



SNS College of Technology, Coimbatore-35.
(Autonomous)
B.E/B.Tech- Internal Assessment -I
Academic Year 2023-2024 (ODD)
Fifth Semester
Department of Information Technology
19ITT302 & INTERNET OF THINGS
Answer Key for SET B

Answer All Questions
PART - A (5 x 2 = 10 Marks)

1. Compare and contrast LoRaWAN and zigbee

	Owner	Frequency (MHz)	Range	Power requirement	Security	Compatibility
Zigbee	Zigbee Alliance	868 - 868.6 (Europe) 902 - 928 (US)	10–100 meters line-of-sight	Low-Power, Potential Batteryless	Low, basic encryption	Compatible across Zigbee devices. DotDot OS.
Lo-RaWan	LoRa Alliance	169, 433, 868 (Europe) 915 (US)	Up to 6.2 miles or 10 km.	Low-Power	Basic 64-128 bit encryption	Depends on OEM

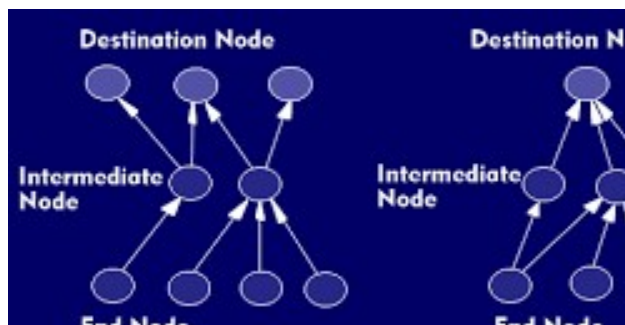
2. Difference between Structured, semi structured and Unstructured Data in Bigdata Analytics.

Characteristic	Structured	Unstructured	Semi Structured
Mapping	Data is mapped by Relational Database	Data is mapped on the basis of binary and simple character	Data is mapped with XML/RDF
Scalability	Data is schema dependant, which makes it less flexible and scalable	Due to no dependency, unstructured data is flexible and scalable as well	Semi structure data is more scalable and flexible than structures data, but less flexible when
Performance	Guarantees highest performance with structure query	Only Textual query is executable	Only allows anonymous queries
Organized	Highly Organised data	Unorganised Data	Partially organized Data

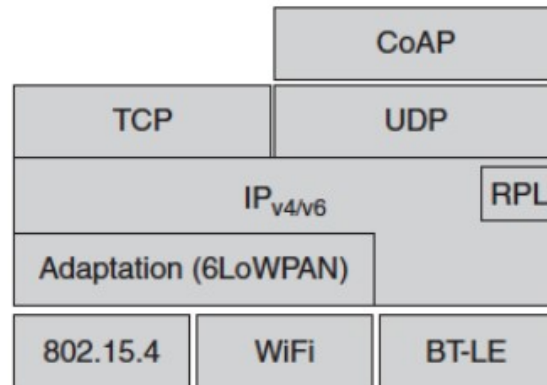
3. Where IEEE. 802.15.4 can be deployed?

IEEE standard 802.15.4 intends to offer the fundamental lower network layers of a type of wireless personal area network (WPAN) which focuses on low-cost, low-speed ubiquitous communication between devices. It can be contrasted with other approaches, such as Wi-Fi, which offer more bandwidth and requires more power.

4. Difference between DAG and DODAG



5. Sketch the protocol Stack of CoAP



PART - B (40 Marks) (2*13= 26 marks, 1x14 = 14 Marks)

6.a Analyze the various key Technologies of IoT with example.

- Device Intelligence
- Communication Capabilities
- Mobility Support
- Device Power
- Sensor Technology
- RFID Technology
- Satellite Technology

b Demonstrate the IoT Enabling Technologies with real world example.

