business objectives,

Product lifecycle management (PLM) involves the use of specialized software and processes to manage the various stages of a product's lifecycle, from idea generation through retirement. The specific stages of PLM may vary depending on the product and the needs of the organization, but generally, the stages of PLM include:

Idea generation: This is the initial phase of product development, when ideas for new products are generated and analyzed for feasibility. The goal of this stage is to identify and prioritize new product ideas based on market demand, technical feasibility, and the organization's business objectives.

Design and development: This is the phase where the product is designed and developed, and prototypes are created and tested. The goal of this stage is to create a product that meets the needs of the target market and can be produced efficiently and cost-effectively.

Production: This is the phase where the product is manufactured and made available for sale. The goal of this stage is to produce the product efficiently and with high quality, and to get the product to market as quickly as possible.

Marketing and sales: This is the phase where the product is promoted and sold to customers. The goal of this stage is to generate demand for the product and to increase sales and revenue.

Service and support: This is the phase where the product is supported and maintained after it has been sold. The goal of this stage is to ensure customer satisfaction and to reduce the costs associated with warranty claims and other service-related issues.

Retirement: This is the final phase of the product lifecycle, when the product is no longer being sold or supported and is removed from the market. The goal of this stage is to decommission the product in an orderly and cost-effective manner.

The business objectives of PLM vary depending on the specific product and the needs of the organization, but generally, PLM is used to improve efficiency, reduce costs, increase innovation, and improve the quality and value of the product.

63.Tata Motors limited manufacture four wheel passenger vehicles using traditional techniques. The company planning for transform to smart factories. Recommend various technologies are required to transform to smart factory by you and explain.CO1 L3

To transform a traditional factory into a smart factory, there are several technologies that can be implemented. Some of these technologies include:

Industrial Internet of Things (IIoT): This technology allows for the connection and communication of devices, machines, and sensors within the factory. It enables real-time data collection and analysis, which can be used to optimize processes and improve efficiency.

Predictive Maintenance: Predictive maintenance technologies use machine learning and sensor data to predict when equipment is likely to fail. This allows for proactive maintenance, reducing downtime and improving overall equipment efficiency.

Artificial Intelligence (AI): AI can be used to analyze data, identify patterns, and make decisions. It can be used to optimize production processes, improve quality control, and reduce the need for human intervention.

Robotics: Robotics technologies can be used to automate tasks, improving efficiency and reducing the need for manual labor.

3D Printing: 3D printing technologies can be used to quickly prototype and manufacture parts and products, improving the speed and flexibility of production.

Augmented Reality (AR): AR technologies can be used to provide real-time guidance and training to workers, improving efficiency and accuracy.

Cloud Computing: Cloud computing technologies can be used to store and process data, enabling real-time data analysis and decision-making.

Implementing these technologies can help Tata Motors to transform into a smart factory, improving efficiency, productivity, and competitiveness.

64.TVS automobile Ltd Company manufactures 2 wheel & 3 wheel vehicles. The company transforms traditional industries to smart factories by adoption of certain changes in the existing processes. What are all the various characteristics company should adopt for smart factory and explain? CO1 L3

There are several characteristics that a company should adopt in order to transform traditional industries into smart factories. Some of these characteristics include:

Connectivity: Smart factories are connected, allowing for the exchange of data and information between devices, machines, and people.

Automation: Smart factories use advanced technologies such as robotics and artificial intelligence to automate tasks, reducing the need for manual labor.

Data-Driven: Smart factories rely on data to make informed decisions and optimize processes. They use sensors, machine learning, and other technologies to collect and analyze data in real-time.

Flexibility: Smart factories are able to adapt and change quickly in response to market demands and changing conditions.

Collaboration: Smart factories use advanced technologies such as the Internet of Things (IoT) and cloud computing to enable collaboration between departments, suppliers, and customers.

Sustainability: Smart factories strive to minimize their environmental impact and promote sustainability through energy-efficient technologies and processes.

By adopting these characteristics, TVS Automobile can transform its traditional industries into smart factories, improving efficiency, productivity, and competitiveness.

65.A smart factory use IOT application in industrial production process. There are few very critical production process is monitored by using sensors generates data and send data to cloud using network via gateway, cloud analyze this data and action taken based on the analysis. Identify the problem with this setup and how this issue will resolved and justify your answer. CO3 L4

In this setup the main issue is the latency. The critical application demands zero latency and real time data process and action taken without any latency.

- This can be solved using Edge architecture or edge computing.
- Edge computing is a distributed computing model in which computing takes place near the physical location where data is being collected and analyzed, rather than on a centralized server or in the cloud. This new infrastructure involves sensors to collect data and edge servers to securely process data in real-time on site.
- Edge architecture consists of edge gateway, edge tools and edge computing.
- 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.
- The **Edge Gateway** is the core and is responsible for forwarding the data from the site to the IoT Data Hub.
- The **Edge Tools** are utilities for configuration, log management, and patching the edge operating system, either from a remote or a local user interface.
- The **Edge Computing** is uses data to perform an action at site level or to provide insights to headquarters.
- Critical Data processed locally where it generated minimize the latency and provide real time data process and action.

66.A BYJU'S education startup company provides online training & tuitions to class 1 to class 12 students in India. The company stores training content and videos in other company server located near Mumbai because of infrastructure constrains. The company likes to enter into Europe, Germany and North America global market. To provide global services what company should adopt and how it will benefits and what are the main challenges faced by the company.CO1 L3

To enter the European, German, and North American markets, the BYJU's education startup company will likely need to adopt a global delivery model for its online training and tuition services. This could involve storing and delivering the training content and videos from servers located in these regions, rather than from a server located in Mumbai.

There are several benefits to adopting a global delivery model for this company. For example, it could help to improve the speed and reliability of the service for users in these regions, as the content will be delivered from

servers that are physically closer to them. It could also help to reduce latency and improve the overall user experience.

In addition, a global delivery model could help the company to better serve a diverse and dispersed customer base, and to more effectively compete in these global markets.

However, there are also several challenges that the company may face in adopting a global delivery model. For example, it may require significant infrastructure investments to set up and maintain servers in these regions. It may also require the company to navigate different legal and regulatory environments in each of these regions. There may also be challenges in terms of language and cultural differences, which could require the company to adapt its content and marketing strategies to better serve these markets.

Cloud Storage Benefits

- **Low costs** Because of economies of scale, public cloud vendors can offer extremely low prices on storage. Public cloud storage services eliminate the need for organizations to buy and configure their own hardware, and they allow organizations to convert capital expenses (capex) into operational expenses (opex), which looks good on their financial reports.
- **Simplified management** :When organizations use a cloud storage service, their IT personnel no longer need to configure, deploy and maintain the physical storage hardware. That can further reduce ongoing expenses.
- **Speed of deployment** :Users can set up new cloud storage services and begin using them within just a few minutes. By comparison, it may take weeks or months to deploy new storage hardware in an enterprise data center.
- **Scalability** :When they store data on-premises, organizations have to forecast their needs far into the future and purchase excess capacity in order to have enough space as their data continues to grow. But with cloud storage, more resources are automatically available as the organization needs them, with no need for over provisioning.
- **Availability**: While public cloud outages sometimes occur, in general, the leading public cloud vendors offer better uptime guarantees than most enterprises are able to achieve in their own data centers.
- **Security**: People have different opinions about whether it's safer for enterprises to keep their sensitive data in their own data centers or store it in a public cloud. However, there is certainly an argument to be made that the large cloud vendors with their big budgets and knowledgeable are better equipped to protect against constantly evolving threats.

Cloud Challenges:

1. Security
2. Password Security
3. Cost Management
4. Lack of expertise
5. Internet Connectivity
6. Control or Governance
7. Compliance

8. Multiple Cloud Management
9. Creating a private cloud
10. Performance
11. Migration
12. Interoperability and Portability
13. Reliability and High Availability

67.NASA (National Aeronautics and Space Administration) has always wondered about creating a library to present people with all its achievements through pictures and videos of space. Later on, it created such platforms, but because it had 10 different NASA centers, it couldn't provide the best experience for viewers. So, all it wanted was to create an easy-access platform for people to search for and view images and videos. How did NASA handle this situation? Which web services were used, mention its features.

How did NASA handle this situation? CO3 L4

▪ NASA created an easy-access platform for people to search for and view images and videos with the help of AWS. Then, NASA started adopting many services from AWS to solve this problem. **Following Amazon Web Services are used:**

i. Amazon Elastic Compute Cloud
ii. Elastic Load Balancing
iii. Amazon Simple Storage Service
iv. Amazon Simple Queue Service, etc.

Among these, Amazon S3 helped the company store all the incoming data such as photos, videos, and audio files without any hassle.

Amazon S3:

▪ Amazon S3 (Simple Storage Service) is a scalable, high-speed, low-cost web-based service designed for online backup and archiving of data and application programs.

▪ It allows uploading, storing, and downloading of any type of file up to 5 TB in size. This service allows the subscribers to access the same systems that Amazon uses to run its own websites. The subscriber has control over the accessibility of data, i.e., privately/publicly accessible.

▪ **Features**

i. Low cost and Easy to Use − Using Amazon S3, the user can store a large amount of data at very low charges.

ii. Secure − Amazon S3 supports data transfer over SSL and the data gets encrypted automatically once it is uploaded. The user has complete control over their data by configuring bucket policies using AWS IAM.

ii. Scalable − Using Amazon S3, there need not be any worry about storage concerns. We can store as much data as we have and access it anytime.

iv. Higher performance − Amazon S3 is integrated with Amazon CloudFront, which distributes content to the end

users with low latency and provides high data transfer speeds without any minimum usage commitments.

v. **Integrated with AWS services** − Amazon S3 integrated with AWS services including Amazon CloudFront, Amazon CloudWatch, Amazon Kinesis, Amazon RDS, Amazon Route 53, Amazon VPC, AWS Lambda, Amazon EBS, Amazon Dynamo DB, etc.

68.Vulnerabilities are a major and constant issue in the field of the IoT. It can come from any layer of IoT devices severely affecting the business operations of all the industries. As a systems engineer what steps would you take to secure the organization from malwares, adwares , Trojans,etc. Prepare a document for the best practices to be used by all the employees of an organization. CO4 L3

There are several steps that an organization can take to secure itself from malware, adware, and Trojans in the Internet of Things (IoT) space:

Use strong passwords: All employees should be required to use strong, unique passwords for their accounts and devices. This can help prevent unauthorized access to the organization's systems.

Enable two-factor authentication: Two-factor authentication adds an extra layer of security by requiring users to provide a second form of authentication, such as a code sent to their phone, in order to access the system.

Keep all devices and systems up to date: Regularly updating devices and systems with the latest security patches and software versions can help prevent vulnerabilities from being exploited.

Use a firewall: A firewall can help block unauthorized access to the organization's systems and protect against malicious traffic.

Implement network segmentation: Segmenting the network into different subnets can help limit the spread of malware and contain potential infections.

Use antivirus software: Installing antivirus software on all devices can help protect against malware and other threats.

Educate employees: All employees should be trained on the importance of cybersecurity and how to identify and report potential threats.

Regularly monitor and audit systems: Regular monitoring and auditing of systems can help identify potential vulnerabilities and allow for timely remediation.

Overall, it is important for an organization to have a comprehensive cybersecurity strategy in place to protect against threats in the IoT space. This may include implementing the above best practices as well as other measures, such as regularly backing up data and using encryption to secure sensitive information.

69.Given the breadth of operation technology (OT) in manufacturing, the modern factory often includes many machines, devices, and control mechanisms operating in relative isolation, and communicating using a variety of niche protocols. This has created silos, communication difficulties, and blindspots in processes. How can this condition be improved in IIoT to better work with the Information technology (IT) components. CO1 L3

One way to improve the integration of OT and IT in manufacturing is to use a standard protocol for communication between the different devices and systems. This can allow for greater interoperability and make it easier to integrate new technologies as they are developed. Some examples of protocols that are commonly used in industrial environments include Modbus, Profinet, and OPC UA. Another option is to use a middleware platform that can act as a bridge between different systems and protocols, making it easier to exchange data and integrate new technologies. Additionally, implementing secure and reliable networks and using cybersecurity best practices can help protect against potential vulnerabilities and ensure the integrity of the systems.
The IT/OT convergence is the integration of manufacturing systems controlling physical events and processes with back-end hardware and software for conveying and processing information.

Operational technology in manufacturing includes the hardware and software systems that control and execute processes on the shop floor.
OT has included systems like MES, SCADA, PLCs, and CNCs.
While these systems can be extremely sophisticated, they weren't always networked. So even though mechanical OT systems in manufacturing were quick to embrace digital technologies, they often weren't integrated into a broader, computerized system.

Given the breadth of OT in manufacturing, the modern factory often includes many machines, devices, and control mechanisms operating in relative isolation, and communicating using a variety of niche protocols. This has created silos, communication difficulties, and blindspots in processes.
OT in industrial contexts like manufacturing, "unlike information technology (IT), the technology that controlled operations in those industries was not networked. Many of the tools for monitoring or making adjustments to physical devices were mechanical and those that did have digital controls used closed proprietary protocols."
Information technology, in contrast, refers to the information infrastructure in a given operation. It encompasses the network architecture, and all of the hardware and software components necessary for processing and storing of information.

IT includes hardware like laptops and servers, software, as well as enterprise systems software like ERPs, inventory management programs, and other business-related tools.

70.Explain the necessity of adopting IoT technology for a growing need to increase customer loyalty and deliver the best in-store experience by retail sector in the following sectors: (i) Inventory management (ii) Smart payments (iii) Smart vending machines. CO1 L3

oT technology can be useful in the retail sector for a number of reasons, including:

Inventory management: IoT sensors and devices can be used to track inventory levels in real-time, which can help retailers better manage their stock and reduce the risk of running out of popular items. This can improve customer satisfaction and loyalty by ensuring that products are always available when customers need them.

Smart payments: IoT-powered payment systems can make it easier for customers to make purchases, which can improve the overall shopping experience. For example, customers can use their smartphones to make payments, which can be more convenient than using cash or traditional credit cards.

Smart vending machines: IoT-enabled vending machines can offer a more personalized and convenient shopping experience for customers. For example, they can use machine learning algorithms to recommend products based on past purchases or customer preferences, or allow customers to order and pay for products using their smartphones.

