# Introduction to Internet of Things

**Week 2**

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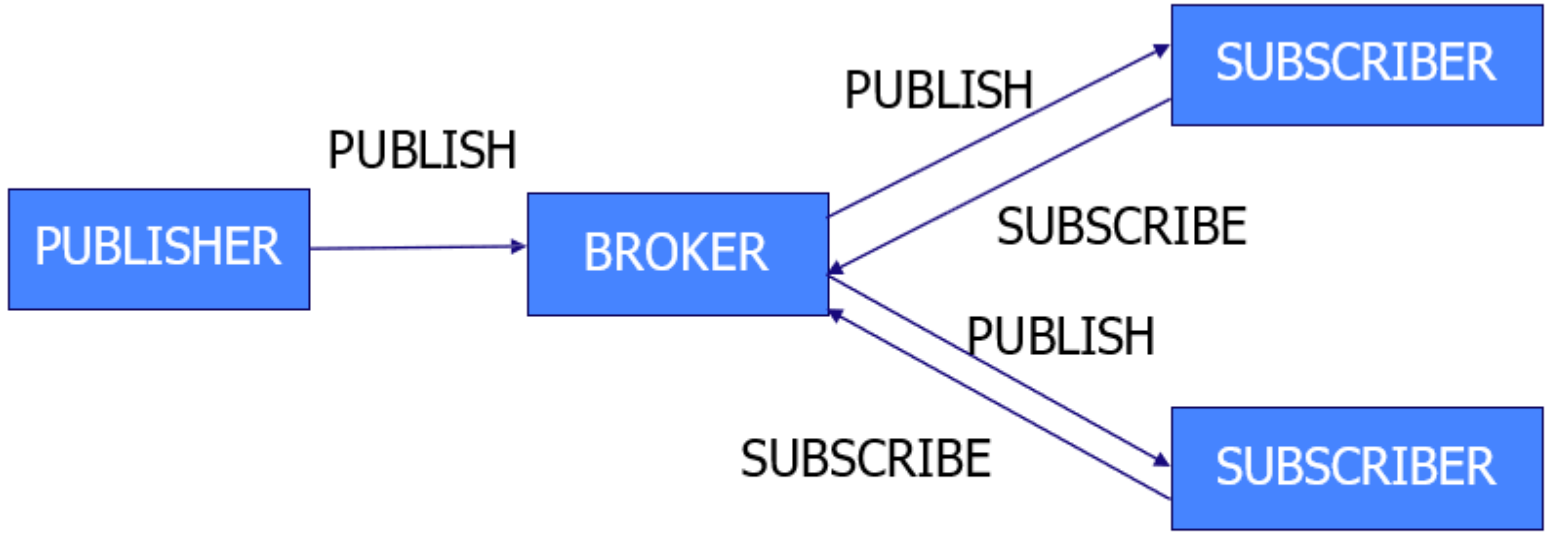
# Functionality-based IoT Protocol Organization

- **Connectivity:** Protocols which helps in establishing connections. **(6LowPAN, RPL)**
- **Identification:** Checks the identity of the user (using private key or password). **(EPC, uCode, IPv6, URIs)**
- **Communication / Transport:** (Protocols which helps in the communication of two devices) **(WiFi, Bluetooth, LPWAN)**
- **Discovery:** Protocol suite for advertisement and discovery of network services **(Physical Web, mDNS, DNS-SD)**
- **Data Protocols:** Enable devices to exchange information **(MQTT, CoAP, AMQP, Websocket, Node)**
- **Device Management:** A device can communicate updates about its location, diagnostic information, and error codes by using the Device Management Protocol. **(TR-069, OMA-DM)**
- **Semantic:** Regulate the application-related aspects of the communicating IT systems **(JSON-LD, Web Thing Model)**
- **Multi-layer Frameworks: P**rotocols spread across various protocol stack layers (**Alljoyn, IoTivity, Weave, Homekit)**

# MQTT

- **Message Queue Telemetry Transport**
- Publish-subscribe-based lightweight messaging protocol
- Components:
  - Publishers
  - Subscribers
  - Brokers

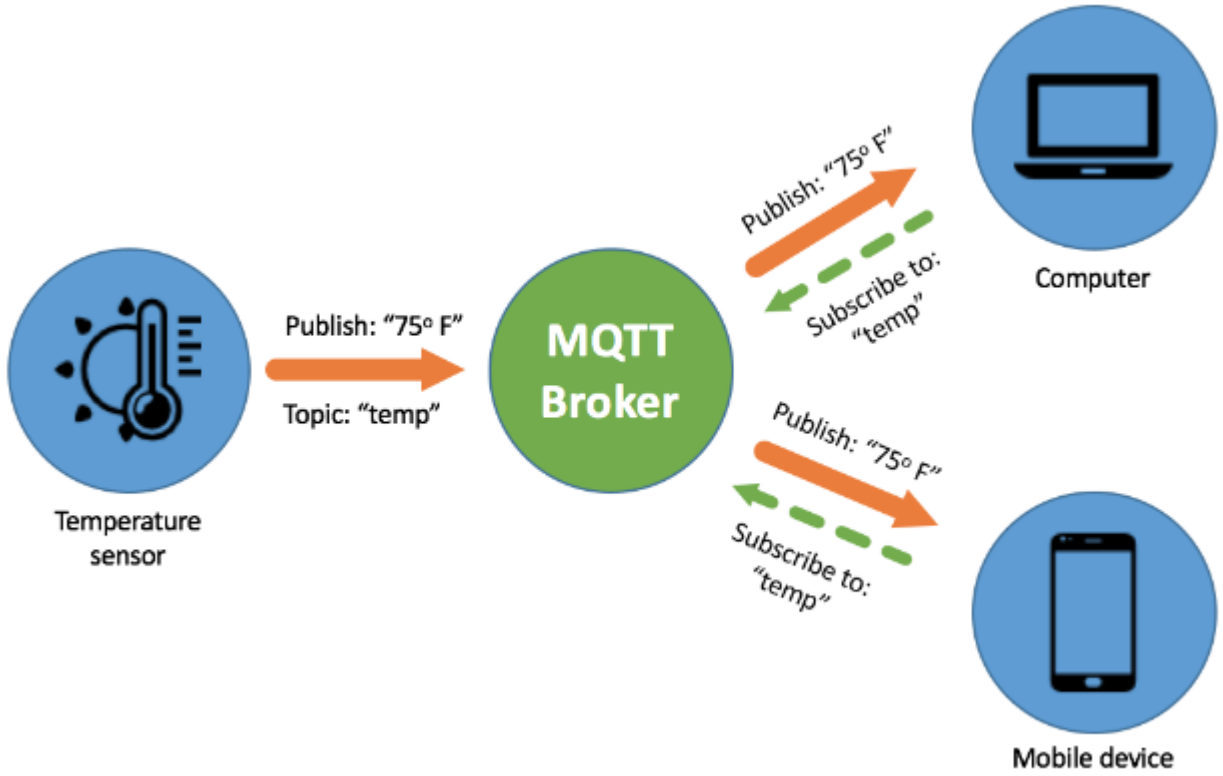


# MQTT

- Connect
- Disconnect
- Subscribe
- Unsubscribe
- Publish

# MQTT Applications

- **Facebook Messenger** uses MQTT for online chat.
- **Amazon Web Services** use Amazon IoT with MQTT.
- **Microsoft Azure** IoT Hub uses MQTT as its main protocol for telemetry messages.
- The **EVRYTHNG IoT platform** uses MQTT as an M2M protocol for millions of connected products.
- **Adafruit** launched a free MQTT cloud service for IoT experimenters called Adafruit IO



# SMQTT

- **Secure MQTT** is an extension of MQTT which uses encryption based on lightweight attribute based encryption.

- The main advantage of using such encryption is the broadcast encryption feature, in which one message is encrypted and delivered to multiple other nodes, which is quite common in IoT applications.

- In general, the algorithm consists of four main stages: setup, encryption, publish and decryption

# SMQTT

- In the setup phase, the subscribers and publishers register themselves to the broker and get a master secret key according to their developer's choice of key generation algorithm.
- When the data is published, it is encrypted and published by the broker which sends it to the subscribers, which is finally decrypted at the subscriber end having the same master secret key.
- The key generation and encryption algorithms are not standardized.
- SMQTT is proposed only to enhance MQTT security features

# CoAP

- CoAP
  Constrained Application Protocol (CoAP)

  The Constrained Application Protocol (CoAP) is a session layer protocol designed by IETF Constrained RESTful Environment (CoRE) working group to provide lightweight RESTful (HTTP)
  interface.

  Representational State Transfer (REST) is the standard interface between HTTP client and servers.