- Wireless Sensor Network
- Cloud Computing
- Bigdata Analytics
- communication protocols
- embedded systems

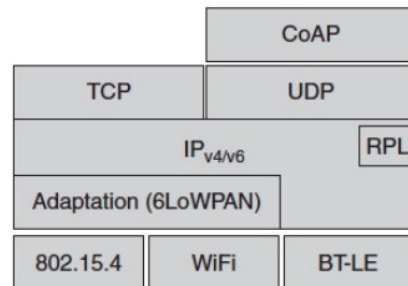
7.a Explain the concepts of Constrained Application Protocol with suitable illustration.

CoAP is a simple application layer protocol targeted to simple electronic devices (e.g., IoT/M2M things) to allow them to communicate interactively over the Internet. CoAP is designed for low power sensors (especially wireless sensor network [WSN] nodes). CoAP can be seen as a specialized web transfer protocol for use with constrained networks and nodes for M2M applications, such as smart energy and building automation. CoAP operates with HTTP (hypertext transfer protocol) for basic support with the web, allowing proxies to be built providing access to CoAP resources via HTTP in a uniform way, while also supporting multicast and enjoying low overhead CoAP can run on most devices that support user datagram protocol (UDP) or a similar protocol. Some key aspects of the protocol are as follows:

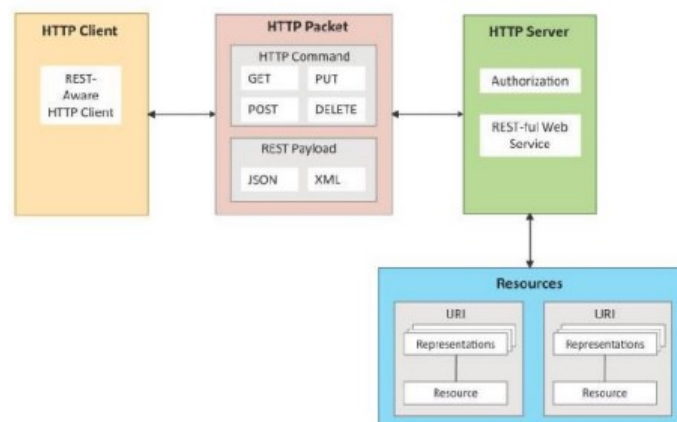
- minimal complexity for the mapping with HTTP;

- Low header overhead and low parsing complexity;
- support for the discovery of resources;
- simple resource subscription process; and
- simple caching based on max-age.

Protocol Stack



7.b.i) Illustrate the concepts of REST with block diagram.



7.b.ii) Explain in detail about IPSO.

The IPSO Alliance is an advocate for IP-networked devices for use in energy, consumer, healthcare, and industrial applications.

The IPSO Alliance is a non-profit association of more than 60 members from leading technology, communications, and energy companies around the world.

The mission is to provide a foundation for industry growth through building stronger relationships, fostering awareness, providing education, promoting the industry, generating research, and creating a better understanding of IP and its role in connecting smart objects.

Goals include

- Promote IP as the premier solution for access and communication for smart objects.
- Promote the use of IP in smart objects by developing and publishing white papers and case studies and providing updates on standards progress from associations like IETF, among others, and through other supporting marketing activities.
- Understand the industries and markets where smart objects can have an effective role in growth when connected using the Internet protocol.
- Organize interoperability tests that will allow members and interested parties to show that products and services using IP for smart objects can work together and meet industry standards for communication.
- Support IETF and other standards development organizations in the development of standards for IP for smart objects

8.a Compare and contrast Structured, semi structured and Unstructured Data in Bigdata Analytics.