Overall, the use of IoT technology can help retailers improve efficiency, better understand their customers, and deliver a more personalized and convenient shopping experience, which can all contribute to increased customer loyalty.

Inventory Management

- IoT system using Radio Frequency Identification (RFID) tags can help inventory management and maintaining the right inventory levels.
- RFID tags attached to the products allow them to be tracked in the real-time so that the inventory levels can be determined accurately and products which are low on stock can be fill up again.
- Tracking can be done using RFID readers attached to the retail store shelves or in the warehouse.

Retail Smart Payments

- Smart payments solutions such as contact-less payments powered technologies such as Near field communication (NFC) and Bluetooth.
- NFC is a set of standards for smart-phones and other devices to communicate with each other by bringing them into proximity or by touching them.
- Customer can store the credit card information in their NFC-enabled smart-phones and make payments by bringing the smart-phone near the point of sale terminals.
- NFC maybe used in combination with Bluetooth, where NFC initiates initial pairing of devices to establish a Bluetooth connection while the actual data transfer takes place over Bluetooth.

Retail Smart Vending Machines

- Smart vending machines connected to the Internet allow remote monitoring of inventory levels, elastic pricing of products, promotions, and contact-less payments using NFC.
- Smart-phone applications that communicate with smart vending machines allow user preferences to be remembered and learned with time.
- E.g: when a user moves from one vending machine to the other and pairs the smart-phone, the user preference and favorite product will be saved and then that data is used for predictive maintenance.

- Smart vending machines can communicate each others, so if a product out of stock in a machine, the user can be routed to nearest machine
- For perishable items, the smart vending machines can reduce the price as the expiry date nears.

71.This protocol has formed the foundation of data communication over the web. It is the most common protocol that is used for IoT devices when there is a lot of data to be published. Which is this IoT network protocol? Why is it not a preferred choice nowadays? Which protocol would you suggest for an Additive manufacturing/3D printing process for an industry? List its features. CO2 L4

The protocol you are describing is HTTP (Hypertext Transfer Protocol). HTTP is a widely used protocol for communication over the web and has been the foundation of the internet as we know it. It is commonly used by IoT devices to publish data, but it has some limitations that make it less suitable for some types of IoT applications.

One of the main limitations of HTTP is that it is a "request-response" protocol, which means that one device must initiate a request and another device must respond to it. This can be inefficient in scenarios where devices need to send large amounts of data or communicate in real-time, as it requires a lot of back-and-forth communication.

For an additive manufacturing/3D printing process in an industry, I would suggest using the MQTT (Message Queue Telemetry Transport) protocol. MQTT is a lightweight publish-subscribe protocol that is designed for efficient communication in low-bandwidth, high-latency networks. Some of the key features of MQTT include:
Efficient use of bandwidth: MQTT uses a compact binary format for messages, which makes it more efficient to use than HTTP.
Low-power: MQTT is designed to be used by devices with low-power constraints, such as battery-powered sensors.
Publish-subscribe model: MQTT uses a publish-subscribe model, which allows devices to send messages to a central broker without the need for direct communication with each other. This can be useful in scenarios where devices may not always be connected to the network.
Quality of Service (QoS): MQTT supports three levels of QoS, which allows devices to specify the level of reliability they need for their messages.
Overall, MQTT is a good choice for an additive manufacturing/3D printing process in an industry because it is efficient, low-power, and can support real-time communication and data transfer.

72.The cloud architect of ABB company has informed you to select the best communication protocol to be used in smart cities, where there are millions of devices that function with less power and memory. Which protocol would you suggest and why? Which protocol is used for smart street lighting in a smart city? CO2 L3

For a smart city with millions of devices that function with less power and memory, I would suggest using the MQTT (Message Queue Telemetry Transport) protocol. MQTT is a lightweight publish-subscribe protocol that is designed for efficient communication in low-bandwidth, high-latency networks. It is particularly well-suited for use in smart cities because it is energy-efficient and can be used with devices that have limited power and memory resources. Additionally, MQTT's publish-subscribe model allows devices to send messages to a central broker without the need for direct communication with each other, which can be useful in scenarios where devices may not always be connected to the network.

For smart street lighting in a smart city, it is common to use a protocol called DALI (Digital Addressable Lighting Interface). DALI is a communication protocol specifically designed for controlling lighting systems, and it is often used in smart street lighting applications because it allows for precise control of individual lights and the ability to configure lighting scenes. Some other features of DALI include the ability to remotely monitor lighting systems and the ability to use a single network to control both lighting and other building systems.

73.An organization debating whether to install a private cloud or to use a public cloud, e.g., the AWS, for its computational and storage needs, asks your advice. What information will you require to base your recommendation on, and how will you use each one of the following items: (a) the description of the algorithms and the type of the applications the organization will run; (b) the system software used by these applications; (c) the resources needed by each application; (d) the size of the user population; (e) the relative experience of the user population; (d) the costs involved. CO3 L3

To provide a recommendation on whether an organization should install a private cloud or use a public cloud like AWS, I would need the following information:

(a) **The description of the algorithms and the type of the applications the organization will run:** This information is important because it will help me understand the computational and storage requirements of the applications, as well as any specialized needs (such as specific hardware or software requirements) that may impact the decision.

(b) **The system software used by these applications:** This information will help me understand any dependencies or compatibility issues that may need to be taken into account when choosing a cloud solution.

(c) **The resources needed by each application:** This includes the type and amount of computing power, storage, and other resources that each application will require. This information will help me understand the scale of the cloud solution that is needed and whether a private or public cloud is the most appropriate.

(d) **The size of the user population:** This will help me understand the level of demand that the cloud solution will need to handle and whether a private or public cloud is the most appropriate.

(e) **The relative experience of the user population:** If the user population is more experienced, they may be more comfortable using a public cloud like AWS. If the user population is less experienced, a private cloud may be more suitable as it allows for more control and customization.

(f) **The costs involved:** This includes the upfront costs of setting up a private cloud and the ongoing costs of maintaining it, as well as the costs of using a public cloud like AWS. I will need to compare these costs to determine which option is the most cost-effective for the organization.

Based on this information, I will be able to make a recommendation on whether a private cloud or a public cloud is the most appropriate for the organization's needs.

74.Siemens is a German multinational conglomerate company. The company builds automated machines for the likes of BMW. Siemens introduced an operating system called Mindsphere, the cloud-based IoT unit from Siemens which basically aggregates the data from all the different vital components of a factory and then processes them through rich analytics to produce useful results. Suddenly, the operating system was behaving weirdly and started to give inaccurate data / links were popping up , as if the system was hanging and it was noticed by the system engineers. What could have gone wrong? how to control the situation CO4 L4

There could be a number of potential issues that could cause the behavior you described in the Siemens Mindsphere operating system. Some possibilities could include:

Hardware failure: One possibility is that there is a hardware issue with one of the devices connected to the Mindsphere system, which could be causing the system to behave erratically.

Software bugs: Another possibility is that there is a bug in the Mindsphere software itself, which is causing the system to behave strangely. This could be due to a coding error, or it could be caused by a problem with the software's dependencies or libraries.

Network issues: It's also possible that there is a problem with the network that the Mindsphere system is running on, which could be causing the system to behave unexpectedly. This could be due to problems with the network infrastructure or connectivity issues.

Cyber attack: Finally, it's possible that the Mindsphere system is experiencing a cyber attack, which could be causing the system to behave erratically. This could be due to a variety of factors, such as malware, ransomware, or other malicious software.

To control the situation, it would be important to first identify the root cause of the issue. This could involve checking hardware and software logs, running diagnostic tests, and possibly seeking the assistance of cybersecurity experts if there is a possibility of a cyber attack. Once the root cause has been identified, it should be possible to implement a solution to fix the problem and restore normal operation to the Mindsphere system.

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MindSphere is the cloud-based, open IoT operating system from Siemens that connects your products, plants, systems, and machines, enabling you to harness the wealth of data generated by the Internet of Things (IoT) with advanced analytics.

MindSphere delivers wide range of device and enterprise system connectivity protocol options, industry applications, advanced analytics and an innovative development environment that utilizes both Siemens' open Platform-as-a-Service (PaaS) capabilities along with access to AWS cloud services.

Through these capabilities, MindSphere connects real things to the digital world and provides powerful industry applications and digital services to help drive business success.

MindSphere's open PaaS capabilities enable a rich partner ecosystem to develop and deliver industry applications.

Siemens provides business-focused solutions to help drive closed-loop innovation through digital twins for products, production, and performance.

Siemens AG and Software AG announced a partnership to strengthen the presence of the cloud-based open Internet of Things (IoT) operating system MindSphere across industries. MindSphere supports industrial companies in their digital transformation and offers a development platform to a broad customer base where companies can integrate their own applications and services to promote IoT innovations. Software AG brings the highly scalable components of its Digital Business Platform to MindSphere, which help customers to flexibly manage networks of millions of end devices.

MindSphere is Siemens' cloud-based, open IoT operating system that connects real things to the digital world, and enables powerful industry applications and digital services to drive business success.

MindSphere's open Platform as a Service (PaaS) enables a rich partner ecosystem to develop and deliver new applications providing a basis for new business models, such as in the fields of preventive maintenance, energy data management or resource optimization. The open access of the operating system is particularly important here, such as the use of open interfaces (APIs) to produce OEM and customer specific apps as well as open standards for connectivity such as OPC UA. MindSphere thus forms the basis for new business models, for example for machine manufacturers. Siemens MindApps provide the basic functions for machine manufacturers to enter the digital world. Machine manufacturers can use these basic functions to apply their specific and comprehensive machine and process knowledge to developing and marketing innovative customized applications, solutions and services for their customers. This allows them, for example, to monitor machines scattered throughout the world, or whole machine fleets, and to reduce their downtime.

Software AG and Siemens AG's technology will provide comprehensive market-leading capabilities enabling users to acquire and comprehensively analyze raw data produced by plants, machines, systems and products even more easily. For this, Software AG application and device management technology enables both centralized networking of devices as well as cloud-based management, providing scalable and flexible management for a network of millions of end devices, also in the area of edge analytics in the future. Software

AG application connectivity technology integrates a variety of different business applications (e.g., SaaS, Big Data, IoT, client-, partner- or shop-floor applications) along the entire value chain.

MindSphere is part of Siemens' comprehensive Digital Enterprise Suite solution. Companies that are designing, developing, and manufacturing products using the Digital Enterprise Suite for Product Lifecycle Management (PLM), Manufacturing Operations Management (MOM) and Totally Integrated Automation (TIA) are building products, like laptops, computers, televisions, cars, trucks, planes, heavy equipment, fitness devices, white goods, etc. Siemens envisions these products being connected to MindSphere so their data can be collected and analyzed in MindSphere applications and connected back to the complete Digital Twin to drive innovation. With this platform, the company enables smooth collaboration for all stakeholders along the entire industrial value chain, from individual product design to the delivery of associated services

75.In the healthcare industry (Medical IoT) IoT devices are already being utilized to remotely monitor patients' vital signs and have proven very helpful since the pandemic . What are the possible consequences of IoT security attacks in Medical IoT.

IoT security attacks on medical devices can have serious consequences, particularly in the healthcare industry where the devices are being used to monitor and manage patient health. Some potential consequences of IoT security attacks in the medical sector include: CO4 L4

IoT security attacks on medical devices can have serious consequences, particularly in the healthcare industry where the devices are being used to monitor and manage patient health. Some potential consequences of IoT security attacks in the medical sector include:

Compromised patient privacy: Medical devices that are connected to the internet often contain sensitive patient data, such as medical history, diagnoses, and treatment plans. If these devices are compromised, this data could be accessed or stolen, leading to serious privacy breaches for patients.

Disruption of medical treatment: If an IoT device that is being used to monitor or manage a patient's health is compromised, it could disrupt the delivery of medical treatment. For example, an insulin pump that has been hacked could deliver the wrong dosage of insulin to a patient, which could have serious consequences.

Damage to device: In some cases, an IoT security attack could damage the device itself, rendering it inoperable. This could be particularly problematic if the device is essential for the ongoing treatment of a patient.

Financial consequences: IoT security attacks could also have financial consequences for healthcare providers, including the cost of repairing or replacing compromised devices, as well as the cost of any legal or regulatory action that may be taken as a result of the attack.

Overall, it is important for the healthcare industry to prioritize the security of medical IoT devices to ensure the safety and privacy of patients and avoid negative consequences.

It is possible that hackers could tamper with medical devices to harm individuals,

- Devices are usually hacked so attackers can get into larger medical systems and steal
- protected health information.

- Enabling unauthorized access that can lead to misuse of personal information
  - Facilitating attacks on other systems
  - Creating risks to personal safety
- Privacy risks that arise from the collection of personal information, locations and physical
  - conditions

76. Heavy-equipment maker Caterpillar has long been an IoT projects pioneer. It wants to give the machine operators an at-a-glance view of everything from fuel levels to when air filters need replacing. If an old filter expires, the company can send basic instructions for how to replace it via an AR app. Recommend the technology can be adopted by Caterpillar to meet its desired requirements and improve the efficiency CO1 L3

There are several technologies that Caterpillar could consider adopting in order to meet its desired requirements and improve efficiency:

Augmented reality (AR): As mentioned, Caterpillar is already using AR technology to provide instructions to machine operators. This technology could be further leveraged to provide real-time information about machine performance, maintenance needs, and other important metrics.

Internet of Things (IoT) sensors: Caterpillar could consider implementing IoT sensors on its heavy equipment to gather data about machine performance, usage, and maintenance needs. This data could then be used to optimize machine performance, reduce downtime, and improve efficiency.

Predictive maintenance: By using the data gathered from IoT sensors and other sources, Caterpillar could implement predictive maintenance techniques to proactively identify and address potential maintenance issues before they result in equipment downtime.

Machine learning: Caterpillar could also consider using machine learning algorithms to analyze the data gathered from its equipment and identify patterns and trends that could help optimize performance and maintenance schedules.

Overall, the key to improving efficiency in this context will be the ability to gather and analyze large amounts of data about machine performance, usage, and maintenance needs. By leveraging technologies such as AR, IoT sensors, predictive maintenance, and machine learning, Caterpillar can gain a more complete understanding of its equipment and take proactive steps to optimize performance and reduce downtime.