  Lightweight applications such as those in IoT, could result in significant overhead and power consumption by REST. CoAP is designed to enable low-power sensors to use RESTful services while meeting their power constraints

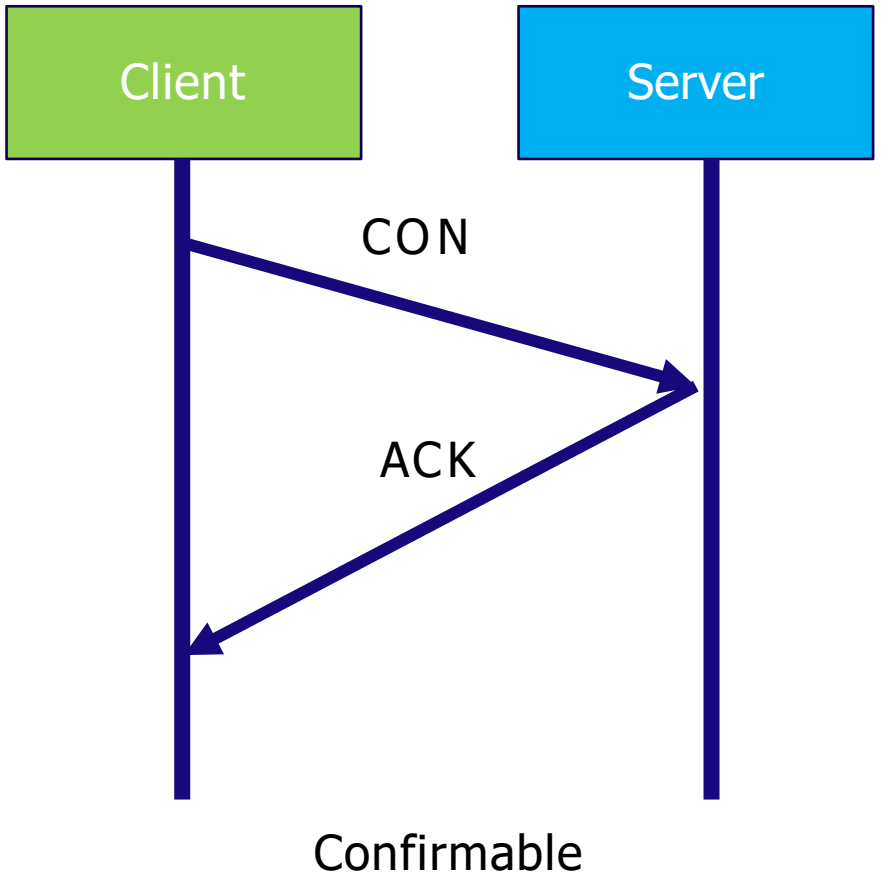
# CoAP Layers

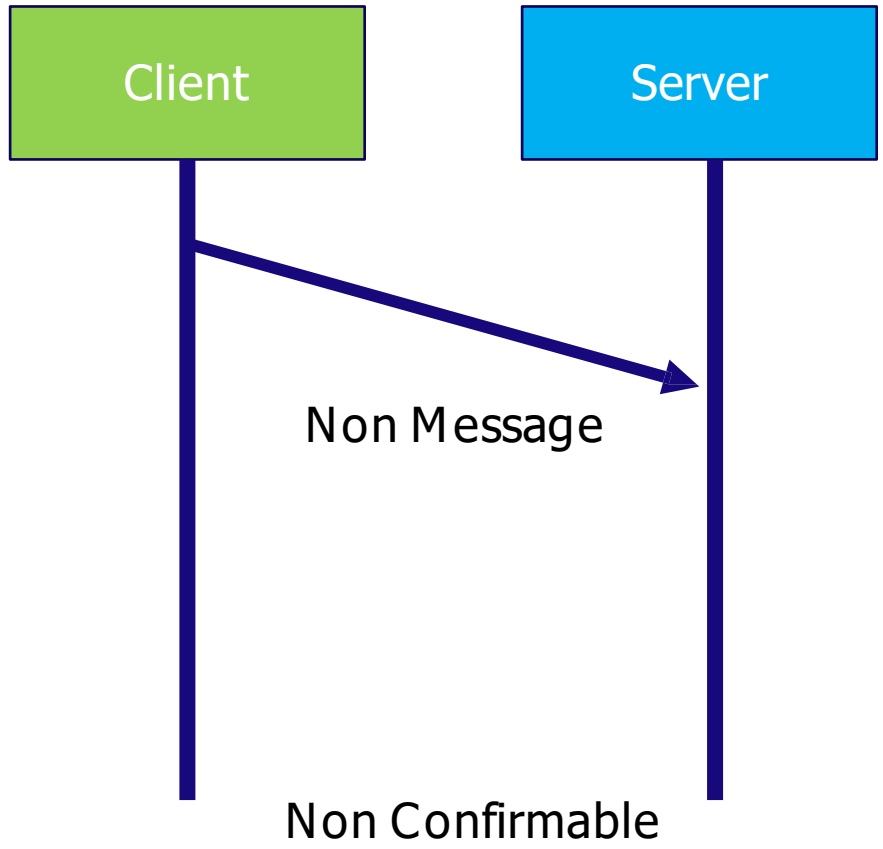
- CoAP architecture is divided into two main sub-layers:
  - Messaging
  - Request/response.

- The messaging sub-layer is responsible for reliability and duplication of messages, while the request/response sub-layer is responsible for communication.

- Data Protocol  Message Types:
  - Confirmable
  - Non Confirmable
  - Piggyback
  - Separate

- CoAP: Cont…


Client
Server
CON
ACK
Confirmable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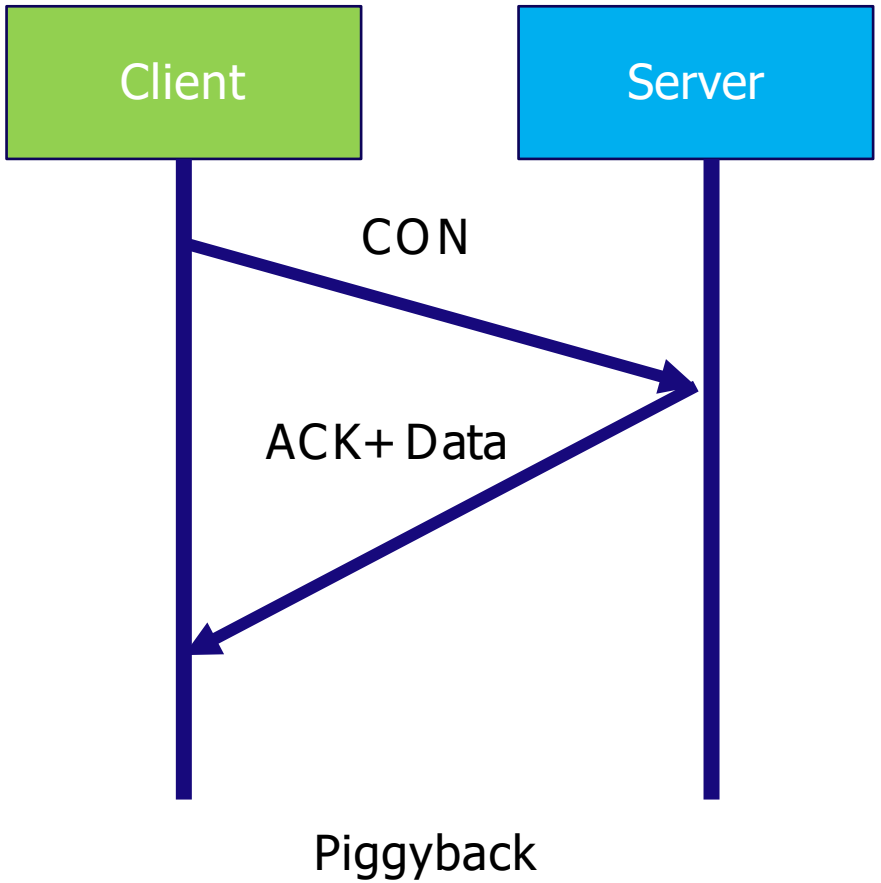
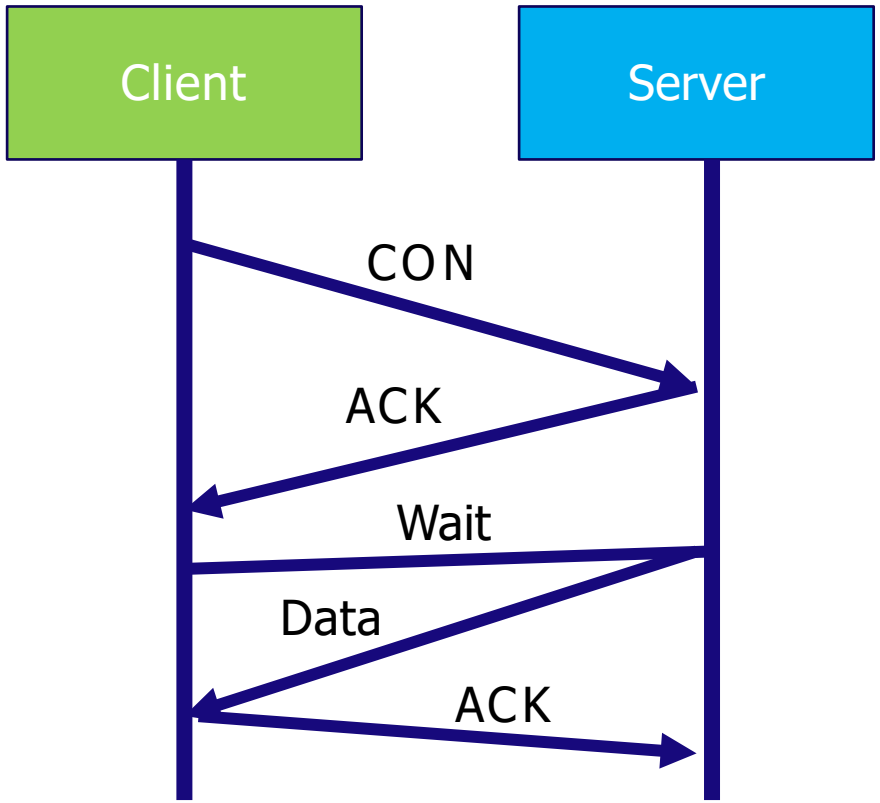
- CoAP: Cont…