Parameters	Structured Data	Semi-Structured Data	Unstructured Data
Data Structure	The information and data have a predefined organization.	The contained data and information have organizational properties- but are different from predefined structured data.	There is no predefined organization for the available data and information in the system or database.
Technology Used	Structured Data works on the basis of relational database tables.	Semi-Structured Data works on the basis of Relational Data Framework (RDF) or XML.	Unstructured data works on the basis of binary data and the available characters.
Flexibility	The data depends a lot on the schema. Thus, there is less flexibility.	The data is comparatively less flexible than unstructured data but way more flexible than the structured data.	Schema is totally absent. Thus, it is the most flexible of all.
Management of Transaction	It has a mature type of transaction. Also, there are various techniques of concurrency.	It adapts the transaction from DBMS. It is not of mature type.	It consists of no management of transaction or concurrency.
Management of Version	It is possible to version over tables, rows, and tuples.	It is possible to version over graphs or tuples.	It is possible to version the data as a whole.
Robustness	Structured data is very robust in nature.	Semi-Structured Data is a fairly new technology. Thus, it is not very robust in nature.	-
Scalability	Scaling a database schema is very difficult. Thus, a structured database offers lower scalability.	Scaling a Semi-Structured type of data is comparatively much more feasible.	An unstructured data type is the most scalable in nature.
Performance of Query	A structured type of query makes complex joining possible.	Semi-structured queries over various nodes (anonymous) are most definitely possible.	Unstructured data only allows textual types of queries.

b Analyse in detail the Wireless personal Area Network Technologies for IoT / M2M with suitable illustration

3GPP:

- 3GPP brings together six telecommunications standard bodies, known as “organizational partners,” and offers a stable environment for their members to generate the reports and specifications that define 3GPP technologies.
- These technologies are constantly advancing through what has come to be recognized as commercial cellular/mobile system generations. 3GPP was originally the standards collaboration that was advancing Global System for Mobile Communication (GSM) platforms toward 3G. However, 3GPP has been the main point for mobile systems beyond 3G since the completion of the initial LTE and the Evolved Packet Core (EPC) specifications.
- 3GPP Release 10 and later are compliant with the most recent ITU-R specifications for IMT-Advanced “Systems beyond 3G.” The standard currently enables high-mobility communication at speeds of up to 100 Mbps and low-mobility communication at speeds of up to 1 Gbps.
- The original mission of 3GPP was to develop Technical Specifications and Technical Reports for a 3G Mobile System based on evolved GSM CNs and the radio access technologies that they support (i.e., Universal Terrestrial Radio Access (UTRA) in both frequency division duplex (FDD) and time division duplex (TDD) modes).
- The scope was later expanded to encompass the upkeep and development of GSM Technical Specifications and Technical Reports, as well as advanced radio access technologies (e.g., GPRS and EDGE).
- All GSM (including GPRS and EDGE), W-CDMA, and LTE (including LTE-Advanced) specifications are included in the term “3GPP specification”.

3GPP2 (Third-Generation Partnership Project 2):

3GPP2 is a collaborative 3G telecommunications specification-setting project that includes North American and Asian interests in developing global specifications for ANSI/TIA/EIA-41 Cellular Radio telecommunication Intersystem Operations network evolution to 3G, as well as global specifications for the radio transmission technologies (RTTs) supported by ANSI/TIA/EIA-41. 3GPP2 encompasses HS, broadband, and Internet protocol (IP)-based mobile systems with network-to-network interconnection and feature/service transparency, global roaming, and location-independent services, thanks to the International Telecommunication Union’s (ITU) International Mobile Telecommunications “IMT-2000” effort.

6LoWPAN: IPv6 over low-power area networks (IEEE 802.15.4):

6LoWPAN Based on RFC 4944, 6LoWPAN is currently a generally acknowledged method for running IP on 802.15.4. TinyOS, Contiki, and protocols such as ISA100 and ZigBee SE 2.0 all support it. RFC 4944 disguises 802.15.4 as an IPv6 link. It provides simple encapsulation and efficient 100-byte packet representation. It covers themes such as:

- The first approach to stateless header compression
- Datagram tag/datagram offset
- Mesh forwarding
- Identify originator/final destination
- Minimal use of complex MAC layer concepts