Heavy-equipment maker Caterpillar has long been an IoT projects pioneer. With the help of IOT technology and augmented reality (AR) applications to give machine operators an at-a-glance view of everything from fuel levels to when air filters need replacing. If an old filter expires, the company can send basic instructions for how to replace it via an AR app.

The name **Caterpillar** was originally coined in the early 1900s when Benjamin Holt replaced the wheels of his steam tractors with wooden tracks bolted to chains, in an effort to improve their mobility and traction.

Today Caterpillar is the world's largest manufacturer of construction and farm machinery and employs over 90,000 people worldwide

In the field service industry IoT devices are being employed to significantly change the way jobs are managed and servicing and repairs are carried out. Connected sensors can self-diagnose issues and report back to a central hub. This allows for engineers to be dispatched automatically when a problem arises and cuts down time on the job by removing the manual diagnostic process.

"Before internet-connected devices, it was common for facilities managers and in-house maintenance staff to spend time on the phone with suppliers booking in a suitable time for repairs to be carried out,"

"It might have taken hours, if not days, for an engineer to come out to the site, leading to potential downtime in the interim. However, the advent of the IoT means that much of this model is shifting to real-time, predictive maintenance and those companies that adapt their businesses will benefit the most from the resulting competitive advantage."

Caterpillar has already been using IoT technology to automate its factories, and has manufactured a range of heavy-duty equipment complete with IoT sensors for several of its clients, who are already seeing a notable increase in the efficiency and productivity of the sites they are deployed on.

However, while IoT powered equipment is working hard onsite, Caterpillar is also gathering vast quantities of data from the machines. This data is then being put to work to enable predictive maintenance on the equipment. By turning data into actionable insight, Caterpillar can schedule maintenance at the appropriate time, thereby increasing product uptime, and extending the life-cycle significantly.

The IoT technology in Caterpillar machines is also facilitating better service management, buy automatically detecting faults. A notification alerts Caterpillar field service staff when a part is developing a fault, allowing them to send the affected business a replacement before the machine malfunctions completely – again, drastically reducing downtime.

The collected data can be used in ongoing product development. If Caterpillar detects that a function is not being used, or a certain fault keeps recurring, they can make changes for future models – either replacing or removing the unused/troublesome component or feature. As new generations of Caterpillars equipment are developed, they will be able to fine tune the design, based on real data.

77. Netflix is an entertainment platform that started in the United States, but eventually, it expanded to many countries and soon became popular. How could Netflix confront the scalability problem with the sudden increase in viewers? What kind of databases were used and what were the other services offered by the solution to the scalability problem?

Compare this with Disney Hotstar and list the differences. CO3 L3

To address scalability issues as it expanded its viewer base, Netflix likely implemented a number of technical solutions, including:

Distributed computing: Netflix likely used distributed computing techniques to distribute its workload across

multiple servers and data centers, rather than relying on a single, centralized server. This can help to improve scalability by allowing the system to handle more users and requests without becoming overwhelmed.

Load balancing: To further improve scalability, Netflix likely used load balancing techniques to distribute incoming traffic across multiple servers, rather than having all traffic directed to a single server. This can help to ensure that the system can handle large spikes in traffic without crashing or becoming unresponsive.

Caching: Netflix may have also implemented caching strategies to improve the performance and scalability of its system. By storing frequently accessed data in cache, Netflix can reduce the load on its servers and improve the speed with which it can deliver content to users.

Databases: It is likely that Netflix used a variety of different databases to support its operations, including both relational databases (such as MySQL) and NoSQL databases (such as MongoDB). These databases would have been used to store and manage data related to user accounts, recommendations, streaming history, and other key information.

In comparison to Netflix, Disney Hotstar is an Indian entertainment platform that offers both streaming video and live sports. Some potential differences between Netflix and Disney Hotstar could include:

Content offerings: While both platforms offer a variety of content, Netflix is known for its original programming, while Disney Hotstar focuses more on licensed content from Disney and other studios.

Pricing and subscription models: Netflix and Disney Hotstar may have different pricing and subscription models, with Netflix offering a range of subscription tiers and Disney Hotstar offering both free and premium content.

Target audience: While Netflix is popular globally, Disney Hotstar is primarily targeted at the Indian market. This may influence the types of content offered, as well as the pricing and distribution strategies used by the platform.

Netflix confronts the scalability problem with the sudden increase in viewers with the help of Amazon Web Services (AWS).

- AWS provides Netflix with compare, storage, and infrastructure that allows the company to scale quickly, operate securely and meet capacity needs anywhere in the world.
- Started using AWS services like **DynamoDB** and **Cassandra** for its distributed databases, it could handle the data easily.
- Moreover, Netflix, a leading content producer, has used AWS to build a studio in the cloud. This virtual studio enables Netflix to engage top artistic talent, no matter the location, and Netflix artists and partners have the freedom to collaborate without technological or geographical barriers. ▪ Following Amazon Web Services are used by the Disney Hotstar:

i. Amazon Route S3

ii. Amazon EC2

iii. Amazon CloudFront

iv. Amazon S3

Netflix:

Pros:

- Original titles
- Parental controls
- Huge content library
- Seamless streaming experience

Cons:

- No live streaming options
- Limited global content
- No free trial. Netflix used to offer a 30-day trial to users but removed the offer in October 2020.
- Can be expensive.

Hotstar:

Pros:

- Without login, you can watch content.
- The picture quality is very good.
- Hotstar OTT app provides free online Streaming for 1)Sports 2)TV 3)News
- Hotstar OTT platform allows quick availability of TV serials and other news in different languages.
- Layout and Design are average.

Cons:

- In the Hotstar OTT app, some specific tv shows available
- Hotstar app takes time to load the website and application.
- Even if your internet speed is high the website takes time to load.

78. McDonald's is the world's largest fast-food company that serves around 64 million people per day. The growth of this company has gone to another level when it started home deliveries. McDonald's created platform that integrates local restaurants with delivery partners such as Uber Eats, Swiggy & Zomato. McDonald's platform can scale 20,000 orders per second and integrate with global partners easily. Howcan McDonald's manage such a higher number of orders every day? CO3 L3

There are a number of strategies that McDonald's could use to manage a high volume of orders every day, including:

Automation: McDonald's could use automation to streamline its order processing and fulfillment process. For example, the company could use automated systems to handle tasks such as taking orders, generating invoices, and tracking inventory.

Load balancing: To ensure that orders are distributed evenly across its system, McDonald's could use load balancing techniques to direct incoming orders to the appropriate servers or fulfillment centers.

Caching: McDonald's could also use caching techniques to improve the performance of its order fulfillment system. By storing frequently accessed data in cache, the company can reduce the load on its servers and improve the speed with which it can fulfill orders.

Databases: McDonald's may use a variety of different databases to support its operations, including both relational databases (such as MySQL) and NoSQL databases (such as MongoDB). These databases would be used to store and manage data related to orders, inventory, customer information, and other key data points.

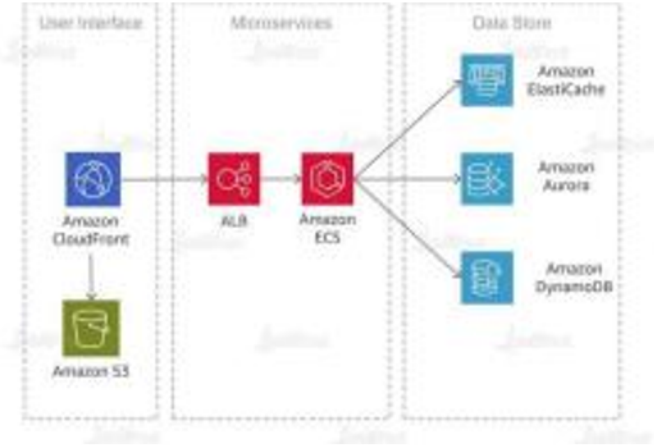
Overall, the key to managing a high volume of orders at McDonald's will be the ability to scale its systems and processes to handle the increased demand. By leveraging automation, load balancing, caching, and robust databases, McDonald's can ensure that it can fulfill orders efficiently and effectively, regardless of the volume of traffic.

It is made possible by **AWS Microservices Architecture**

AWS Microservices is an architectural approach toward software development by the disintegration of the whole software into small independent services.

Microservices are components of an application that are interconnected by APIs, Amazon web services use this strategy on a big scale while building applications.

The ultimate goal of using microservices is to split an application into several independent services, the diagram below shows how a microservice is implemented on AWS.



The following three crucial AWS services can help you lower operational complexity and establish microsystem architecture:

API management: Without needing to operate a server, you can build and use RESTful APIs with AWS API Gateway. It increases the security of microservice applications and serves as a gateway for web or mobile apps that are hosted on Amazon and other on-premises or cloud infrastructures.

Lambda functions: The API Gateway and AWS Lambda collaborate as concurrent requests arrive at the application. This makes serverless microservice applications possible.

Deploy Lambda-based applications: AWS CloudFormation is a tool for defining, deploying and managing serverless applications. Before publishing the code to the AWS production environment,

79.Airbnb is an international online marketplace for rental homes. This platform connects people who are looking for rental accommodation with those who want to rent out their houses. Quite soon, Airbnb

became unable to handle the constant streaming of data on the website from its customers. What you would suggest handling the situation? CO3 L4

There are several strategies that Airbnb could use to handle a high volume of data on its platform, including:

Distributed computing: Airbnb could use distributed computing techniques to distribute its workload across multiple servers and data centers, rather than relying on a single, centralized server. This can help to improve scalability by allowing the system to handle more data and requests without becoming overwhelmed.

Load balancing: To further improve scalability, Airbnb could use load balancing techniques to distribute incoming traffic across multiple servers, rather than having all traffic directed to a single server. This can help to ensure that the system can handle large spikes in traffic without crashing or becoming unresponsive.

Caching: Airbnb may also use caching strategies to improve the performance and scalability of its system. By storing frequently accessed data in cache, Airbnb can reduce the load on its servers and improve the speed with which it can deliver data to users.

Databases: Airbnb likely uses a variety of different databases to support its operations, including both relational databases (such as MySQL) and NoSQL databases (such as MongoDB). These databases would be used to store and manage data related to user accounts, listings, reservations, and other key information.

Overall, the key to handling a high volume of data on the Airbnb platform will be the ability to scale its systems and processes to handle the increased demand. By leveraging distributed computing, load balancing, caching, and robust databases, Airbnb can ensure that it can handle a high volume of data efficiently and effectively.

The Amazon Web Services like Amazon EC2 service and Elastic Load Balancing, which distributes incoming traffic to multiple Amazon EC2 instances. In this way, Airbnb could avoid traffic, and customers could use the online platform without any disruption.

Amazon EC2 service

· The full form of Amazon EC2 is Amazon Elastic Compute Cloud.

· EC2 is a machine with an operating system and hardware components of your choice. But the difference is that it is totally virtualized. You can run multiple virtual computers in a single physical hardware.

· Elastic Compute Cloud (EC2) is one of the integral parts of the AWS ecosystem. EC2 enables on demand, scalable computing capacity in the AWS cloud.

· Amazon EC2 instances eliminate the up-front investment for hardware, and there is no need to maintain any rented hardware. It enables you to build and run applications faster. You can use EC2 in AWS to launch as many virtual servers as you need. Also, you can scale up or down when there is an increase or decrease in website traffic.

· Advantages of EC2:

i. Auto-scaling

ii. Pay-as-you-go

iii. Increased Reliability

iv. Elasticity

Elastic Load Balancing

▪ Load balancer is a service that uniformly distributes network traffic and workloads across multiple servers or clusters of servers.

▪ Load balancer in AWS increases the availability and fault tolerance of an application. ▪ AWS Elastic Load Balancer is the single point of contact for all the clients, they can be sent to the nearest geographic instance or the instance with the lowest latency.

▪ AWS Load balancer will distribute your workloads across multiple compute resources, such as a Virtual Machine or Virtual Server. The applications availability and failover will decrease due to this.

80.Novartis is one of the world's largest healthcare companies that provides solutions for patient's well being. The Data Analysts of Novartis want to take the advantage of the AWS services and implement new solutions for the patients. Assume you are the Data Analyst of Novartis which amazon services you would implement? Explain in brief. CO3 L3

As a Data Analyst at Novartis, there are several Amazon Web Services (AWS) that I might consider implementing in order to provide new solutions for patients:

Amazon S3: Amazon Simple Storage Service (S3) is a highly scalable, cloud-based storage service that could be used to store and manage large amounts of data related to patients' health. This data could include medical records, diagnostic images, laboratory results, and other types of data.

Amazon EC2: Amazon Elastic Compute Cloud (EC2) is a cloud-based computing service that could be used to host applications and services related to patient care. For example, Novartis could use EC2 to host a web-based application that allows patients to track their health data or communicate with their healthcare providers.

Amazon EMR: Amazon Elastic MapReduce (EMR) is a cloud-based service that could be used to process and analyze large amounts of data related to patient health. Novartis could use EMR to analyze patient data in order to identify trends, predict future health issues, and develop personalized treatment plans.

Amazon SageMaker: Amazon SageMaker is a machine learning platform that could be used to develop and deploy machine learning models related to patient health. For example, Novartis could use SageMaker to build models that can predict the likelihood of certain health conditions or identify patterns in patient data that could be used to improve treatment outcomes.

Overall, these AWS services could be used to support a range of patient-facing solutions at Novartis, including data storage, application hosting, data analysis, and machine learning. By leveraging these services, Novartis can develop innovative solutions that can help improve patient care and outcomes.

I would like to suggest using Amazon EC2 services and built a platform using other services such as Amazon Simple Storage Service, Amazon Elastic Block Store, and four availability zones.

Amazon EC2 service

· The full form of Amazon EC2 is Amazon Elastic Compute Cloud.

· EC2 is a machine with an operating system and hardware components of your choice. But the difference is that it is totally virtualized. You can run multiple virtual computers in a single physical hardware.

· Elastic Compute Cloud (EC2) is one of the integral parts of the AWS ecosystem. EC2 enables on demand, scalable computing capacity in the AWS cloud.