Piggyback




Separate

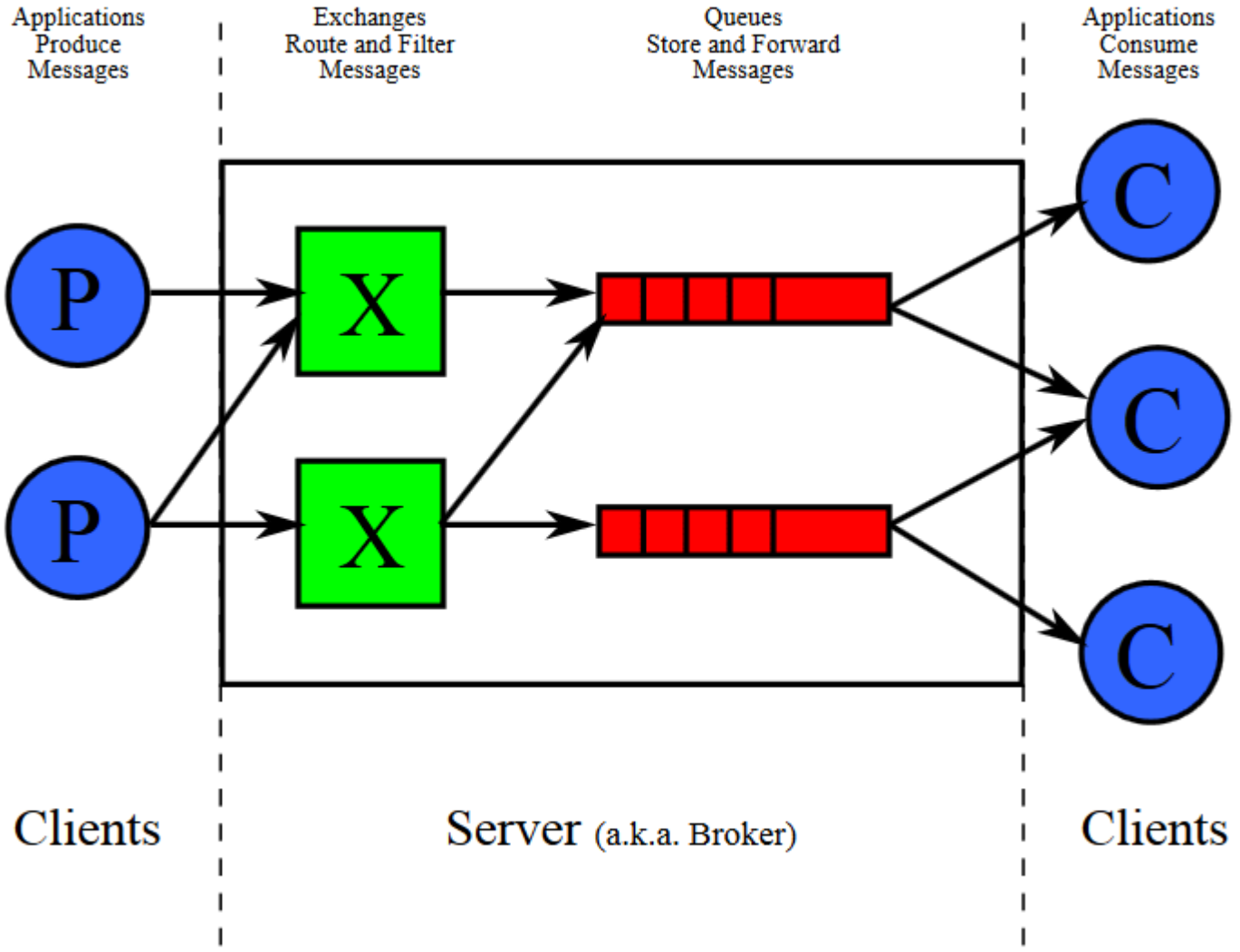
# CoAP Features

- Reduced overheads and parsing complexity.
- URL and content-type support.
- Support for the discovery of resources provided by known CoAP services.
- Simple subscription for a resource, and resulting push notifications.
- Simple caching based on maximum message age

# AMQP

**Advanced Message Queuing Protocol.**

- ✓ Open standard for passing business messages between applications or organizations.
- ✓ Connects between systems and business processes.
- ✓ It is a binary application layer protocol.
- ✓ Basic unit of data is a *frame*

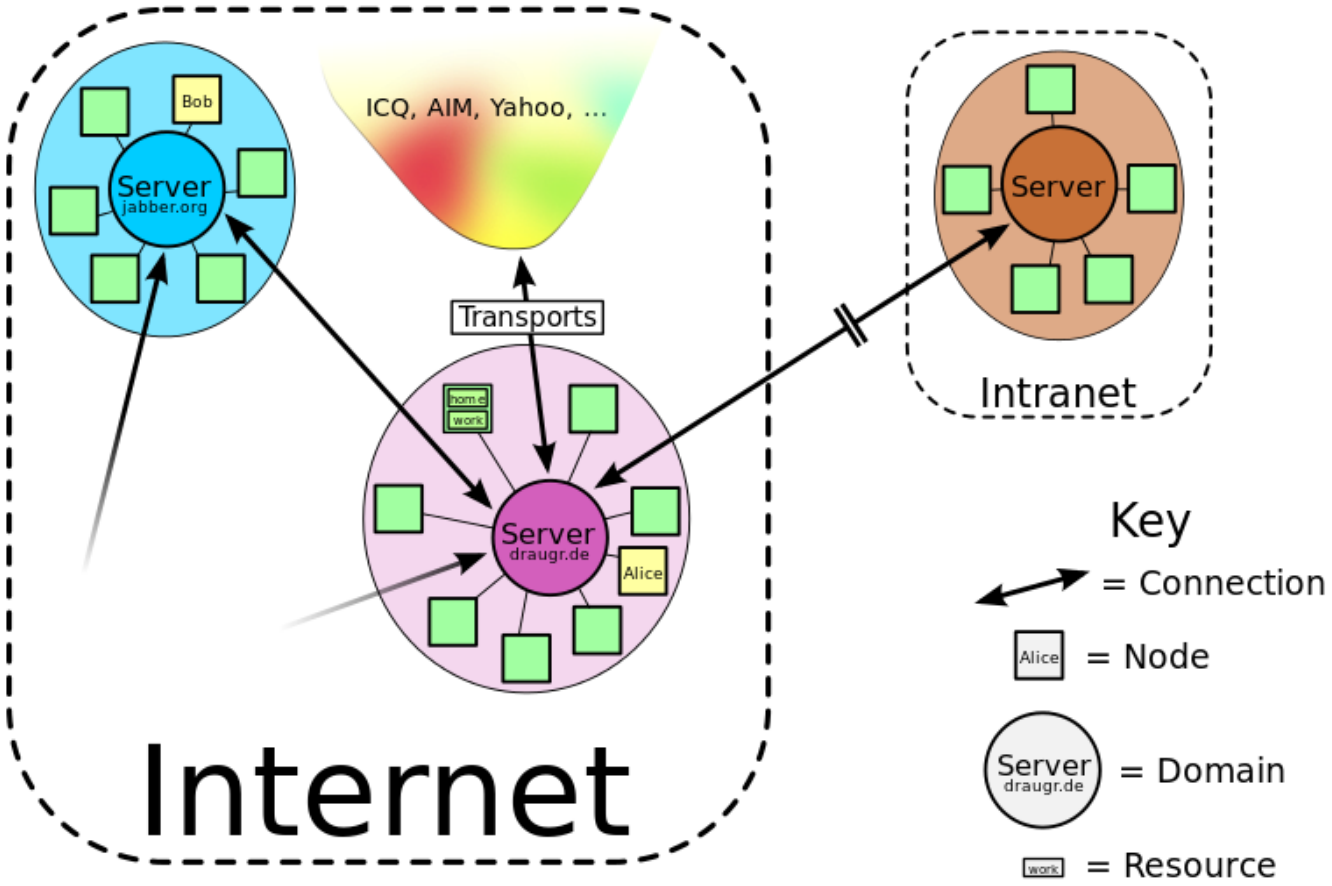


# AMQP: Applications

- ✓ Monitoring and global update sharing.
- ✓ Connecting different systems and processes to talk to each other.
- ✓ Allowing servers to respond to immediate requests quickly and delegate time consuming tasks for later processing.
- ✓ Distributing a message to multiple recipients for consumption.
- ✓ Enabling offline clients to fetch data at a later time.
- ✓ Introducing fully asynchronous functionality for systems.
- ✓ Increasing reliability and uptime of application deployments.

# XMPP

- **XMPP – Extensible Messaging and Presence Protocol**
- A communication protocol for **message-oriented middleware** based on XML (Extensible Markup Language).
- Real-time exchange of structured data.
- It is an open standard protocol.
- Decentralization – No central server; anyone can run their own XMPP server.
- Open standards – No royalties or granted permissions are required to implement these specifications
- Security – Authentication, encryption, etc.
- Flexibility – Supports interoperability