· Amazon EC2 instances eliminate the up-front investment for hardware, and there is no need to maintain any rented hardware. It enables you to build and run applications faster. You can use EC2 in AWS to launch as many virtual servers as you need. Also, you can scale up or down when there is an increase or decrease in website traffic.

· Advantages of EC2:

v. Auto-scaling

vi. Pay-as-you-go

vii. Increased Reliability

viii. Elasticity

AWS Storage Services

▪ AWS offers a wide range of storage services that can be provisioned depending on your project requirements and use case.

▪ AWS storage services have different provisions for highly confidential data, frequently accessed data, and not-so-frequently accessed data.

▪ You can choose from various storage types namely, object storage, file storage, block storage services, backups, and data migration options. All of which fall under the AWS Storage Services list.

Amazon Elastic Block Store

▪ Amazon EBS is a block storage system used to store persistent data.

▪ Amazon EBS is suitable for EC2 instances by providing highly available block-level storage volumes. ▪ It has three types of volume:

i. General Purpose (SSD)

ii. Provisioned IOPS (SSD)

iii. Magnetic

These three volume types differ in performance, characteristics, and cost.

81.Facebook, without a doubt, is a widespread social media platform. To build a scalable application, Facebook wants to use AWS. Express your views on it. CO3 L3

Using Amazon Web Services (AWS) can be a good choice for building a scalable application like Facebook, as AWS offers a range of services that can help support the development and deployment of large-scale applications. Some potential benefits of using AWS for a project like Facebook include:

Scalability: AWS provides a range of services that can help support the scalability of a application like Facebook. For example, Amazon Elastic Compute Cloud (EC2) can be used to host applications and services, while Amazon Simple Storage Service (S3) can be used to store and manage large amounts of data.

Reliability: AWS is known for its high levels of reliability, with multiple layers of redundancy built into its infrastructure. This can be particularly important for an application like Facebook, which has a large and highly active user base that needs to be able to access the platform consistently.

Security: AWS has a number of security features and controls in place to help protect its customers' data, including encryption, access controls, and monitoring and alerting tools. These features can help ensure that data is secure and compliant with relevant regulations.

Flexibility: AWS offers a wide range of services and tools that can be tailored to meet the specific needs of a project like Facebook. This can help Facebook to build and deploy a scalable application that meets its unique requirements.

Overall, AWS can be a strong choice for building a scalable application like Facebook, due to its scalability, reliability, security, and flexibility.

82.An IT company decides to provide free access to a public cloud dedicated to higher education. Which one of the three cloud computing delivery models, SaaS, PaaS, or IaaS should it embrace and why? What applications would be most beneficial for the students? Will this solution have an impact on distance learning? Why? CO3 L4

If an IT company decides to provide free access to a public cloud dedicated to higher education, it could consider using the Software as a Service (SaaS) delivery model. This model would allow the company to provide students with access to cloud-based applications and services, without the need for them to purchase and maintain the underlying infrastructure.

Some examples of applications that could be beneficial for students in this context might include:

Collaboration and productivity tools: Applications like Google Workspace, Microsoft Office 365, and Slack can help students collaborate with each other and their professors, and manage their coursework and schedules.

Learning management systems: Platforms like Blackboard, Canvas, and Moodle can help students access course materials, submit assignments, and communicate with their instructors and classmates.

Virtual labs: Cloud-based virtual lab environments can allow students to access and experiment with specialized software and equipment remotely, without the need to be physically present in a lab.

Providing free access to a cloud-based education platform can have a significant impact on distance learning, as it can help to remove barriers to access and allow students to participate in coursework and interact with their peers and instructors remotely. This can be particularly beneficial for students who may not have access to the necessary resources or technology to participate in traditional on-campus education.

A public cloud dedicated to higher education would be extremely beneficial; it would allow concentration of educational resources and sharing of software for different educational activities. It would increase the student

participation and interest in the different topics. At the same time, it would significantly reduce the cost of educational computing.

Each one of the three cloud delivery models would have its own applications. For example, SaaS could be uses for testing and for systems like Piazza (see https://piazza.com/) which allow groups of students and faculty to interact. Collaborative environments which allow an instructor to interact with a large class where the students are connected via mobile devices would most certainly increase the level of student participation. Projects given to engineering and science students would have useful results as the students would be able to run concurrently multiple models of the systems and use different parameters of the models. Such projects would require either a Paas or an IaaS cloud model.

83. Compare the three cloud computing delivery models, SaaS, PaaS, and IaaS, from the point of view of the application developers and users. Discuss the security and the reliability of each one of them. Analyze the differences between the PaaS and the IaaS. CO3 L3

The three main cloud computing delivery models are Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS). Each of these models has different implications for application developers and users, as well as different levels of security and reliability.

From the point of view of application developers:

SaaS: With SaaS, developers create and deliver applications to users via the cloud, but do not need to worry about the underlying infrastructure or platforms. This can be a convenient and cost-effective way for developers to deliver applications to users, but it can also limit their control over the environment in which the applications are run.

PaaS: With PaaS, developers create applications that run on a cloud-based platform provided by the PaaS provider. This can allow developers to focus on the development of their applications, rather than having to worry about managing the underlying infrastructure. However, it can also limit the flexibility and customization options available to developers.

IaaS: With IaaS, developers have access to cloud-based infrastructure resources that they can use to build and deploy their own applications. This can provide developers with a high level of flexibility and control, but it also requires them to manage and maintain the underlying infrastructure, which can be time-consuming and complex.

From the point of view of users:

SaaS: With SaaS, users access and use applications via the cloud, but do not need to worry about installing or maintaining the applications or the underlying infrastructure. This can be a convenient and easy way for users to access applications, but it

84.The web transfer protocol for use with constrained nodes and constrained networks in the Internet of Things. The protocol is designed for machine-to-machine (M2M) applications such as smart energy and building automation. Which is this IoT protocol? List its features. CO2,L3

The Internet of Things (IoT) protocol you are referring to is probably Constrained Application Protocol (CoAP). CoAP is a web transfer protocol designed for use with constrained nodes and networks in the IoT. Some key features of CoAP include:

Lightweight: CoAP is designed to be lightweight and efficient, making it suitable for use with constrained devices that have limited processing and memory resources.

Request/response model: CoAP uses a request/response model similar to HTTP, which allows devices to communicate with each other by sending and receiving messages.

Asynchronous communication: CoAP supports asynchronous communication, which means that devices can send and receive messages at any time, rather than having to wait for a response before sending the next message.

Secure communication: CoAP supports secure communication through the use of encryption and authentication mechanisms.

Interoperability: CoAP is designed to be interoperable with other protocols, such as HTTP, which allows it to be easily integrated with other systems and devices.

Overall, CoAP is a useful protocol for IoT applications that require efficient, secure, and interoperable communication between devices.

85.Illustrate the role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments for Logistics & Supply Chain Optimization in manufacturing sector? CO1 L3

The Internet of Things (IoT) can play a significant role in increasing autonomy and agility in collaborative production environments for logistics and supply chain optimization in the manufacturing sector.

One way in which the IoT can achieve this is through the use of sensors and connected devices to gather data about the production process, supply chain, and logistics operations. This data can be used to optimize various aspects of the process, such as identifying bottlenecks or inefficiencies, predicting maintenance needs, and optimizing inventory levels.

Another way the IoT can increase autonomy and agility in collaborative production environments is through the use of advanced algorithms and machine learning techniques to analyze the data collected from connected devices and make decisions in real-time. For example, an IoT system could automatically adjust production schedules based on changes in demand or adjust the routing of delivery trucks to optimize the supply chain.

Overall, the IoT has the potential to significantly improve the efficiency and effectiveness of logistics and supply chain operations in the manufacturing sector by providing real-time visibility and control over the production process, enabling better decision-making and more agile responses to changes in the environment.

86.Tesla. Inc is an American multinational automotive company designs and manufactures electric vehicles in Chain, Europe & North America manufacturing plant and provide sales and service all over the world. And the company adopted industry 4.0. Explain the issues faced by the company to achieve

sustainable development?CO1 L3

It is not uncommon for companies, especially those in the automotive industry, to face a number of challenges when striving for sustainable development. Some of the issues that Tesla may have encountered include:

Environmental impact: Manufacturing vehicles, regardless of their power source, can have a significant impact on the environment. Tesla may have faced challenges in reducing its carbon footprint and minimizing the environmental impact of its manufacturing processes.

Limited access to raw materials: Sourcing raw materials, such as lithium for batteries, can be a challenge for any company, but it can be particularly difficult for companies that rely on sustainable and ethical sourcing practices.

Infrastructure: Building and maintaining a network of charging stations and service centers can be a significant undertaking, especially in areas where electric vehicle adoption is still low.

Competition: Tesla operates in a highly competitive industry, and it may have faced challenges in differentiating itself from other companies that also produce electric vehicles.

Government regulations: Governments around the world have different regulations and incentives related to electric vehicles, and navigating these can be a challenge for any company.

Despite these challenges, Tesla has made significant progress in the area of sustainable development, and it has become a leader in the production of electric vehicles.

87.Hero Motors Limited manufacture two wheel vehicles in Bangalore, Chennai and Pune manufacturing plant and proved sales and service only in India. The company operation processes are automated using the PLC, SCAD & HMI. The company planning to enter global market and increase the production for next 10 years, what kind of solution should adopted company to improve production and emerge as leader in global market and justify your answer?CO1 L3

There are several solutions that Hero Motors Limited could consider adopting in order to improve production and emerge as a leader in the global market. Some potential options might include:

Expanding and upgrading their manufacturing facilities: In order to increase production and meet the demand of the global market, Hero Motors may need to invest in new or upgraded manufacturing facilities. This could involve installing more advanced production equipment and automation technologies, as well as increasing the size of the facilities to accommodate more production lines.

Investing in research and development: Another way that Hero Motors could improve production and emerge as a leader in the global market is by investing in research and development. This could involve developing new technologies or processes that allow for more efficient and cost-effective production.

Diversifying their product line: To appeal to a wider range of customers in the global market, Hero Motors could consider diversifying their product line to include a wider range of two-wheel vehicles. This could include different types of motorcycles or scooters, or even electric bikes or other alternative transportation options.

Increasing their marketing and sales efforts: To increase brand awareness and reach a larger customer base

in the global market, Hero Motors may need to increase their marketing and sales efforts. This could involve hiring additional sales staff, expanding their online presence, or participating in trade shows and other industry events.

Overall, in order to improve production and emerge as a leader in the global market, Hero Motors should consider a combination of these strategies and other solutions that are tailored to their specific needs and goals.

Benefits of Adopting an Industry 4.0 Model

- Increased competitiveness of businesses
- Increased productivity
- Increased revenue
- Increased employment opportunities, enhanced human and IT resources management
- Optimization of manufacturing processes
- Development of exponential technologies
- Delivery of better customer service
- **To address potential issues before they become big problems: P**redictive analytics, real-time data, internet-connected machinery, and automation can helps identify the issues before the occurrence.
- **It allows reduce costs, boost profits, and increase growth**

The Benefits of Adopting IIoT are:

1. Operational efficiency of the different industrial processes is improved.
2. Product development and assembly line-related costs (operational cost) are reduced.
3. Downtime of machines is reduced, and energy is conserved. In addition to this, machines can schedule their maintenance using predictive and prescriptive analysis of the data.
4. The managers and other relevant officials can remotely monitor the factory operations.
5. Improved estimation of available materials, work progress, and the arrival of inventory lead to the maximum utilization of the resources.
6. Safety and security of workers is enhanced.
7. Both customers' experience and cost of packaging the products have improved significantly.
8. New business opportunities have been created.
9. The real-time monitoring of the supply chain reduces inventory and capital requirements.

88. JSW pains manufacturing home decorate paint, provide sales in India and also exports to global market. The company planning to upgrade to industry 4.0 in next 2 years, what are challenges will faced during the transformation process and how this transformation will help the company. **CO1 L3**

There are several challenges that JSW Paints may face during the process of upgrading to Industry 4.0. Some potential challenges could include:

Technological challenges: Implementing Industry 4.0 technologies can be complex and requires a high level of technical expertise. JSW Paints may need to invest in training for their employees to ensure that they are able to

effectively use and maintain the new technologies.

Cost challenges: Upgrading to Industry 4.0 technologies can be expensive, and JSW Paints may need to invest significant resources in order to implement the changes. The company may need to carefully consider the potential return on investment for these changes in order to ensure that they are financially viable.

Organizational challenges: Implementing Industry 4.0 technologies can also require significant organizational changes, including the development of new processes and procedures. This can be a challenging process and may require JSW Paints to make significant changes to the way that they do business.

Despite these challenges, upgrading to Industry 4.0 has the potential to bring numerous benefits to JSW Paints. Some potential benefits could include:

Increased efficiency: Industry 4.0 technologies can help to streamline production processes and reduce waste, leading to increased efficiency and lower costs.

Improved quality: Industry 4.0 technologies can also help to improve the quality of the products that JSW Paints produces, as they can provide real-time data on the production process and allow for faster detection and correction of problems.

Enhanced competitiveness: By adopting Industry 4.0 technologies, JSW Paints may be able to differentiate themselves from competitors and gain a competitive advantage in the market.

Improved customer satisfaction: The use of Industry 4.0 technologies may also help JSW Paints to better understand and meet the needs of their customers, leading to improved customer satisfaction.

89.Identify the application of the given two examples and compare the difference between these two.

a) A home uses sensors to control and maintain lighting, resource management, and security systems. All the things are connected to cloud server using wireless internet connection to monitor and control home appliances.

b) A company uses CPS, Information and Communication Technologies (ICT), sensors and cloud-based data integration to help human beings and things to communicate among themselves in the production process to monitor & control industrial production process. **CO1 L4**

The first example, a home using sensors to control and maintain lighting, resource management, and security systems, is an example of the Internet of Things (IoT). The IoT refers to the connection of devices (such as home appliances and sensors) to the internet, allowing them to communicate with each other and be controlled remotely.

The second example, a company using CPS, ICT, sensors, and cloud-based data integration to help human beings and things communicate and monitor & control the industrial production process, is an example of Industry 4.0. Industry 4.0, also known as the Fourth Industrial Revolution, refers to the integration of advanced technologies (such as the IoT, artificial intelligence, and big data) into manufacturing and other industries.

One key difference between these two examples is the scope of their application. The IoT is a broad term that

refers to the connection of any device to the internet, while Industry 4.0 specifically refers to the integration of advanced technologies into manufacturing and other industrial settings. Additionally, the use of the IoT in a home setting is typically focused on improving the convenience and efficiency of daily life, while the use of Industry 4.0 in a company is typically focused on improving the efficiency and competitiveness of the business.

Features	**Internet of Things**	**Industrial Internet of Things**
Focus	Devices are developed for the well-being of individuals	Devices are developed for the improvement of efficiency, safety, and security in industries
Interoperability	M-2-M communication possible in small scale	M2M communication, SCADA, and other manufacturing technologies are applicable in large scale
Scalability	Applicable in small scale, compared to IIoT, where things are interconnected through the Internet	Applicable in large scale networks, where seamless integration of devices are done in the industrial networks and IoT devices
Automation	IoT devices sense, process, and transmit data with limited or no human involvement	IIoT devices, in addition to the intelligence of the IoT devices, require control and automation logic, deep learning, and analytics
Emergency situation	In case any device fails, an emergency situation will not occur	Failure of any device may lead to a critical situation
Application	Consumer purpose	Industrial purpose

90.JSW steels manufactures steel at ballari plant using CPS, M2M communication, AI, MachineLearning, Big Data technology, and various automation technologies in production and maintenance process. How all this technologies will help the company? And if TATA Steels want to adopt this same technology what are the requirement need.CO1 L3

The use of CPS, M2M communication, AI, machine learning, big data technology, and various automation technologies in the production and maintenance process at JSW Steels can help the company in a number of ways. Some potential benefits could include:

Increased efficiency: These technologies can help to streamline production processes and reduce waste, leading to increased efficiency and lower costs.

Improved quality: The use of advanced technologies such as AI and machine learning can help to improve the quality of the steel produced by JSW Steels, as they can provide real-time data on the production process and allow for faster detection and correction of problems.

Enhanced competitiveness: By adopting these technologies, JSW Steels may be able to differentiate

themselves from competitors and gain a competitive advantage in the market.

Improved maintenance: The use of M2M communication and automation technologies can help to improve the maintenance process at JSW Steels, as it can allow for more efficient and timely maintenance of equipment.

If TATA Steels wants to adopt the same technology, some of the requirements that the company may need to consider could include:

Training and support for employees: TATA Steels may need to invest in training for their employees to ensure that they are able to effectively use and maintain the new technologies.

Investment in new technology: TATA Steels may need to invest in the hardware and software necessary to implement these technologies, which can be expensive.

Changes to processes and procedures: TATA Steels may also need to make changes to their processes and procedures in order to fully utilize the new technologies.

Integration with existing systems: TATA Steels may also need to consider how to integrate the new technologies with any existing systems that they have in place.

91.A small scale industry wants to adopt the IIOT application in the existing manufacturing plant. Like connect the assembly line to cloud using wireless internet connection. What are the main issues are identified and justify your answer?CO1 L4

There are several potential issues that a small scale industry might encounter when implementing IIoT (Industrial Internet of Things) in their existing manufacturing plant. Some potential issues could include:

Cost: One of the main issues that a small scale industry might face when implementing IIoT is the cost of the technology. IIoT requires the use of sensors, cloud computing, and other advanced technologies, which can be expensive to purchase and maintain.

Technological challenges: Implementing IIoT can also be complex and may require a high level of technical expertise. A small scale industry may need to invest in training for their employees to ensure that they are able to effectively use and maintain the new technology.

Security concerns: Connecting manufacturing equipment to the internet can also raise security concerns, as it creates the potential for cyber attacks or data breaches. A small scale industry may need to invest in additional security measures to protect their systems and data.

Integration with existing systems: Implementing IIoT may also require the integration of new technologies with any existing systems that the small scale industry has in place. This can be a challenging process and may require significant changes to processes and procedures.

Overall, while IIoT has the potential to bring significant benefits to a manufacturing plant, it is important for a small scale industry to carefully consider the potential challenges and issues that may arise when implementing this technology.

92.A Thermal Power plant located in Shaktinagar Raichur generates power and distribute to Karnataka state. If this company wants to adopt IIOT, suggest which all the IOT application can adopt by company

and how it will benefit. CO1 L3

There are several IIoT (Industrial Internet of Things) applications that a thermal power plant in Shaktinagar Raichur could potentially adopt in order to improve operations and increase efficiency. Some potential IIoT applications for a power plant could include:

Predictive maintenance: IIoT technologies such as sensors and machine learning algorithms can be used to monitor the condition of equipment and predict when maintenance is needed. This can help to reduce downtime and improve the overall efficiency of the power plant.

Asset management: IIoT technologies can also be used to track and manage the performance of equipment and other assets in the power plant. This can help to identify problems and inefficiencies, and allow for more effective maintenance and repair.

Energy management: IIoT technologies can be used to monitor and optimize energy usage in the power plant. This can help to reduce energy costs and improve the overall efficiency of the plant.

Environmental monitoring: IIoT technologies can be used to monitor environmental conditions in and around the power plant, such as air and water quality. This can help to ensure compliance with environmental regulations and improve the overall sustainability of the plant.

Overall, the adoption of IIoT technologies by a thermal power plant in Shaktinagar Raichur could bring numerous benefits, including increased efficiency, improved maintenance and asset management, and better energy and environmental management.

93.Is Amazon warehouse is smart warehouse are not? Justify your answer CO1 L3

It is likely that Amazon warehouses are considered "smart warehouses," as they utilize a range of advanced technologies in order to improve efficiency and productivity. Some examples of the technologies that Amazon warehouses might use include:

Automated material handling systems: Amazon warehouses often use automated systems such as robots and conveyor belts to move and sort packages. These systems can help to increase the speed and accuracy of the fulfillment process.

RFID (radio-frequency identification) technology: Amazon warehouses may also use RFID technology to track and manage inventory. RFID tags can be attached to products and scanned using special readers, which allows for real-time tracking of inventory and more efficient restocking and replenishment.

Artificial intelligence and machine learning: Amazon warehouses may also use AI and machine learning algorithms to optimize routing and transportation, forecast demand, and improve other aspects of the fulfillment process.

Overall, the use of these and other advanced technologies likely qualifies Amazon warehouses as "smart warehouses," as they are leveraging technology to improve efficiency and productivity.

94.Is IoT enhances safety at any industrial workplace, do you agree? CO1 L3

Yes, it is possible that the use of IoT (Internet of Things) technologies can enhance safety at an industrial workplace. Some examples of how IoT could potentially improve safety in an industrial setting include:

Monitoring equipment and conditions: IoT technologies such as sensors and cameras can be used to monitor equipment and environmental conditions in real-time. This can help to identify potential safety hazards and allow for timely intervention to prevent accidents or incidents.

Predictive maintenance: IoT technologies can also be used to predict when maintenance is needed on equipment, which can help to prevent equipment failures and improve overall safety.

Remote monitoring and control: IoT technologies can allow for remote monitoring and control of equipment, which can reduce the need for workers to be in potentially hazardous areas.

Improved training and communication: IoT technologies can also be used to improve training and communication in an industrial setting, which can help to reduce the risk of accidents and incidents.

Overall, while the use of IoT technologies alone cannot guarantee safety in an industrial setting, they can certainly play a role in improving safety by allowing for better monitoring and control of equipment and conditions, and by enabling improved training and communication.

95.Netflix Company planning to adopt cloud storage services for contents, videos and movies storage. What important requirement companies should consider for cloud storage and explain.CO3 L4

There are several important requirements that companies should consider when planning to adopt cloud storage services for storing content, videos, and movies:

Security: It is important to ensure that your data is secure in the cloud and that only authorized users can access it. Look for a cloud storage provider that offers robust security measures, such as encryption of data in transit and at rest, as well as secure access controls.

Scalability: As your company grows, you will likely need to store more data in the cloud. It is important to choose a cloud storage provider that can scale to meet your growing needs.

Performance: The speed at which data can be transferred to and from the cloud is an important consideration. Choose a cloud storage provider that offers high performance to ensure that your users have a seamless experience when accessing your content.

Reliability: You need to be able to depend on your cloud storage provider to keep your data available and accessible at all times. Look for a provider that offers a high level of reliability and has a track record of uptime.

Cost: Finally, consider the cost of using the cloud storage service. Compare prices from different providers and choose one that offers a good balance of features and affordability.

96.The rapid urbanization of Delhi city leads to environmental problems, air pollution, water pollution and noise pollution are major environmental challenges that the city is facing. What IOT solution you will suggest and justify your answer CO1 L3

One potential solution for addressing air pollution in Delhi using the Internet of Things (IoT) could be the implementation of a network of air quality sensors throughout the city. These sensors could continuously monitor the levels of various air pollutants, such as particulate matter, ozone, and nitrogen dioxide, and transmit

the data to a central server in real-time. This information could then be analyzed to identify sources of pollution and inform decision-making around pollution control and mitigation measures.

Another way that the IoT could be used to address environmental issues in Delhi is through the deployment of smart waste management systems. For example, sensors could be placed on garbage bins to track when they are full and need to be emptied, or on recycling bins to monitor the types of materials being disposed of. This data could be used to optimize the routes of waste collection trucks and improve the efficiency of the waste management system as a whole.

To address water pollution, IoT sensors could be used to monitor the quality of water in rivers, lakes, and other bodies of water in and around Delhi. These sensors could measure parameters such as pH, temperature, and the presence of various contaminants, and transmit this data to a central server for analysis. Based on the results of this analysis, authorities could take action to address sources of pollution and protect the water quality of these bodies of water.

In terms of addressing noise pollution, one possibility could be the use of IoT sensors to monitor the decibel levels in different areas of the city. This data could be used to identify areas where noise levels are consistently above recommended levels and to inform the development of strategies for reducing noise pollution in those areas.

Overall, the IoT offers many potential solutions for addressing the environmental challenges facing Delhi, including air pollution, water pollution, and noise pollution. By continuously monitoring various environmental parameters and transmitting the data to a central server for analysis, authorities and decision-makers can gain a better understanding of the sources and impacts of these problems and take informed action to address them.

97.A 5 star hotel located near to Hampi having huge demand from foreign visitors entire year, the hotel facing difficult to operate and maintenance due to lack of human resources. What kinds of IOT solutions are suggested to solve these problems? Explain with example CO1 L3

There are several ways that the Internet of Things (IoT) could be used to address the challenges of operating and maintaining a 5-star hotel in Hampi with a high demand for foreign visitors. Here are a few examples of IoT solutions that could potentially help:

Smart room management: IoT sensors and smart devices could be used to automate various tasks related to managing hotel rooms, such as adjusting the temperature and lighting, controlling the TV and other electronics, and providing information to guests. For example, a smart thermostat could be used to automatically adjust the temperature based on the time of day and the preferences of the guests, and a smart speaker could be used to provide information about local attractions and services.

Predictive maintenance: IoT sensors and analytics software could be used to monitor the condition of various hotel systems and equipment, such as HVAC, plumbing, and electrical systems. By continuously collecting data on the performance of these systems, it would be possible to identify potential problems before they occur and schedule maintenance accordingly. This could help to reduce the risk of unexpected breakdowns and improve the overall efficiency of the hotel.

Energy management: IoT sensors and smart devices could be used to optimize the use of energy in the hotel. For example, occupancy sensors could be used to turn off lights and other electronics when rooms are not in use, and smart thermostats could be used to adjust the temperature based on the number of guests in a given area. By reducing energy waste, it would be possible to lower the hotel's energy bills and reduce its carbon footprint.

Guest engagement: IoT devices could be used to enhance the guest experience and provide personalized services. For example, a smart concierge system could be used to provide information and recommendations to guests based on their interests and preferences, and smart kiosks could be used to allow guests to easily make reservations and access other services.

Overall, the IoT offers many potential solutions for addressing the challenges of operating and maintaining a 5-star hotel in Hampi with a high demand for foreign visitors. By using sensors, smart devices, and analytics software, it would be possible to automate various tasks, improve the efficiency of hotel systems and equipment, reduce energy waste, and enhance the guest experience.

98.Government of Karnataka developed Bangalore electronics city as a smart city by investing 1500Cr in the year 2020. Like this government of Karnataka identify 2 different cities Tumakuru and yadgir for smart city project. Identify which city is better to implement smart city and why not in other city and justify your answer. CO1 L4

Smart people, smart mobility, smart environment, Internet, sensor networks, wireless broadband network, and smart governance converge together to form a Smart City. The primary goal of a smart city is to improve the quality of life for everyday people, the safety of citizens, better and timely transportation, and increased energy efficiency.

The following are some main requirements of any Smart Cities are

- Smart health care
- Digital signage systems
- Smart grids systems
- Smart urban lighting systems
- Smart city maintenance systems
- Transportation and vehicular traffic networks
- Smart parking systems
- Intelligent public transport systems
- Traffic management systems
- Smart taxi applications
- Weather monitoring
- Smart commercial building
- Connected public Transport

- Utilities
- Public services
- **Waste Management**
- **Smart parking**
- **Connected streetlights**

By implementing all this technologies will make any city into smart city, for implementation this required lots of investment and time and also to evaluate the outcomes and business results.

When it comes to pick an city and convert it into an smart city is not an small decision and it mainly requires factors to be considered and based on that factors it is to be decide that the smart city has to be implemented or not.

The main factors on which it is decided are:-

1. Much number of populations should be present in the city.
2. It should have enough Geographical area.
3. It should contain traffic problems such that smart traffic signal management could be implemented.
4. Pollution in the environment should be above medium level which solution the smart city provides.
5. Energy should be sufficient to control the all over the city without any interruption.
6. Should be centralized zone through which many other cities should be connected.
7. It requires Smart people.
8. It requires smart mobility.
9. It requires stronger Internet facility.
10. It requires higher sensor networks.
11. It requires wireless broadband network.
12. It requires smart governance.
13. It also considers the budget calculation.