# XMPP Weakness

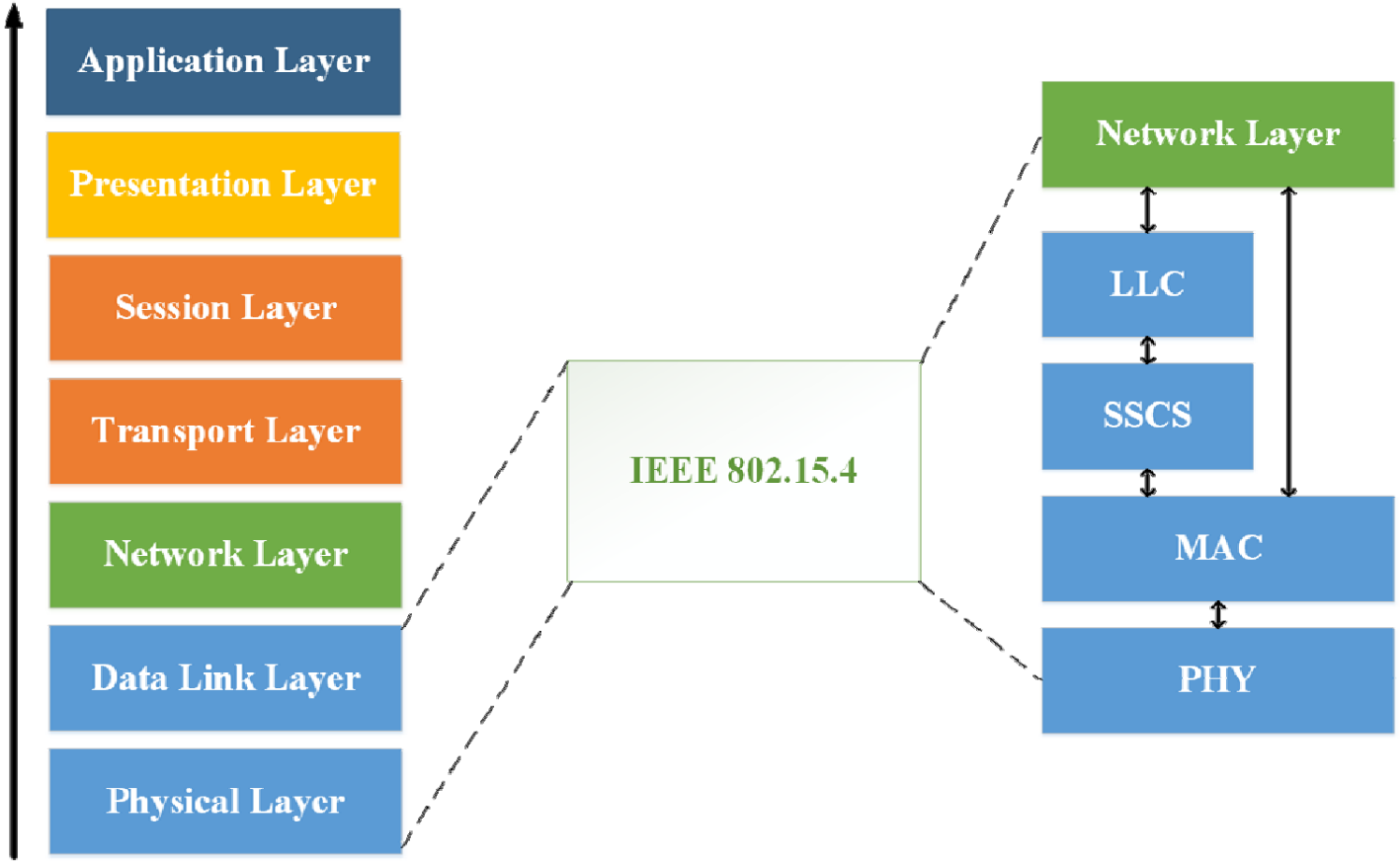
- Does not support QoS.
- Text based communications induces higher network overheads.
- Binary data must be first encoded to base64 before transmission.

# XMPP Applications

- Publish-subscribe systems
- Signalling for VoIP
- Video
- File transfer
- Gaming
- Internet of Things applications
  - Smart grid
  - Social networking services

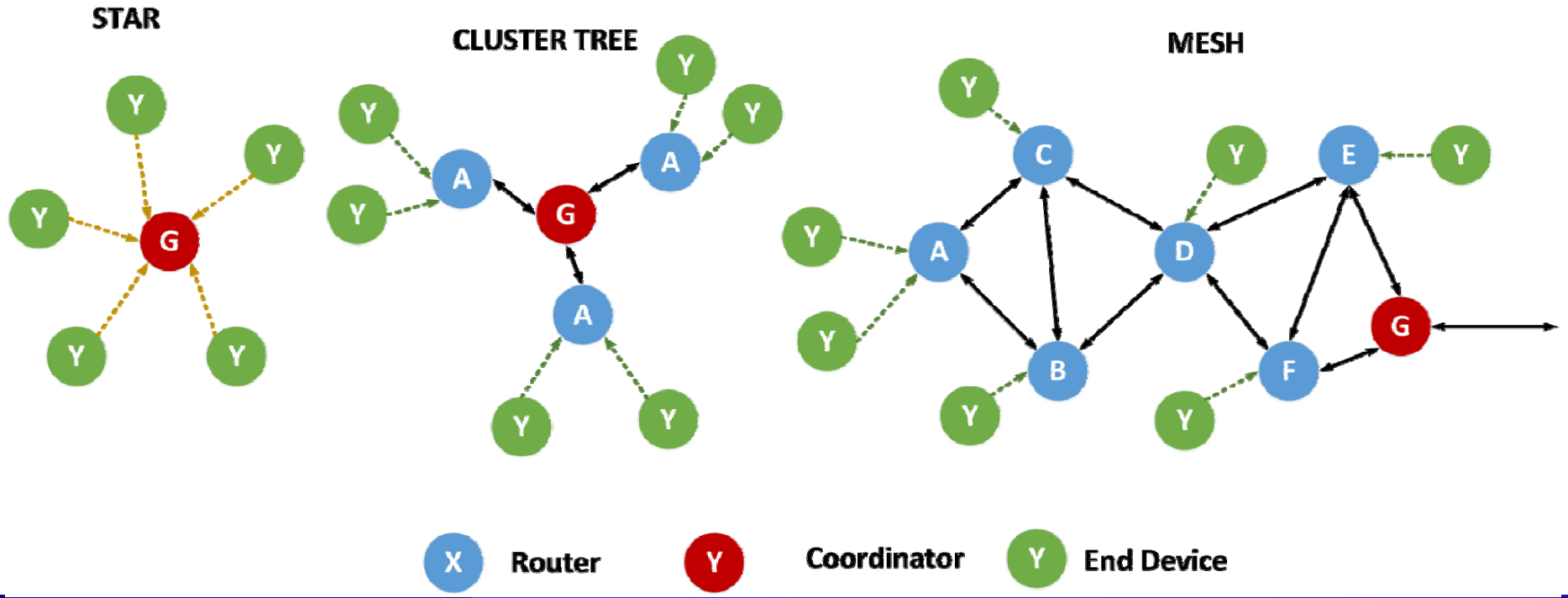
# IEEE 802.15.4

- ✓ Well-known standard for low data-rate WPAN.
- ✓ Developed for low-data-rate monitoring and control applications and extended-life low-power-consumption uses.
- ✓ This standard uses only the first two layers (PHY, MAC) plus the logical link control (LLC) and service specific convergence sub-layer (SSCS) additions to communicate with all upper layers
- ✓ Operates in the ISM band



# Zigbee

- ✓ Most widely deployed enhancement of IEEE 802.15.4.
- ✓ The ZigBee protocol is defined by **layer 3 and above**. It works with the 802.15.4 layers 1 and 2.
- ✓ The standard uses layers 3 and 4 to define additional communication enhancements.
- ✓ These enhancements include authentication with valid nodes, encryption for security, and a data routing and forwarding capability that enables mesh networking.
- ✓ The most popular use of ZigBee is wireless sensor networks using the mesh topology



# Zigbee Applications

- ✓ Building automation
- ✓ Remote control (RF4CE or RF for consumer electronics)
- ✓ Smart energy for home energy monitoring
- ✓ Health care for medical and fitness monitoring
- ✓ Home automation for control of smart homes
- ✓ Light Link for control of LED lighting
- ✓ Telecom services

# 6LoWPAN

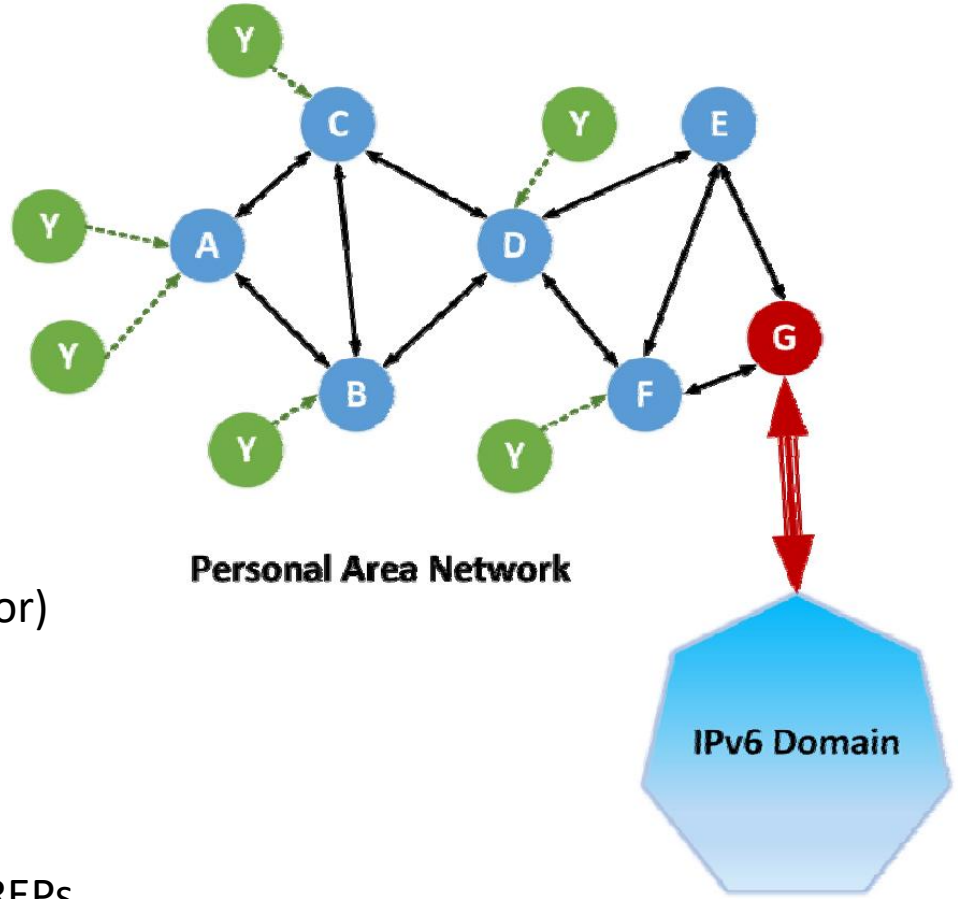
- Low-power Wireless Personal Area Networks over IPv6.
- Allows for the smallest devices with limited processing ability to transmit information wirelessly using an Internet protocol.
- Allows low-power devices to connect to the Internet.
- Allows IEEE 802.15.4 radios to carry 128-bit addresses of Internet Protocol version 6 (IPv6).
- Header compression and address translation techniques allow the IEEE 802.15.4 radios to access the Internet.
- IPv6 packets compressed and reformatted to fit the IEEE 802.15.4 packet format.
- Uses include IoT, Smart grid, and M2M applications.