By considering all these factors such as population, people, mobility, internet facility, sensor network, governance and budget the Tumakuru city is chosen as the city to be implemented as the smart city and because yadgir cannot be implemented as the smart city is because of the higher geographical area but less population and non availability of skilled people in the terms of using the internet and use the advantages of the smart city and the governance is weak and also it already has good street management because of no population and less problems in Yadgir compared to Tumakuru. With all this assumptions Tumakuru city is selected for implementing the Smart City project.

99.In your city, around 30 to 40% home are getting electricity bill was generated with fault tolerant data collection and fault energy meter. Suggest solution for this problem and justify your solution and what

are the benefits.CO1 L3

As around 30 to 40% of home are getting electricity bill with fault data collection and fault energy meter due to human intervention, which is not a good situation and is a huge problem. It can mitigate with the help of the smart energy meter.

- Smart energy meter is the monitoring of resource consumption of home energy through modern metering devices connected to the Internet via IoT technology, which is an electronic device that allows for remote monitoring, recording of energy consumption and powerful data analytics tools to help companies and individual users optimize their energy consumption.
- Smart energy meters to record/monitor energy consumption and improve the interaction between consumers and energy suppliers related to the monitoring and billing consumed energy
- Smart energy meter avoid human intervention for billing, billing generated automatically and accurately without any fault.
- It covers smart energy meter data analytics, smart billing, meter networks, and smart energy profiling.
- The smart energy meter gateways, which gather and communicate complete consumption data from power clients, must be safe from hackers.
- Smart energy meters present at home can talk with other networked devices inside homes, such as fridge, air conditions and etc.
- Smart energy meters use preventive maintenance it will help to identify the fault meter before it occurs.

Smart meter main functions are:-

•Controlled consumption

•Billing & planning: Enables the utility firms to improve the accuracy of billing, forecast the energy usage and perform demand planning for efficient operations

•Customer portal: Provide customers with the option of online bill payments, usage info tracking & rates, account management and more

•Innovative pricing models: Utilities can dynamically monitor the usage pattern and set critical peak pricing. smart metering solution helps in defining the energy consumption habits which enables the power providers to develop tier-based and time-based tariff offers

• Security & escalations: Identifies and sends on-time alerts to utilities on any abnormalities such as water/gas leakages, power fluctuations, load imbalance, tampering, theft etc.

•Remote metering operations: Remotely takes control on meter reading, connecting and disconnecting (switching) service, and supporting customer billing requests

•Greener benefits: Reduce unnecessary wastage due to over consumption and CO2 emissions.

Due to this all factors and the feature it is the only one solution that can be more accurate and efficient to adopt and work conveniently and it can solve the problem of fault billing and we can also customize the energy parameter using these smart energy meter benefits.

Benefits of Smart energy Metering:

- **Convenience**: readings can be automatically sent to the electricity department without manual intervention.
- **Accuracy**: no room for human error
- **Control over energy consumption:** It helps to track the actual cost of bill before it is generated and how much energy is consumed by each appliances can be monitor.
- **Safety from faulty appliances:** how much energy is being used at a specific time, you can notice sudden spikes that can be related to a faulty appliance.
- **Good Energy Habits**: helps everyone adopt good energy habits.
- **Environment Protection**: eliminating the need to build more power plants or avoiding the use of less efficient power plants because customers can lower their energy demand.
- **Data processing and Data visualization.**

100.In an SBI ATM, a customer needs to withdraw Rs 15000/- cash. On entering the details, the ATM Kiosk asks for the PIN as it is over Rs 10,000/- withdrawal The customer does get the OTP message from the bank, enters the data, collects the receipt with the updated balance. However, the ATM KIOSK does not ask for an OTP for transactions below Rs 10,000/-? Where is the checkpoint happening in the communication between SBI and customer. Elaborate your answer with details. CO1 L4

In a scenario where an SBI customer is attempting to withdraw cash from an ATM, the process for verifying the transaction typically involves the following steps:

The customer initiates the transaction by entering their account details and the desired amount of cash to be withdrawn.

If the amount of cash requested is over the threshold for requiring additional verification (such as Rs. 10,000 in this case), the ATM will prompt the customer to enter their PIN.

The ATM will send a request to the bank's server to verify the customer's account information and ensure that there are sufficient funds available to complete the transaction.

If the account information is valid and there are sufficient funds available, the bank will send a one-time password (OTP) to the customer's registered mobile number.

The customer will enter the OTP into the ATM, and the ATM will send it back to the bank's server for verification.

If the OTP is valid, the bank will authorize the transaction and send a response back to the ATM to dispense the requested amount of cash.

The ATM will dispense the cash and provide the customer with a receipt showing the updated account balance.

In this scenario, the checkpoint for verifying the OTP is happening at the bank's server, which is receiving the OTP from the ATM and verifying it before authorizing the transaction. This helps to ensure the security of the transaction and protect the customer's account from unauthorized access.

101.In a smart health care system, sensors like smartwatches ,Xray machine,CT scanners fitness trackers. etc monitors required system parameters .The data is recorded in the system and historical data can be viewed whenever required using cloud.In order to design this system what are the components required and if the system behaves improperly ,how do you test and trouble shoot to make the system functional. CO5 L4

here are many types of sensors that can be used in a smart healthcare system, depending on the specific needs and goals of the system. Some common types of sensors used in smart healthcare systems include:

Wearable sensors: These sensors can be worn on the body and can track various health metrics, such as heart rate, sleep patterns, and physical activity levels.

Environmental sensors: These sensors can be placed in the home or other healthcare setting and can monitor factors such as air quality, temperature, and humidity.

Bioimpedance sensors: These sensors use electrical signals to measure various body functions, such as hydration levels and muscle mass.

Medical imaging sensors: These sensors, such as X-ray machines and CT scanners, can be used to create detailed images of the body for diagnostic purposes.

To test these sensors, it is important to ensure that they are functioning correctly and producing accurate readings. This may involve calibrating the sensors, conducting tests with known values, and comparing the sensor readings to expected results.

If a sensor is not functioning properly, the first step in troubleshooting it is to identify the issue. This may involve checking for physical damage to the sensor, testing the sensor's connectivity to other systems, and examining the sensor's data output for any anomalies. Once the issue has been identified, appropriate steps can be taken to repair or replace the sensor as needed.

102. In a smart manufacturing company, sensors like Temperature sensor,Pressure sensor,vibration sensor,Flow sensor etc monitors required system parameters .The data is recorded in the system and historical data can be viewed whenever required using cloud.In order to design this system what are the components required and if the system behaves improperly ,how do you test and trouble shoot to make the system functional. CO5 L4

There are many types of sensors that can be used in a smart manufacturing company, depending on the specific needs and goals of the company. Some common types of sensors used in smart manufacturing include:

Temperature sensors: These sensors can be used to monitor the temperature of equipment, materials, and the surrounding environment in order to ensure that optimal conditions are maintained.

Pressure sensors: These sensors can be used to measure the pressure of gases or liquids, such as in a piping system or a hydraulic system.

Flow sensors: These sensors can be used to measure the flow rate of fluids, such as water or oil, through a pipe

or other conduit.

Position sensors: These sensors can be used to detect the position of objects or components within a manufacturing process, such as the position of a robot arm or the level of a liquid in a tank.

Vibration sensors: These sensors can be used to detect vibrations in machinery or structures, which can be indicative of problems such as wear or imbalance.

To test these sensors, it is important to ensure that they are functioning correctly and producing accurate readings. This may involve calibrating the sensors, conducting tests with known values, and comparing the sensor readings to expected results.

If a sensor is not functioning properly, the first step in troubleshooting it is to identify the issue. This may involve checking for physical damage to the sensor, testing the sensor's connectivity to other systems, and examining the sensor's data output for any anomalies. Once the issue has been identified, appropriate steps can be taken to repair or replace the sensor as needed.

103.In a smartcity, sensors like environmental sensor,Traffic sensor,energy sensor etc monitors required system parameters .The data is recorded in the system and historical data can be viewed whenever required using cloud.In order to design this system what are the components required and if the system behaves improperly ,how do you test and trouble shoot to make the system functional.

CO5 L4

Smart cities use a variety of sensors to collect data about various aspects of city life, such as traffic flow, air quality, and energy consumption. Some common types of sensors used in smart cities include:

Environmental sensors: These sensors can be used to monitor factors such as air quality, temperature, humidity, and noise levels in order to improve the livability of the city.

Traffic sensors: These sensors can be used to detect the flow of vehicles on roads and highways, as well as the occupancy of parking spaces, in order to improve traffic management and reduce congestion.

Energy sensors: These sensors can be used to measure energy consumption in buildings and other infrastructure, in order to optimize energy use and reduce costs.

Public safety sensors: These sensors can be used to detect and respond to emergencies, such as fires, earthquakes, and chemical spills, in order to improve public safety.

Infrastructure sensors: These sensors can be used to monitor the condition of city infrastructure, such as bridges and buildings, in order to identify and repair problems before they cause major issues.

To test these sensors, it is important to ensure that they are functioning correctly and producing accurate readings. This may involve calibrating the sensors, conducting tests with known values, and comparing the sensor readings to expected results.

If a sensor is not functioning properly, the first step in troubleshooting it is to identify the issue. This may involve checking for physical damage to the sensor, testing the sensor's connectivity to other systems, and

examining the sensor's data output for any anomalies. Once the issue has been identified, appropriate steps can be taken to repair or replace the sensor as needed.

104.In a smart grid and smart meter, sensors like voltage sensor,current sensor,power factor sensor etc monitors required system parameters .The data is recorded in the system and historical data can be viewed whenever required using cloud.In order to design this system what are the components required and if the system behaves improperly ,how do you test and trouble shoot to make the system functional.

CO5 L4

Smart grids and smart meters use a variety of sensors to collect data about the generation, distribution, and consumption of electricity. Some common types of sensors used in smart grids and smart meters include:

Voltage sensors: These sensors can be used to measure the voltage of electrical current in order to ensure that it is within acceptable limits.

Current sensors: These sensors can be used to measure the flow of electrical current in order to determine how much electricity is being used.

Power factor sensors: These sensors can be used to measure the ratio of real power to apparent power in an electrical system, in order to optimize energy efficiency.

Frequency sensors: These sensors can be used to measure the frequency of electrical current, in order to ensure that it is stable and within acceptable limits.

Temperature sensors: These sensors can be used to measure the temperature of electrical equipment, in order to detect overheating or other problems.

To test these sensors, it is important to ensure that they are functioning correctly and producing accurate readings. This may involve calibrating the sensors, conducting tests with known values, and comparing the sensor readings to expected results.

If a sensor is not functioning properly, the first step in troubleshooting it is to identify the issue. This may involve checking for physical damage to the sensor, testing the sensor's connectivity to other systems, and examining the sensor's data output for any anomalies. Once the issue has been identified, appropriate steps can be taken to repair or replace the sensor as needed.

105.In a smart asset tracking , sensosystemrs like RFID sensor,GPS,accelerometer sensor etc monitors required system parameters .The data is recorded in the system and historical data can be viewed whenever required using cloud.In order to design this system what are the components required and if the system behaves improperly ,how do you test and trouble shoot to make the system functional.

CO5 L4

Smart asset tracking systems use sensors and other technologies to track the location and status of assets, such

as vehicles, equipment, and inventory. Some common types of sensors used in smart asset tracking systems include:

GPS sensors: These sensors can be used to determine the location of an asset in real-time, using satellite signals.

RFID sensors: These sensors can be used to identify and track assets using radio frequency technology.

Accelerometers: These sensors can be used to measure the acceleration of an asset, which can be used to detect movement and changes in velocity.

Temperature sensors: These sensors can be used to monitor the temperature of an asset, which can be useful for detecting problems or ensuring that temperature-sensitive goods are being stored or transported properly.

To test these sensors, it is important to ensure that they are functioning correctly and producing accurate readings. This may involve calibrating the sensors, conducting tests with known values, and comparing the sensor readings to expected results.

If a sensor is not functioning properly, the first step in troubleshooting it is to identify the issue. This may involve checking for physical damage to the sensor, testing the sensor's connectivity to other systems, and examining the sensor's data output for any anomalies. Once the issue has been identified, appropriate steps can be taken to repair or replace the sensor as needed.

106.There are a number of common mistakes that organizations may make when it comes to protecting against cloud vulnerabilities. What are the most common mistakes organizations make when it comes to protecting against cloud vulnerabilities, and how can these mistakes be avoided?

CO4 L4

Failing to properly secure the cloud infrastructure: This can include not properly configuring security controls, not applying security patches and updates, or not properly managing access to the cloud environment.

Neglecting to implement proper access controls: Organizations may fail to implement appropriate access controls for their cloud environment, leading to unauthorized access to sensitive data.

Not properly protecting data in transit: Organizations may fail to encrypt data as it is transmitted between the cloud and other systems, leaving it vulnerable to interception.

Failing to monitor for threats: Organizations may not have adequate monitoring in place to detect and respond to potential threats to their cloud environment.

To avoid these mistakes, organizations can take a number of steps, including:

Ensuring that the cloud infrastructure is properly configured and secured.

Implementing strong access controls, including authentication and authorization protocols, to prevent unauthorized access to the cloud environment.

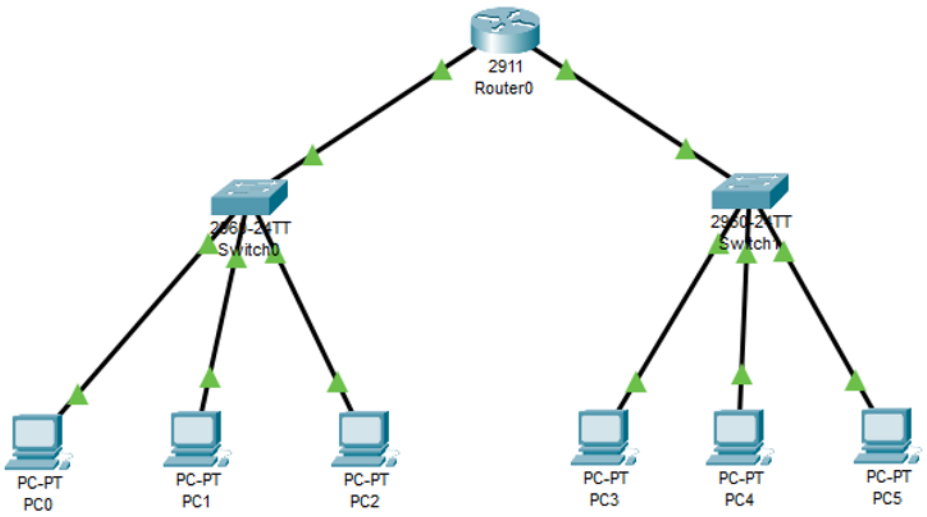
Encrypting data in transit to protect it from interception.

Implementing monitoring and alerting systems to detect and respond to potential threats in the cloud environment.

Regularly reviewing and updating security measures to ensure that they are effective and up to date.

107.To establish the connectivity between building A computers in one LAN network with building B computers in another LAN through a router . Though after following all the proper procedure like assigning IP addresses to those computers, IP address to Router, proper cable connectivity etc. Still the packet of information is not transferring between two LAN. Find the the problem and troubleshoot it?

CO5 L4



troubleshooting

The data sent from the sources device is not reaching the destination because we have not assigned router IP address as default gateway address for each end devices.

A default gateway makes it possible for devices in one network to communicate with devices in another network. In other word default gateway is an intermediate device between the local network and the internet. The default gateway is an important device for the data forwarding and routing of the data on the other network. It helps in the communication of one network computer with the other network computer. So the default gateways of the router should be assigned to all the end devices in the network.in the same way we should set default gateway for other side of the router and assign it to the end devices which is present in that LAN.by this process the two lan got the gateway and they can transfer the data with each other and the data sent from the source reaches destination successfully.

There could be a number of reasons why the packets of information are not transferring between the two LANs. Here are a few things you can try to troubleshoot the problem:

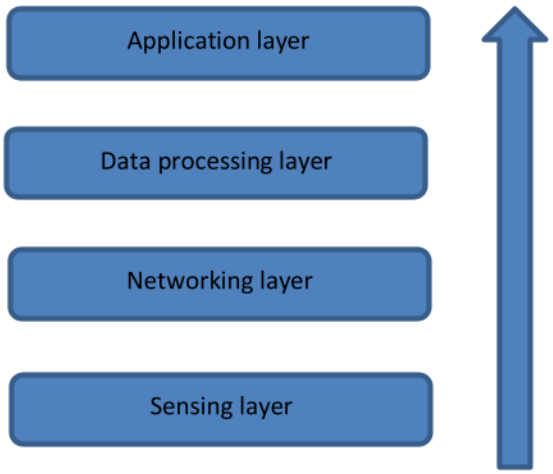
- Check the cable connections to make sure they are secure and in good working condition.
- Make sure that the router is properly configured and has the correct IP addresses for the two LANs.
- Check to see if there are any firewalls or security protocols that are blocking the transfer of information between the two LANs.
- Check the status of the network interfaces on the computers to make sure they are active and configured

properly.

- Try pinging the computers in one LAN from the other to see if there is a connection.
- Check the logs on the router to see if there are any error messages that might indicate the source of the problem.
- If these steps do not resolve the issue, it may be necessary to seek further assistance from a network administrator or a technical support specialist.

108.You are the architect for a consumer product company. You have to design a IOT device control app for different consumer products for simplicity. Let's assume an air conditioner for this challenge what are the points will you consider to design IOT device control app. CO5 L4

Ans:



- Sensing layer: the sensors, actuators and devices are present in sensing layer, these sensors or actuators accepts the data and transmit it over the network.
- Network layer: network/internet gateway, data acquisition system (DAS) are present in this layer. DCS collects the data then convert Analog data of sensor into digital data. Gateways functionalities like malware protection and filtering.
- Data processing layer: This is processing unit of IoT ecosystem. Here data is analyzed and pre-processed before sending it to data center.
- Application layer: This is last layer of 4 stages of IoT architecture. Data centers or cloud is management stage of data where data is managed and is used by end-user applications like agriculture, health care, aerospace, farming, defense, etc.
- Wireless capability.
- Functionality.

- Interoperability.
- Secure storage.
- Immediate boot capacity.
- Device categorization.
- Bandwidth.
- Cryptographic controls.
- Power management.

There are several points that I would consider when designing an IoT device control app for an air conditioner:

User interface: The app should have an intuitive and user-friendly interface that is easy for users to navigate and understand.

Device connectivity: The app should be able to connect to the air conditioner through a reliable and secure connection, such as Wi-Fi or Bluetooth.

Remote control: The app should allow users to control their air conditioner remotely, including the ability to turn it on or off, adjust the temperature, and set a schedule.

Energy efficiency: The app should provide users with information about their air conditioner's energy usage and suggest ways to improve energy efficiency.

Alerts and notifications: The app should provide alerts and notifications for issues such as low refrigerant levels or filter replacement.

Compatibility: The app should be compatible with a variety of devices, including smartphones and tablets.

Security: The app should prioritize security to protect user data and ensure the privacy and safety of users.

109.Smart grid technology is a modernized electrical grid that uses advanced technology to improve the efficiency, reliability, and security of the electric grid. It allows two-way communication between the utility and consumers, enabling the integration of renewable energy sources, such as solar and wind power, and the use of energy storage systems.Which technologies that are used in smart grids and explain.CO1 L4

Smart grid technology is a modernized electrical grid that uses advanced technology to improve the efficiency, reliability, and security of the electric grid. It allows two-way communication between the utility and consumers, enabling the integration of renewable energy sources, such as solar and wind power, and the use of energy storage systems.

There are several technologies that are used in smart grids, including:

Advanced metering infrastructure (AMI): AMI involves the use of smart meters to collect and transmit data on energy usage in real-time.

Distributed generation: This refers to the use of small-scale power generation sources, such as solar panels or wind turbines, that are located closer to the point of use.

Energy storage systems: These systems, such as batteries or flywheels, store excess energy for later use.

Demand response systems: These systems enable consumers to adjust their energy usage in response to changes in the price of electricity or to reduce demand on the grid.

Smart appliances: These appliances, such as smart thermostats or smart washing machines, are connected to the internet and can be controlled and scheduled remotely to optimize energy usage.

110.Most commonly used website was hacked.Users were not able to access data from that website.What could be the types of hacking and explain CO4 L4

There are many different types of hacking that can result in a website being unable to be accessed. Some common types of hacking include:

Cross-Site Scripting (XSS) attacks: These attacks involve injecting malicious code into a website that is then executed by the user's browser.

Phishing attacks: These attacks involve tricking users into providing sensitive information, such as login credentials, through fake websites or emails.

Malware attacks: These attacks involve installing malicious software on a device or network in order to gain access to sensitive information or disrupt operations.

Man-in-the-middle attacks: These attacks involve intercepting communications between two parties in order to gain access to sensitive information.

SQL injection attacks: These attacks involve injecting malicious code into a database through a weakness in the website's input validation.

Denial of service (DoS) attacks: These attacks involve overwhelming a device or network with traffic in order to disrupt its operations.

Password cracking: This involves using specialized software to guess or otherwise determine a user's login credentials.

Social engineering: This involves manipulating individuals into divulging sensitive information or performing actions that compromise security.

111. A cyber physical system (CPS) is a system that combines computational and physical components in order to control, monitor, and interact with the physical world. Give examples of CPS applications. CO1 L3

There are many applications for cyber physical systems (CPS) in a variety of fields. Some examples of CPS applications include:

Transportation systems: CPSs are used to control and monitor transportation systems, such as traffic lights, intelligent transportation systems, and autonomous vehicles.

Manufacturing: CPSs are used to improve the efficiency and automation of manufacturing processes through the use of robotics, automation, and real-time data analysis.

Critical infrastructure: CPSs are used to control and monitor critical infrastructure, such as power grids, water treatment plants, and oil and gas pipelines.

Healthcare: CPSs are used to monitor and manage healthcare systems, including medical devices, electronic health records, and telemedicine systems.

Environmental monitoring: CPSs are used to monitor and manage environmental systems, such as air and water quality, and to support disaster response and management.

Agriculture: CPSs are used to improve the efficiency and sustainability of agriculture through the use of sensors, automation, and precision agriculture techniques.

Smart cities: CPSs are used to improve the efficiency and sustainability of urban environments through the use of sensors, automation, and data analysis.

112. Data analytics has had a significant impact on supply chain management, enabling businesses to make more informed decisions and improve the efficiency of their supply chains.
Do you agree ?Justify your answer CO4 L4

Some of the ways in which data analytics has impacted supply chain management include:

Improved visibility: Data analytics allows businesses to analyze data from multiple sources, such as sales data, inventory data, and transportation data, to get a more complete view of their supply chain.

Increased efficiency: By analyzing data, businesses can identify bottlenecks and inefficiencies in their supply chain and take steps to address them, resulting in increased efficiency.

Reduced costs: Data analytics can help businesses reduce costs by identifying opportunities to streamline processes, optimize inventory levels, and negotiate better rates with suppliers.

Improved forecasting: Data analytics can be used to improve demand forecasting, allowing businesses to better plan for the future and respond to changing customer demand.

Enhanced decision-making: Data analytics provides businesses with a wealth of data that can be used to inform decision-making, leading to better-informed and more strategic decisions.

113.Is Big data analytics refers to the process of examining large and complex data sets, or big data, to discover patterns, trends, and associations that can help organizations make informed decisions and used to improve a wide variety of business functions .Do you agree?Justify your answer.CO4 L4

Big data analytics refers to the process of examining large and complex data sets, or big data, to discover patterns, trends, and associations that can help organizations make informed decisions. Big data analytics can be used to improve a wide variety of business functions, including marketing, customer service, finance, and operations.

Some specific ways in which big data analytics can be used include:

Identifying customer preferences and behaviors: By analyzing data from social media, online reviews, and other sources, businesses can get a better understanding of what their customers like and how they behave. This can help them tailor their products, services, and marketing efforts to better meet the needs of their target audience.

Improving efficiency and productivity: By analyzing data from internal systems, businesses can identify bottlenecks and inefficiencies in their processes. This can help them streamline their operations and make them more efficient.

Optimizing pricing and inventory: By analyzing data on customer demand and market conditions, businesses can determine the optimal price for their products and services, and adjust their inventory levels accordingly.

Detecting fraud and anomalies: By analyzing data on financial transactions, businesses can identify unusual patterns that may indicate fraudulent activity. This can help them protect themselves and their customers from financial losses.

Overall, big data analytics can help businesses make more informed and strategic decisions, and improve their operations and performance.

114.Measuring and understanding customer satisfaction with a particular device or set of devices can be an important aspect of IoT data analytics. What is the overall level of customer satisfaction with a particular device or set of devices, and how does this vary over time? CO4 L4

Measuring and understanding customer satisfaction with a particular device or set of devices can be an important aspect of IoT data analytics. There are various ways to assess customer satisfaction, including:

Surveys: Surveys can be used to ask customers directly about their satisfaction with a particular device or set of devices. Surveys can be administered through various channels, such as email, online forms, or in-person interviews.

Social media monitoring: By tracking mentions of a particular device or set of devices on social media platforms, analysts can get a sense of how customers are feeling about the product. Positive mentions may indicate high satisfaction, while negative mentions may indicate low satisfaction.

Customer support data: Data on customer support interactions (e.g. phone calls, emails, chat sessions) can be used to understand common customer issues and concerns. This can help identify areas where customers may be less satisfied with a particular device or set of devices.

To understand how customer satisfaction with a particular device or set of devices varies over time, analysts can plot the data on a chart and look for trends or patterns. They can also use statistical analysis techniques (such as regression analysis) to understand the relationship between customer satisfaction and other variables (such as usage of the device or time).

115.When we access data from google sometimes it shows server is busy, to overcome this problem what type of architecture is used? Explain CO3 L4

There are several ways to handle a high volume of requests to a server and prevent it from becoming overloaded. One approach is to use a load balancer, which distributes incoming requests across a group of servers, helping to evenly distribute the workload and improve the performance and availability of the system.

Another approach is to use a cache, which stores frequently accessed data in memory so it can be quickly retrieved, reducing the number of requests that need to be handled by the server.

Additionally, you can scale horizontally by adding more servers to the system, or scale vertically by increasing the resources (e.g. CPU, memory, etc.) of the existing servers. This can help to improve the system's ability to handle a high volume of requests.

Overall, the specific architecture used to handle a high volume of requests will depend on the specific needs and constraints of the system.

116.Value innovation is the strategic logic of high growth,it is the process which company introduces new technologies to upgrade that or designed to achieve product services differentiation at low cost.How can industry 4.0 help your company achieve value innovation

CO1 L4

Industry 4.0, also known as the fourth industrial revolution, is characterized by the integration of advanced technologies such as IoT, artificial intelligence, and automation into manufacturing processes. These technologies can help companies achieve value innovation in several ways:

Cost reduction: Industry 4.0 technologies can automate many manual and repetitive tasks, reducing labor costs and increasing efficiency. Additionally, the use of IoT can lead to better equipment maintenance and energy management, resulting in cost savings.

Product customization: The use of advanced technologies such as 3D printing and robotics can enable companies to offer customized products at a lower cost than traditional mass production methods.

Improved quality and reliability: Industry 4.0 technologies can help detect and prevent defects in the manufacturing process, resulting in higher quality products. Predictive maintenance can also reduce downtime and improve equipment reliability.

Increased speed and agility: The integration of technologies such as IoT and artificial intelligence can lead to faster decision-making and a more responsive supply chain. This can help companies quickly adapt to changing market conditions and customer demands.

New Product Development : Industry 4.0 technologies can also help companies identify new opportunities for growth and develop new products and services. The insights obtained from data analysis and the use of simulation tools can facilitate the development of new products and services with high added value.

However, it's important to note that for these benefits to be realized, companies must make the necessary investments in technology and infrastructure, as well as in training their workforce to effectively use and maintain these new technologies.

117.Some examples of cloud providers include AWS (Amazon Web Services), Microsoft Azure, Google Cloud Platform, and IBM Cloud. Each cloud provider offers a range of different services and pricing models, and users can choose the provider and services that best meet their needs.Which cloud provider has more global regions than any other cloud provider.write its features CO3 L4

As of 2021, the cloud provider with the most global regions is AWS (Amazon Web Services). AWS has regions located in North America, South America, Europe, Asia, Australia, and Africa, and it also has multiple Availability Zones within each region.