# 6LoWPAN

- Routing protocols in use:
  - **LOADng**
  - **RPL**

## LOADng Routing

- Derived from AODV and extended for use in IoT.
- Basic operations of LOADng include:
  - Generation of **Route Requests (RREQs)** by a LOADng Router (originator) for discovering a route to a destination,
  - **Forwarding of such RREQs** until they reach the destination LOADng Router,
  - Generation of **Route Replies (RREPs)** upon receipt of an RREQ by the indicated destination, and unicast hop-by-hop forwarding of these RREPs towards the originator



# 6LoWPAN

If a route is detected to be broken, a **Route Error (RERR)** message is returned to the originator of that data packet to inform the originator about the route breakage.

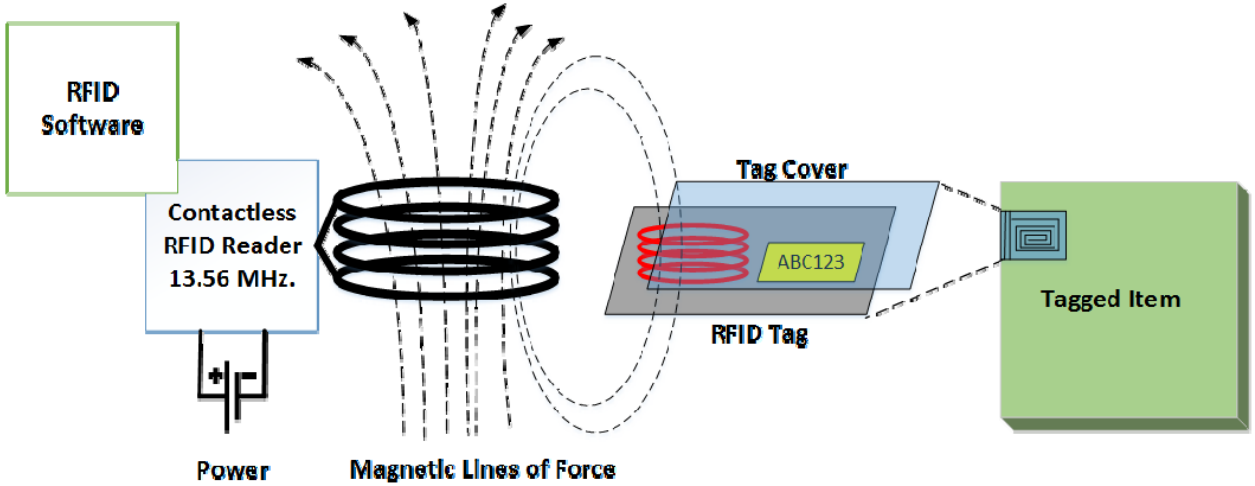
- **Optimized flooding** is supported, reducing the overhead incurred by RREQ generation and flooding.
- Only the destination is permitted to respond to an RREQ.
- Intermediate LOADng Routers are explicitly prohibited from responding to RREQs, even if they may have active routes to the sought destination.
- RREQ/RREP messages generated by a given LOADng Router share a single unique, monotonically increasing sequence number

# RPL

- ✓ Distance Vector IPv6 **routing protocol for lossy and low power networks.**
- ✓ Maintains routing topology using low rate beaconing.
- ✓ Beaconing rate increases on detecting inconsistencies (e.g. node/link in a route is down).
- ✓ Routing information included in the datagram itself.
- ✓ **Proactive**: Maintaining routing topology.
- ✓ **Reactive**: Resolving routing inconsistencies
- ✓ RPL separates packet processing and forwarding from the routing optimization objective, which helps in Low power Lossy Networks (LLN).
- ✓ RPL supports message confidentiality and integrity.
- ✓ Supports Data-Path Validation and Loop Detection
- ✓ Routing optimization objectives include
  - minimizing energy
  - minimizing latency
  - satisfying constraints (w.r.t node power, bandwidth, etc.)
- ✓ RPL operations require bidirectional links.
- ✓ In some LLN scenarios, those links may exhibit asymmetric properties.
- ✓ It is required that the reachability of a router be verified before the router can be used as a parent

# RFID

- ✓ RFID is an acronym for “radio-frequency identification”
- ✓ Data digitally encoded in RFID tags, which can be read by a reader.
- ✓ Somewhat similar to barcodes.
- ✓ Data read from tags are stored in a database by the reader.
- ✓ As compared to traditional barcodes and QR codes, RFID tag data can be read outside the line-of-sight.
- ✓ RFID tag consists of an integrated circuit and an antenna.
- ✓ The tag is covered by a protective material which also acts as a shield against various environmental effects.
- ✓ Tags may be passive or active.
- ✓ Passive RFID tags are the most widely used.
- ✓ Passive tags have to be powered by a reader inductively before they can transmit information, whereas active tags have their own power supply



# RFID

- ✓ Inventory management
- ✓ Asset tracking
- ✓ Personnel tracking
- ✓ Controlling access to restricted areas
- ✓ ID badging
- ✓ Supply chain management
- ✓ Counterfeit prevention (e.g. in the pharmaceutical industry)

# Question No: 1

- Which of the following is NOT a data and communication protocol?

a. MQTT
b. AMQP
c. Websocket
d. Alljoyn

# Question No: 1

- **Functionality-based IoT Protocol Organization**

- **Connectivity:** Protocols which helps in establishing connections. **(6LowPAN, RPL)**
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# Question No: 2

- Which of the following AMQP frame type is used to inform the changes in state of transfer?

a. Flow
b. Disposition
c. Transfer
d. State

# Question No: 2

**AMQP: Advanced Message Queuing Protocol**

Data Protocol

**Types of frames**

- Open (connection open)
- Begin (session open)
- Attach (initiate new link)
- Transfer (for sending actual messages)
- Flow (controls message flow rate)
- Disposition (Informs the changes in state of transfer)
- Detach (terminate the link)
- End (session close)
- Close (connection close

# Question No: 2

- Which of the following AMQP frame type is used to inform the changes in state of transfer?

a. Flow
b. Disposition
c. Transfer
d. State

# Question No: 3

- Which of the following is NOT a messaging mode of CoAP?

a. Separate
b. Pager
c. Piggyback
d. Confirmable

# Question No: 3

- CoAP

Constrained Application Protocol (CoAP)
Data Protocol
Message Types:

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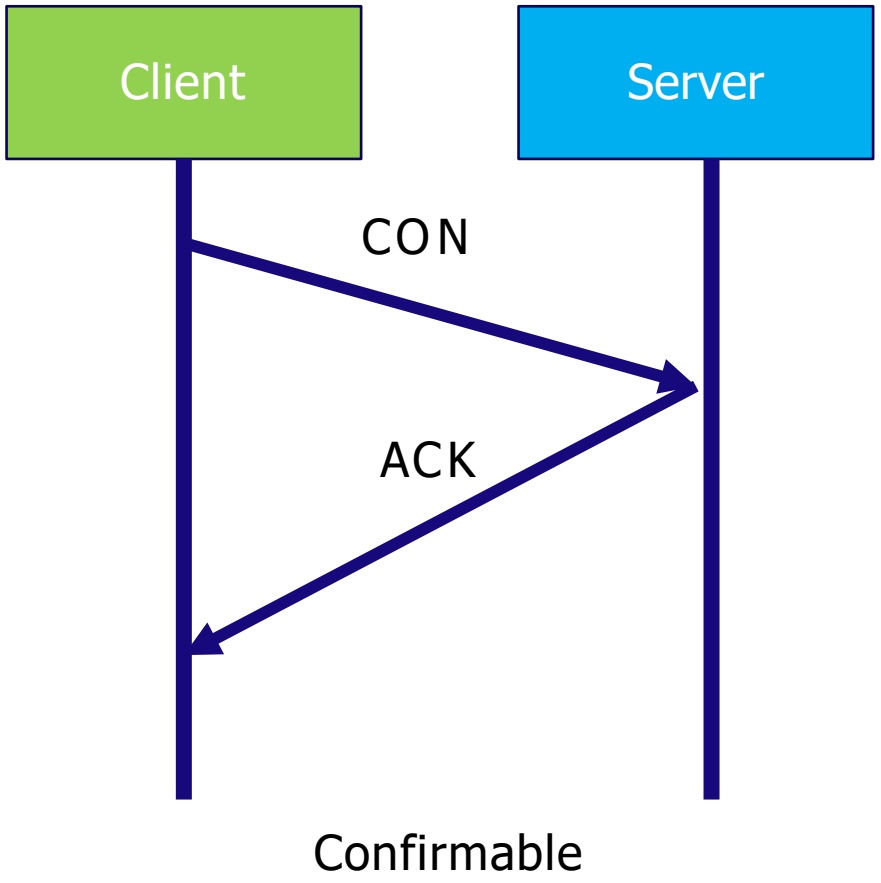
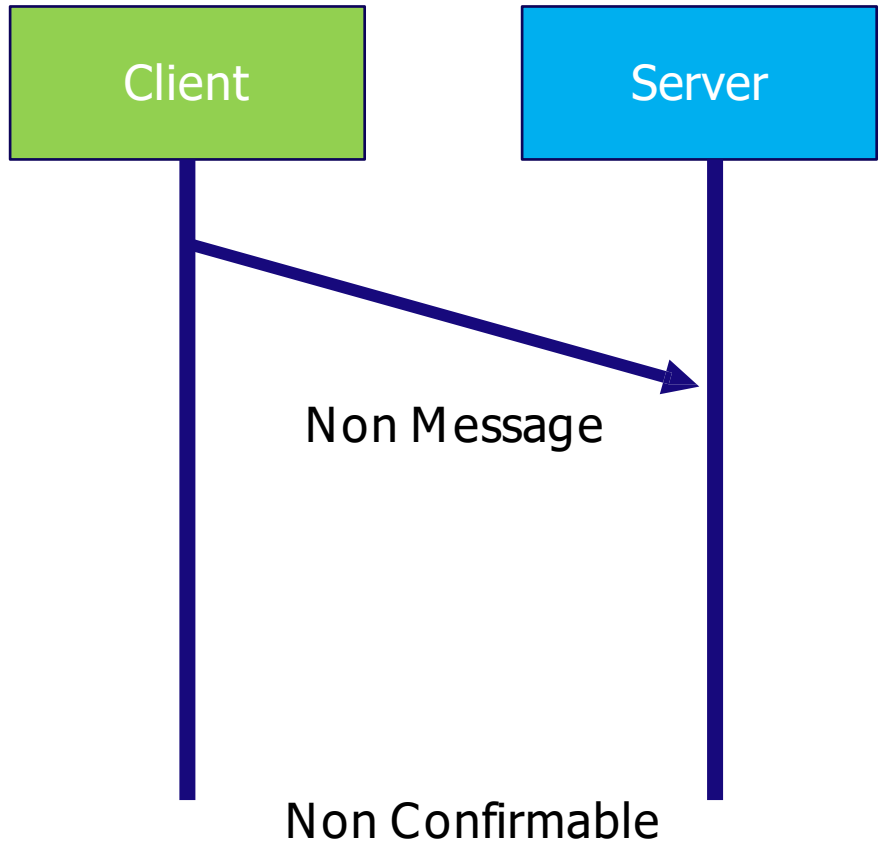
# Question No: 3

- CoAP: Cont…



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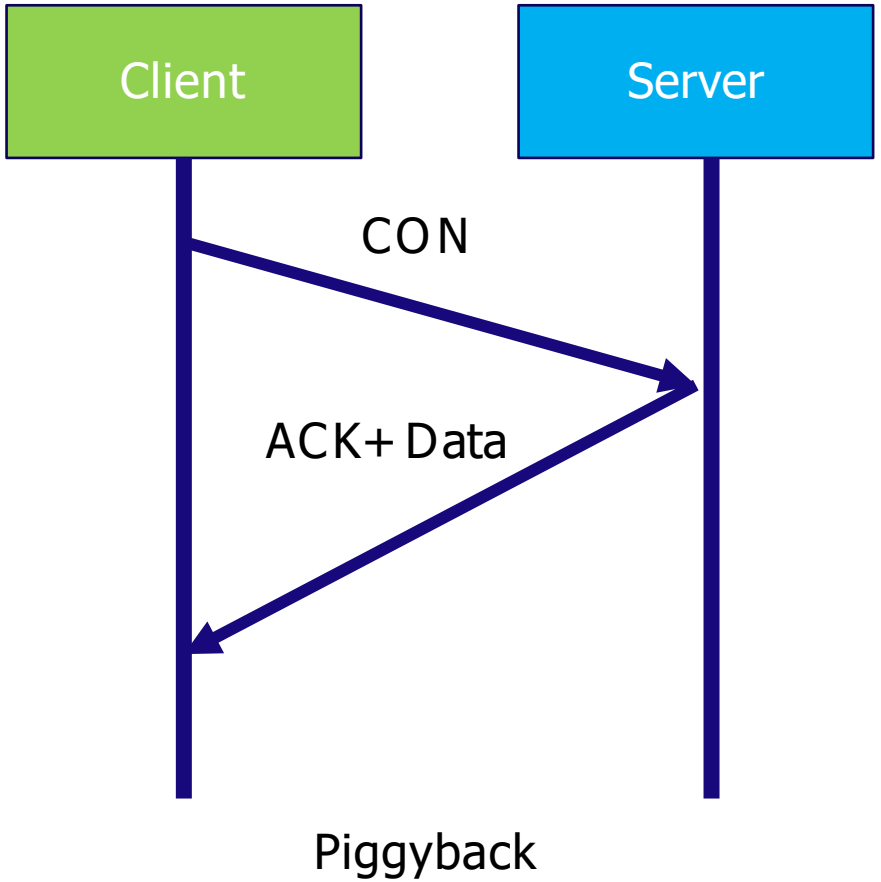


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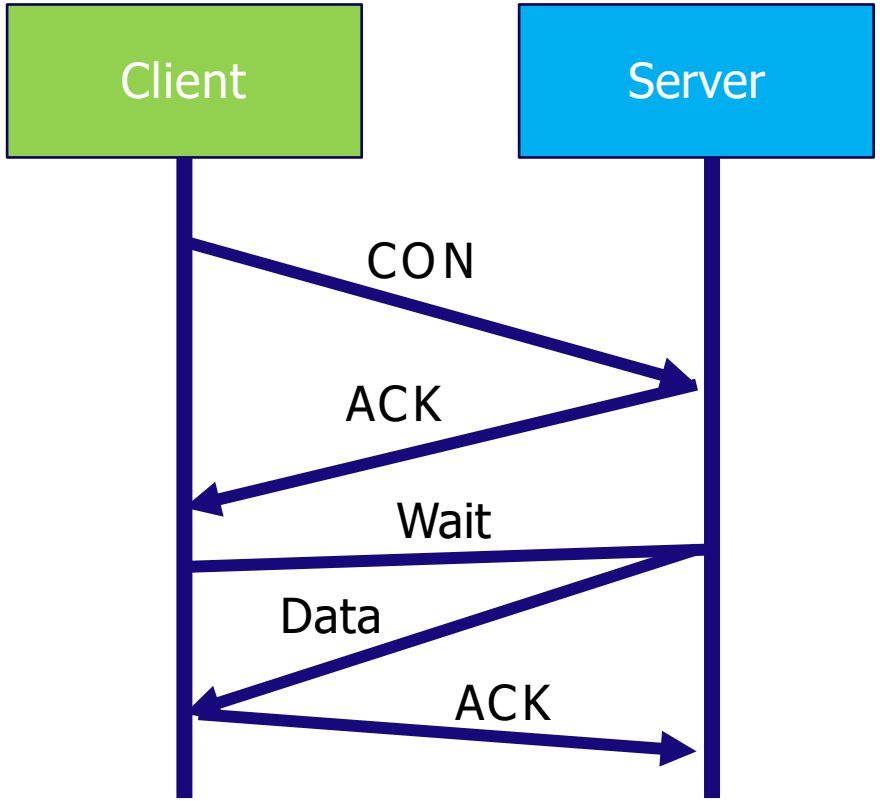


Separate

# Question No: 3

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# Question No: 4

- The Zigbee Component “APS” stands for _____.

a. Application Support Sub-layer
b. Application Protocol Support
c. Application Policy Support
d. Application Protocol Sub-layer

# Question No: 4

APS: Application Support Sub-layer

- Interfacing and control services
- Bridge between network and other layers

# Question No: 4

- The Zigbee Component “APS” stands for _____.

a. Application Support Sub-layer
b. Application Protocol Support
c. Application Policy Support
d. Application Protocol Sub-layer

# Question No: 5

- Does IEEE 802.15.4 support IPv6 multicast?

a. Yes
b. No

# Question No: 5

- Does IEEE 802.15.4 support IPv6 multicast?

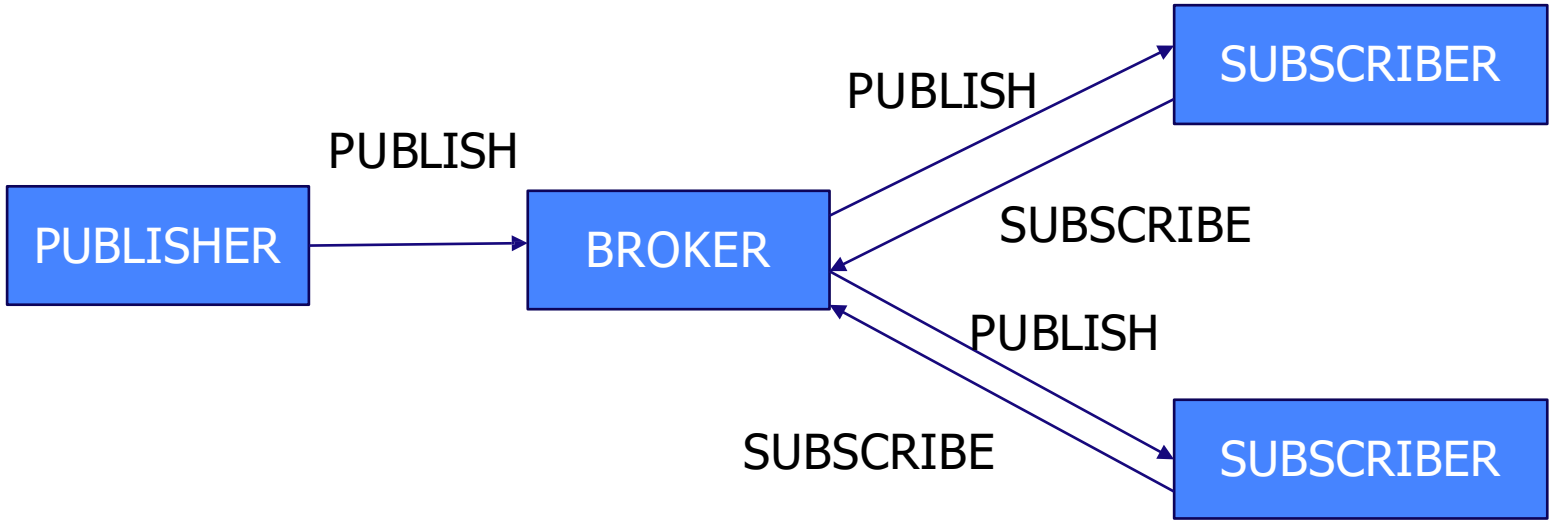
a. Yes
b. No

# Question No: 6

- In MQTT, a_____subscribes to a topic.

a. client
b. broker
c. publisher
d. All of the above

# Question No: 6



# Question No: 6

- In MQTT, a_____subscribes to a topic.

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c. publisher
d. All of the above

# Question No: 7

- Which of the following is a characteristic of XMPP protocol?

a. No interoperability
b. Closed standards
c. No central server
d. All of the above

# Question No: 7

XMPP

- **XMPP – Extensible Messaging and Presence Protocol.**
- A communication protocol for **message-oriented middleware** based on XML (Extensible Markup Language).
- Real-time exchange of structured data.
- It is an open standard protocol.
- Decentralization – No central server; anyone can run their own XMPP server.
- Open standards – No royalties or granted permissions are required to implement these specifications
- Security – Authentication, encryption, etc.
- Flexibility – Supports interoperability

# Question No: 7

- Which of the following is a characteristic of XMPP protocol?

a. No interoperability
b. Closed standards
c. No central server
d. All of the above

# Question No: 8

- Which of the following protocol has a component named “bindings”?

a. XMPP
b. AMQP
c. CoAP
d. None of the above

# Question No: 8

- AMQP Components

Exchange
•Part of Broker
• Receives messages and routes them to Queues

Queue
•Consumers receive messages from queues
• Separate queues for separate business processes

Bindings
Rules for distributing messages (who can access what message, destination of the message)

# Question No: 8

- Which of the following protocol has a component named “bindings”?

a. XMPP
b. AMQP
c. CoAP
d. None of the above

# Question No: 9

- Is CoAP RESTful?

a. Yes
b. No

# Question No: 9

- Is CoAP RESTful?

a. Yes
b. No

# Question No: 10

- RPL routing is based upon_____routing protocol.

a. Enhanced Interior Gateway
b. Interior Gateway
c. Open Shortest Path First
d. Distance vector IPv6

# Question No: 10

- RPL routing

- Routing Protocol for Low-Power and Lossy Networks
- Proactive protocol
- IPV6 Distance vector

# Question No: 10

- RPL routing is based upon_____routing protocol.

a. Enhanced Interior Gateway
b. Interior Gateway
c. Open Shortest Path First
d. Distance vector IPv6

# Question No: 11

Which of the following protocol is used to implement device management for mobile devices?

a. OMA-DM

b. Websocket

c. Alljoyn

d. DNS-SD

# Question No: 11

Which of the following protocol is used to implement device management for mobile devices?

a. OMA-DM

b. Websocket

c. Alljoyn

d. DNS-SD

OMA-DM is a protocol specified by the Open Mobile Alliance and is often used in the context of complex structured mobile solutions. It is often preferred by service providers to implement device management for mobile devices.

# Question No: 12

In LOADng, can intermediate routers respond to Route Requests (RREQs)?

a. Yes, in any case

b. Yes, only when RREQ flooding occurs

c. Yes, only if they have active routes to the sought destination

d. No

# Question No: 12

In LOADng, can intermediate routers respond to Route Requests (RREQs)?

a. Yes, in any case

b. Yes, only when RREQ flooding occurs

c. Yes, only if they have active routes to the sought destination

d. No

Intermediate LOADng Routers are explicitly prohibited from responding to RREQs, even if they may have active routes to the sought destination.

# Question No: 13

Which of the following functions as the network bridge in IEEE 802.15.4 network?

a. PAN Coordinator

b. Router

c. Device

d. None of these

# Question No: 13

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a. PAN Coordinator

b. Router

c. Device

d. None of these

Every IEEE 802.15.4 network has a minimum of one coordinator device type who acts as the root; it also functions as the network bridge. The coordinator performs data handling and storing operations.

# Question No: 14

Which of the following allow communication between Zigbee and no-Zigbee devices?

a. layer-5 application-level bridge

b. layer-7 application-level gateway

c. layer-7 application-level bridge

d. layer-5 application-level gateway

# Question No: 14

Which of the following allow communication between Zigbee and no-Zigbee devices?

a. layer-5 application-level bridge

b. layer-7 application-level gateway

c. layer-7 application-level bridge

d. layer-5 application-level gateway

In order to enable communication between Zigbee and no-Zigbee devices, a layer-7 application-level gateway has to be created, which is quite complex.

# Question No: 15

Statement I: RFIDs are radio-frequency-based.

Statement II: RFID devices can act as both readers as well as tags.

Which one of the following is correct?

a. Statement I is true but Statement II is false

b. Statement I is false but Statement II is true

c. Both the statements are true

d. Both the statements are false

# Question No: 15

Statement I: RFIDs are radio-frequency-based.

Statement II: RFID devices can act as both readers as well as tags.

Which one of the following is correct?

a. Statement I is true but Statement II is false

b. Statement I is false but Statement II is true

c. Both the statements are true

d. Both the statements are false

RFIDs are primarily radio-frequency-based, which can work even when they are not visible. These devices can’t act as both readers as well as tags.

# Question No: 16

In AMQP, which of the following functionality defines its component “exchange”?

a. linkage between various queues

b. receives messages from various queues

c. defines rules for message routing to various queues

d. routing the messages to various queues

# Question No: 16

In AMQP, which of the following functionality defines its component “exchange”?

a. linkage between various queues

b. receives messages from various queues

c. defines rules for message routing to various queues

d. routing the messages to various queues

Messages are not posted directly in the queue; rather, the user sends messages to the exchange. An exchange is responsible for routing the messages to the various queues.

# Question No: 17

Which of the following is designed to have low overhead and better scalability in terms of dense networks?

a. LOADng

b. RPL

c. Both LOADng and RPL

d. AODV

# Question No: 17

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b. RPL

c. Both LOADng and RPL

d. AODV

RPL is designed to have low overhead and better scalability in terms of dense networks.

# Question No: 18

Which of the following AMQP frame type controls the message flow rate?

a. Transfer

b. Flow

c. Control

d. Disposition

# Question No: 18

Which of the following AMQP frame type controls the message flow rate?

a. Transfer

b. Flow

c. Control

d. Disposition

“Flow” frame type controls the message flow rate.

# Question No: 19

Does 6LoWPAN allow interoperability between IEEE802.15.4-based wireless devices and other IP-based devices?

a. Yes

b. No

# Question No: 19

Does 6LoWPAN allow interoperability between IEEE802.15.4-based wireless devices and other IP-based devices?

a. Yes

b. No

6LoWPAN allows interoperability between IEEE802.15.4-based wireless devices, as well as other IP-based devices. 6LoWPAN simply uses a bridge to enable communication between other devices.

# Question No: 20

Does MQTT support event-driven architecture?

a. Yes

b. No

# Question No: 20

Does MQTT support event-driven architecture?

a. Yes

b. No

MQTT protocol uses a publish/subscribe architecture.
Publish/subscribe is event-driven and enables messages to be pushed to clients.

# Question No: 21

Which of the following is the acronym for “Extensible Messaging and Presence Protocol”?

a. EMPP

b. XMLP

c. XMPP

d. XMP

# Question No: 21

Which of the following is the acronym for “Extensible Messaging and Presence Protocol”?

a. EMPP

b. XMLP

c. XMPP

d. XMP

# Question No: 22

An IoT network requires communication mechanism, which is capable of synchronous as well as asynchronous communication. The mechanism should support both request-response, as well as publish-subscribe models. Which of the following protocol would be best suited for such a mechanism?

a. AMQP

b. CoAP

c. MQTT

d. None of these

# Question No: 22

An IoT network requires communication mechanism, which is capable of synchronous as well as asynchronous communication. The mechanism should support both request-response, as well as publish-subscribe models. Which of the following protocol would be best suited for such a mechanism?

a. AMQP

b. CoAP

c. MQTT

d. None of these

CoAP is capable of synchronous as well as asynchronous communication. It supports both request-response as well as publish-subscribe models.

# Question No: 23

Which of the following technique is used to transmit data frames in Beacon-enabled IEEE 802.15.4 networks?

a. unslotted CSMA/CA

b. slotted CSMA/CA

c. unslotted CSMA/CD

d. slotted CSMA/CD

# Question No: 23

Which of the following technique is used to transmit data frames in Beacon-enabled IEEE 802.15.4 networks?

a. unslotted CSMA/CA

b. slotted CSMA/CA

c. unslotted CSMA/CD

d. slotted CSMA/CD

The periodic transmission of beacon messages characterizes beacon enabled networks. Here, the data frames are sent via slotted CSMA/CA with a super-frame structure managed by a personal area network (PAN) coordinator.