Some features of AWS include:

- A wide range of compute, storage, and database services, including EC2 (Elastic Compute Cloud) for hosting applications, S3 (Simple Storage Service) for object storage, and RDS (Relational Database Service) for managed database services.
- A variety of tools and services for building, deploying, and managing applications, including CodePipeline for continuous delivery, CloudWatch for monitoring, and CloudFormation for infrastructure as code.
- Integration with a variety of third-party tools and services, including Docker, Jenkins, and Splunk.

118.In the last few decades the integration of IOT has resulted in all round development of different sectors.What are the top challenges of implementing an IOT system.CO1 L4

There are a number of challenges that can arise when implementing an Internet of Things (IoT) system. Some of the key challenges include:

Security: One of the biggest concerns with IoT systems is security. IoT devices often have limited computational power and storage, making them vulnerable to hacking and other types of cyber attacks. Ensuring the security of data transmitted over the network is also critical.

Interoperability: Another challenge with IoT systems is ensuring that the various devices and systems are able to communicate and work together seamlessly. This can be difficult, as there are many different IoT standards and protocols.

Complexity: IoT systems can be very complex, involving a large number of devices, sensors, and other components that need to be integrated and managed. This complexity can make it difficult to design, implement, and maintain an IoT system.

Privacy: With the abundance of data that IoT systems generate, privacy can be a concern. Keeping data private and securing it from unauthorized access is a big concern.

Scalability: With the sheer number of devices and data that an IoT system can involve, it can be challenging to ensure that the system is able to scale up or down as needed to meet the demands of the organization.

Limited battery life on devices: Many IoT devices are designed to be small and low-power, which is great for portability but can be a disadvantage when it comes to battery life. The limited battery life on devices can be a significant challenge for remote or hard-to-reach IoT devices

Cost: An IoT system can be expensive, especially if it involves the deployment of a large number of devices or the use of specialized hardware and software.

Expertise: Building an IoT system can require a variety of different skill sets, including hardware and software development, networking, data analysis, and more. Finding the right expertise and resources can be a challenge. Keep in mind that even though these are some common challenges to IOT system implementation, it doesn't mean these are insurmountable. The technology is evolving and the solution are also being developed to tackle these challenges.

119.To design any IOT project several factors are considered.Explain the points to be considered while designing. CO5 L4

There are several factors to consider when designing an IoT project:

Purpose and objectives: Clearly define the purpose and objectives of the project, and ensure that the IoT solution being developed aligns with these goals.

Target audience: Identify the target audience for the IoT solution and consider their needs and preferences when designing the system.

Use cases: Define the specific use cases for the IoT solution, including the tasks it will perform and the data it will collect and process.

Hardware and software: Determine the hardware and software components that will be needed for the IoT solution, including sensors, devices, and communication protocols.

Network and connectivity: Consider the network and connectivity requirements for the IoT solution, including the type of network (e.g. WiFi, cellular, etc.) and the data transfer needs of the system.

Security: Ensure that the IoT solution is secure, including implementing measures such as encryption and secure authentication.

Data management: Determine how data will be collected, stored, and analyzed, and consider the infrastructure and resources that will be needed to manage this data.

Integration: Consider how the IoT solution will integrate with other systems and devices, and ensure that it is compatible with these systems.

Scalability: Design the IoT solution with scalability in mind, so that it can be easily expanded or modified as needed.

- Advanced security and compliance features, including identity and access management, encryption, and compliance certifications.
- A pay-as-you-go pricing model, with options for on-demand or reserved instances and a variety of pricing discounts.

120.Justify "Machine learning give security and saftey on IOT applications".CO4 L4

Machine learning can give security and safety on IoT applications by providing a way to detect and respond to security threats and potential safety hazards. Some examples of how machine learning can be used to improve security and safety on IoT applications include:

Intrusion detection: Machine learning algorithms can be used to analyze network traffic and detect signs of a potential intrusion. By learning the normal patterns of network traffic, machine learning systems can quickly identify and respond to any anomalies that may indicate a security threat.

Anomaly detection: Machine learning can also be used to monitor sensor data from IoT devices, such as temperature readings from industrial equipment, and detect any anomalies that may indicate a safety hazard. For example, if the temperature of an industrial machine rises above a certain level, machine learning can be used to flag it, and alert the operator.

Predictive maintenance: IoT-enabled equipment are monitored with Machine learning. When machine learning systems are trained on historical data, they can make predictions about the likelihood of a machine failure, thus avoiding downtime and prevent the accident due to unexpected failure.

Security of communication: Machine learning algorithms can be used to encrypt the data sent between devices, and decrypt it when it reaches the intended recipient. By analyzing patterns in the data, machine learning can detect if any unauthorized party intercepts the communication and quickly respond to any security threats.

Behavioural Analysis: Machine learning can also analyze patterns of user behavior in IoT devices, such as the time of day when devices are typically used, or which devices are commonly used together. By recognizing normal patterns, machine learning can detect any unusual behavior that may indicate a security threat.

Deep Learning: Machine learning algorithms like deep learning can be used to build a more sophisticated threat detection system to detect threats across multiple layers of communication, network protocols, and device types.

Overall, Machine learning can bring in a lot of intelligence to the IoT systems, and can be used to improve security and safety in various ways. It can help to identify potential security threats and hazards, predict equipment failures, and respond to them quickly.

121.Based on the IT/OT covergence ,will local IT staff will no longer be required in the plant ?will all our work being done from the corporate?.Justify CO1 L4

The convergence of IT and OT (Information Technology and Operational Technology) in an industrial setting is bringing a lot of changes to the way that plants are managed and operated. While it is true that the use of digital technologies like the IoT and machine learning can greatly improve efficiency and automation in a plant, it is not likely that local IT staff will no longer be required.

Monitoring and Maintenance: The implementation of IoT systems in a plant environment creates a vast amount of data, that require to be analyzed, interpreted, monitored and maintained in order to provide insights for operational optimization. This process is not possible without a dedicated IT staff

Cybersecurity: One of the major concerns of IoT systems is cybersecurity, as these systems are vulnerable to hacking, malware and other cyber attacks. The corporate IT team can take care of the cybersecurity of the data, but the local IT staff should have the knowledge to monitor and prevent the hacking of the IoT devices on site.

Technical Expertise: Industrial plants have a wide variety of equipment and systems, and different types of IT systems are required to monitor and control them. As such, local IT staff are needed to provide technical expertise in the particular systems and devices being used in the plant.

Emergency Response: Despite the various security measures in place, sometimes unexpected issues can still arise. Local IT staff should be able to respond to emergencies as they occur, because they are the one who are physically present in the plant.

Monitoring and control of plant's specific processes: IoT systems are designed to optimize and automate the industrial process, but local IT staff should be able to monitor and control specific process within the plant, they know the details of the process and how it operates.

In summary, the IT/OT convergence in an industrial setting is a major step towards making the plant more efficient, but local IT staff are still required to monitor, maintain, operate and respond to incidents that arise. They are the link between the IoT systems and the physical plant, and they can help ensure that the plant is running smoothly and safely.

122.A startup company wants to adopt cloud based IOT Technology.Which cloud model would you suggest for startup.Analyse with different cloud models CO3 L4

When a startup company is looking to adopt cloud-based IoT technology, there are several different cloud models to choose from, each with its own set of advantages and disadvantages. The cloud model that is best for a startup will depend on the specific requirements of the company and the use case for the IoT technology.

Public Cloud: Public cloud services are provided by third-party companies and are available to anyone over the internet. They are generally the most cost-effective option for startups as they provide a pay-as-you-go model with no upfront costs. The Public cloud providers like AWS, Azure and Google Cloud have wide range of IoT services such as AWS IoT Greengrass, Azure IoT Hub and Google Cloud IoT Core.

Private Cloud: A private cloud is a cloud environment that is dedicated to a single organization. This can provide a higher level of security and control, but it can also be more expensive and requires a larger

investment in infrastructure. A private cloud may be a better fit for a startup if it has strict security or regulatory requirements that can't be met by a public cloud.

Hybrid Cloud: A hybrid cloud is a combination of public and private clouds that allows an organization to run some workloads in a public cloud while keeping others in a private cloud. This can provide the best of both worlds: the cost savings of a public cloud with the control and security of a private cloud. It can also be a good fit for startups that want the flexibility to scale their IoT deployment as needed.

Edge computing: Edge computing brings the data processing capability to the devices, thus reducing the data transfer over the network and improving the latency. This model can be a good fit for startups that require real-time data processing and have a limited network bandwidth

In summary, the best cloud model for a startup will depend on the specific requirements of the company, the use case for the IoT technology, and the budget available. Public cloud models are generally the most cost-effective option, but private and hybrid clouds can provide more control and security. Edge computing is a relatively new model that can be a good fit for startups that require real-time data processing.

123.The protocol does have number of compiling reasons for it to be the centre of your smart home system such as light,bulb,sockets,Explain its network topologies and applications.CO2 L4

The protocol we are referring to is most likely Zigbee, which is a wireless communication protocol used for building automation and smart home systems. Zigbee operates in the 2.4GHz frequency band and is based on the IEEE 802.15.4 standard for wireless personal area networks (WPANs).

Network topologies: Zigbee supports several different network topologies, including star, tree, and mesh. Star topology is typically used for simple networks with a single coordinator, while tree topology is used for larger networks with multiple coordinators. Mesh topology is used for networks with many devices and allows for self-healing and self-organizing capabilities.

Applications: Zigbee is commonly used in building automation and smart home systems for control of lights, bulbs, and sockets, as well as other devices such as thermostats, security systems, and home entertainment systems.

Other Applications: Zigbee can be used in energy management, industrial automation, healthcare, retail, and agriculture. In energy management, Zigbee-enabled devices can monitor energy consumption, turn appliances on and off to reduce consumption, and communicate with utilities to respond to demand response signals. In industrial automation, Zigbee can be used for machine-to-machine (M2M) communication and monitoring of industrial equipment. In healthcare, Zigbee can be used for wireless medical devices such as glucose monitors and patient monitoring systems. In retail, Zigbee can be used for in-store tracking and inventory management. And finally, in agriculture, Zigbee can be used for monitoring soil moisture, temperature, and other environmental factors.

Interoperability: Zigbee is built on an open standard, which means that devices from different manufacturers can work together seamlessly. This makes it a great choice for building automation and smart home systems where you may want to mix and match devices from different vendors.

In summary, Zigbee is a low-power wireless communication protocol that is widely used in building automation and smart home systems. It supports different network topologies and has a wide range of applications. The ability of the devices to communicate with each other, regardless of the manufacturer, makes it an ideal choice for building automation and smart home systems, as well as other industries.

124.Security auditing work is used to check the security levels of the IOT based industries.What methodology is incorporated to check the degree of IOT structures?What are the advantages for the company by doing so?CO4 L4

Security auditing is an important step in ensuring the security of IoT-based industries. There are several methodologies that are commonly used to check the security levels of IoT structures, including:

Vulnerability assessments: A vulnerability assessment is used to identify and analyze potential security vulnerabilities in an IoT system. This can include identifying known vulnerabilities in the software and hardware used in the system, as well as any potential weaknesses in the system's design or configuration.

Penetration testing: Penetration testing simulates a real-world attack on an IoT system to identify potential security vulnerabilities. This can include attempting to exploit known vulnerabilities or attempting to access sensitive data.

Risk assessments: A risk assessment is used to identify and evaluate potential risks to an IoT system. This can include assessing the potential impact of a security breach on the system and the organization, as well as identifying any potential threats and vulnerabilities.

Compliance assessments: IoT industries are required to comply with different regulations, standard and laws. A compliance assessment is used to check whether an IoT system is in compliance with relevant regulations, standards and laws that affects the IoT industry.

Advantages of conducting security audits are:

Identifying vulnerabilities: Security audits can help identify vulnerabilities in an IoT system before they can be exploited by an attacker. This can help organizations take steps to protect against security breaches before they occur.

Improving compliance: Compliance audits can help ensure that IoT systems are in compliance with relevant regulations, standards, and laws. This can reduce the risk of costly fines and penalties, and can improve the organization's reputation.

Reducing Risk: Security audits can help identify potential risks and vulnerabilities in an IoT system. By identifying these risks, organizations can take steps to mitigate them, reducing the overall risk to the system and the organization.

Improving overall security: By regularly conducting security audits, companies can improve the overall security posture of their IoT systems and better protect against security breaches and other cyber threats.

Cost saving: By identifying and addressing security vulnerabilities before they are exploited, security audits can help organizations avoid the high costs of responding to a security breach.

Overall, conducting security audits on IoT systems is a critical step in ensuring the security of these systems. By regularly conducting vulnerability assessments, penetration testing, risk assessments, and compliance assessments, organizations can identify and address potential security vulnerabilities and improve the overall security of their IoT systems.

125.This protocol has formed the foundation of data communication over the web.But it is not preffered choice nowadays .Justify with its features. CO2 L4

he protocol you may be referring to is HTTP (Hypertext Transfer Protocol), which is the foundation of data communication over the web. While it is true that HTTP has been widely used for many years and is still widely used, it is not the preferred choice for certain types of applications and use cases because of its features.

Stateless: HTTP is a stateless protocol, which means that it does not maintain any information about previous requests. This can make it difficult to maintain user sessions and track user behavior.

Limited security features: HTTP has limited security features, making it vulnerable to man-in-the-middle attacks and other types of cyber threats. It is not recommended for use cases that require high-security, sensitive information exchange.

Latency: HTTP can be latency-prone due to the nature of its request-response model, where a request must be sent before a response can be received. This can make it less suitable for use cases that require low latency and real-time communication.

Not meant for Streaming: HTTP is not meant for streaming data, it is built for small chunks of data exchange and not for continuous streaming.

Not meant for IoT: As HTTP is not designed for low power devices and networks, it is not a suitable protocol for IoT applications, which often have limited resources and low-power requirements.

Because of these limitations, other protocols such as WebSockets, MQTT and CoAP are becoming more widely used for certain types of applications and use cases, such as real-time communication, low-power devices, and streaming data. While HTTP still remains a widely used protocol, it may not be the best fit for certain types of applications and use cases.