# Question No: 24

What is the maximum size of hop limit in 6LoWPAN packet format?

a. 8-bit unsigned integer

b. 16-bit unsigned integer

c. 8-bit signed integer

d. 16-bit signed integer

# Question No: 24

What is the maximum size of hop limit in 6LoWPAN packet format?

a. 8-bit unsigned integer

b. 16-bit unsigned integer

c. 8-bit signed integer

d. 16-bit signed integer

Hop limit in 6LoWPAN packet format allows up to 8-bit unsigned integer. Decremented by 1 by each node that forwards the packet. The packet is discarded if Hop Limit is decremented to zero.

# Question No: 25

In the context of XMPP, which of the following correctly defines BOSH?

a. XML streaming

b. HTTP binding

c. Both XML streaming and HTTP binding

d. Binary encoding

# Question No: 25

In the context of XMPP, which of the following correctly defines BOSH?

a. XML streaming

b. HTTP binding

c. Both XML streaming and HTTP binding

d. Binary encoding

# Question No: 26

Which of the following protocol is used to implement device management for mobile devices?

a. OMA-DM

b. Websocket

c. Alljoyn

d. DNS-SD

# Question No: 26

Which of the following protocol is used to implement device management for mobile devices?

a. OMA-DM

b. Websocket

c. Alljoyn

d. DNS-SD

# Question No: 27

In LOADng, can intermediate routers respond to Route Requests (RREQs)?

a. Yes, in any case

b. Yes, only when RREQ flooding occurs

c. Yes, only if they have active routes to the sought destination

d. No

# Question No: 27

In LOADng, can intermediate routers respond to Route Requests (RREQs)?

a. Yes, in any case

b. Yes, only when RREQ flooding occurs

c. Yes, only if they have active routes to the sought destination

d. No

# Question No: 28

Statement I – The messaging sub-layer of CoAP, is responsible for reliability and duplication of messages.

Statement II – The request/response sub-layer is responsible for communication.

Which of the above statement/statements is/are correct?

a. Only Statement I

b. Only Statement II

c. Both Statement I and II

d. Statement I Correct but Statement II Incorrect

# Question No: 28

Statement I – The messaging sub-layer of CoAP, is responsible for reliability and duplication of messages.

Statement II – The request/response sub-layer is responsible for communication.

Which of the above statement/statements is/are correct?

a. Only Statement I

b. Only Statement II

c. Both Statement I and II

d. Statement I Correct but Statement II Incorrect

# Question No: 29

Which of the following is a messaging mode in CoAP?

a. Append

b. Substitute

c. Attempt

d. Separate

# Question No: 29

Which of the following is a messaging mode in CoAP?

a. Append

b. Substitute

c. Attempt

d. Separate

# Question No: 30

Which of the following provides for the discovery of services residing locally or across a network?

a. Internet

b. SMQTT

c. XMPP

d. CoAP

# Question No: 30

Which of the following provides for the discovery of services residing locally or across a network?

a. Internet

b. SMQTT

c. XMPP

d. CoAP

# Question No: 31

AMQP is a protocol of which layer?

a. Transport Layer

b. Application Layer

c. Network Layer

d. Session Layer

# Question No: 31

AMQP is a protocol of which layer?

a. Transport Layer

b. Application Layer

c. Network Layer

d. Session Layer

# Question No: 32

Which of the following is NOT a feature of the AMQP protocol?

a. Closed Standard

b. Security

c. Reliability

d. Routing

# Question No: 32

Which of the following is NOT a feature of the AMQP protocol?

a. Closed Standard

b. Security

c. Reliability

d. Routing

# Question No: 33

There are a total of _____ number of AMQP frame types are defined that are used to initiate, control, and tear down the transfer of messages between two peers.

a. Seven

b. Eight

c. Nine

d. None of these

# Question No: 33

There are a total of _____ number of AMQP frame types are defined that are used to initiate, control, and tear down the transfer of messages between two peers.

a. Seven

b. Eight

c. Nine

d. None of these

# Question No: 34

The function/functions of the Queue component of the AMQP protocol is/are -

a. Receive messages and route them to queues

b. Separate queues for separate business process

c. Consumer receive messages from queues

d. Both (b) and (c)

# Question No: 34

The function/functions of the Queue component of the AMQP protocol is/are -

a. Receive messages and route them to queues

b. Separate queues for separate business process

c. Consumer receive messages from queues

d. Both (b) and (c)

# Question No: 35

In the context of XMPP, which of the following correctly defines BOSH?

a. XML streaming

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c. Both XML streaming and HTTP binding

d. Binary encoding

# Question No: 35

In the context of XMPP, which of the following correctly defines BOSH?

a. XML streaming

b. HTTP binding

c. Both XML streaming and HTTP binding

d. Binary encoding

# Question No: 36

Does MQTT support event-driven architecture?

a. Yes

b. No

# Question No: 36

Does MQTT support event-driven architecture?

a. Yes

b. No

# Question No: 37

Which of the following is the acronym for “Extensible Messaging and Presence Protocol”?

a. EMPP

b. XMLP

c. XMPP

d. XMP

# Question No: 37

Which of the following is the acronym for “Extensible Messaging and Presence Protocol”?

a. EMPP

b. XMLP

c. XMPP

d. XMP

# Question No: 38

An IoT network requires communication mechanism, which is capable of synchronous as well as asynchronous communication. The mechanism should support both request-response, as well as publish-subscribe models. Which of the following protocol would be best suited for such a mechanism?

a. AMQP

b. CoAP

c. MQTT

# Question No: 38

An IoT network requires communication mechanism, which is capable of synchronous as well as asynchronous communication. The mechanism should support both request-response, as well as publish-subscribe models. Which of the following protocol would be best suited for such a mechanism?

a. AMQP

b. CoAP

c. MQTT

# Question No: 39

Which of the following technique is used to transmit data frames in Beacon-enabled IEEE 802.15.4 networks?

a. unslotted CSMA/CA

b. slotted CSMA/CA

c. unslotted CSMA/CD

d. slotted CSMA/CD

# Question No: 39

Which of the following technique is used to transmit data frames in Beacon-enabled IEEE 802.15.4 networks?

a. unslotted CSMA/CA

b. slotted CSMA/CA

c. unslotted CSMA/CD

d. slotted CSMA/CD

# Question No: 40

What is the maximum size of hop limit in 6LoWPAN packet format?

a. 8-bit unsigned integer

b. 16-bit unsigned integer

c. 8-bit signed integer

d. 16-bit signed integer

# Question No: 40

What is the maximum size of hop limit in 6LoWPAN packet format?

a. 8-bit unsigned integer

b. 16-bit unsigned integer

c. 8-bit signed integer

d. 16-bit signed integer

# Question No: 41

Which of the following is based on the publish-subscribe model?

a. MQTT

b. HTTP

c. HTTPS

d. All of these

# Question No: 41

Which of the following is based on the publish-subscribe model?

a. MQTT

b. HTTP

c. HTTPS

d. All of these

# Question No: 41

Which of the following is based on the publish-subscribe model?

a. MQTT

b. HTTP

c. HTTPS

d. All of these

# Question No: 42

In MQTT, a topic to which a client is subscribed is updated in the form of messages and distributed by the _____?

a. Publishers

b. Message Broker

c. Subscribers

d. All of these

# Question No: 42

In MQTT, a topic to which a client is subscribed is updated in the form of messages and distributed by the _____?

a. Publishers

b. Message Broker

c. Subscribers

d. All of these

# Question No: 43

Which of the following is used when more than one level needs to be subscribed, such as the entire sub-tree, i.e., a multilevel wildcard?

a. +

b. #

c. \

d. None of these

# Question No: 43

Which of the following is used when more than one level needs to be subscribed, such as the entire sub-tree, i.e., a multilevel wildcard?

a. +

b. #

c. \

d. None of these

# Question No: 44

The CoAP protocol is designed for -.

a. Heavy Web Application

b. Publish-Subscribe Applications

c. Machine-to-Machine (M2M) applications

d. Both (a) and (b)

# Question No: 44

The CoAP protocol is designed for -.

a. Heavy Web Application

b. Publish-Subscribe Applications

c. Machine-to-Machine (M2M) applications

d. Both (a) and (b)

# Question No: 45

Which of the following statements is/are false?

Statement – I: IEEE 802.15.4 is a well-known standard for low data-rate Wireless

Personal Area Network (WPAN).

Statement – II: IEEE 802.15.4 standard operates in the ISM band.

a. Statement - II

b. Statement - I

c. Both Statement I and II

d. None of these

# Question No: 45

Which of the following statements is/are false?

Statement – I: IEEE 802.15.4 is a well-known standard for low data-rate Wireless

Personal Area Network (WPAN).

Statement – II: IEEE 802.15.4 standard operates in the ISM band.

a. Statement - II

b. Statement - I

c. Both Statement I and II

d. None of these

# Question No: 46

The IEEE 802.15.4 establishes functionalities in which layers?

a. Application and Session Layers

b. Transport and Data Link Layers

c. Network and Session Layers

d. Physical and Data Link Layers

# Question No: 46

The IEEE 802.15.4 establishes functionalities in which layers?

a. Application and Session Layers

b. Transport and Data Link Layers

c. Network and Session Layers

d. Physical and Data Link Layers

# Question No: 47

State whether the following statement is True or False.

Statement: Similar to traditional barcodes and QR codes, RFID tag data cannot be read outside the line-of-sight.

a. False

b. True

# Question No: 47

State whether the following statement is True or False.

Statement: Similar to traditional barcodes and QR codes, RFID tag data cannot be read outside the line-of-sight.

a. False

b. True

# Thank You