IoT Protocols

IoT Lecture 4

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- The final responsibility of the transport layer is to maintain the connection already established. A connection is typically left open while packets and acknowledgments are traded back and forth. Closing the connection usually occurs by an explicit command from the source resource, indicating that the session should close, or because of a timeout.

TCP Segment Header Format

Bit #	0 – 7	8 – 15	16 – 23	24 – 31
0	Source Port		Destination Port	
32	Sequence Number			
64	Acknowledgement Number			
96	Data Offset	Res	Flags	Window Size
128	Header and Data Checksum		Urgent Pointer	
160...	Options			

UDP Datagram Header Format

Bit #	0 – 7	8 – 15	16 – 23	24 – 31
0	Source Port		Destination Port	
32	Length		Header and Data Checksum	

Transmission Control Protocol (TCP)

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- The congestion control capability of TCP helps in avoiding network congestion and congestion collapse which can lead to degradation of network performance.

User Datagram Protocol (UDP)

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- UDP is a best-effort protocol that allows packet transmissions with minimum reliability.
- UDP is “lightweight" - there is no ordering of messages, no tracking connections, and so on. In other words, UDP does not have an option for flow control.

Application Layer

Application layer protocols define how the applications interface with the lower layer protocols to send the data over the network. The application data, typically in files, is encoded by the application layer protocol and encapsulated in the transport layer protocol which provides connection or transaction oriented communication over the network. Port numbers are used for application addressing (for example port 80 for HTTP, port 22 for SSH, etc.). Application layer protocols enable process-to-process connections using ports.

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- HTTP protocol uses Universal Resource Identifiers (URIs) to identify HTTP resources.

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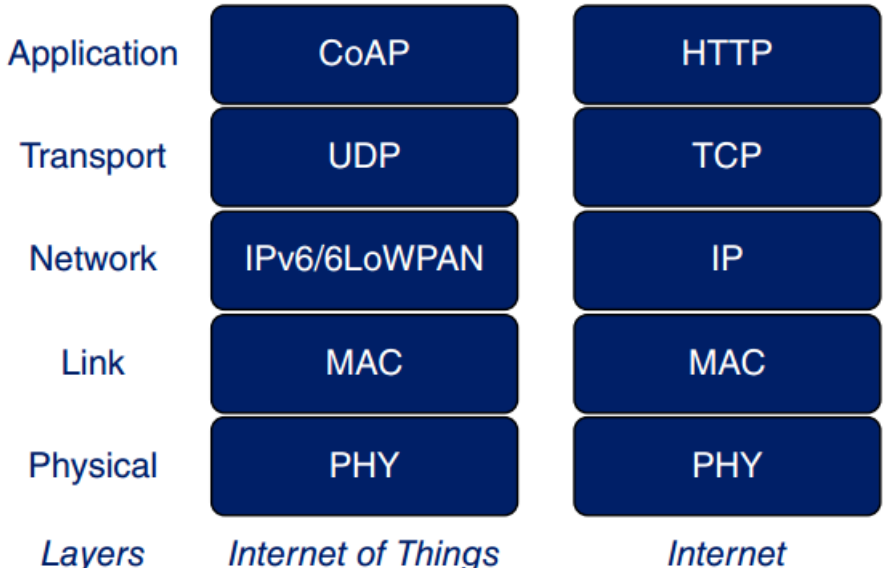
- Asynchronous message exchanges, Support for URI and content-types


Application
Transport
Network
Link
Physical
Layers
CoAP
UDP
IPv6/6LoWPAN
MAC
PHY
Internet of Things
HTTP
TCP
IP
MAC
PHY
Internet

Message Queue Telemetry Transport (MQTT)

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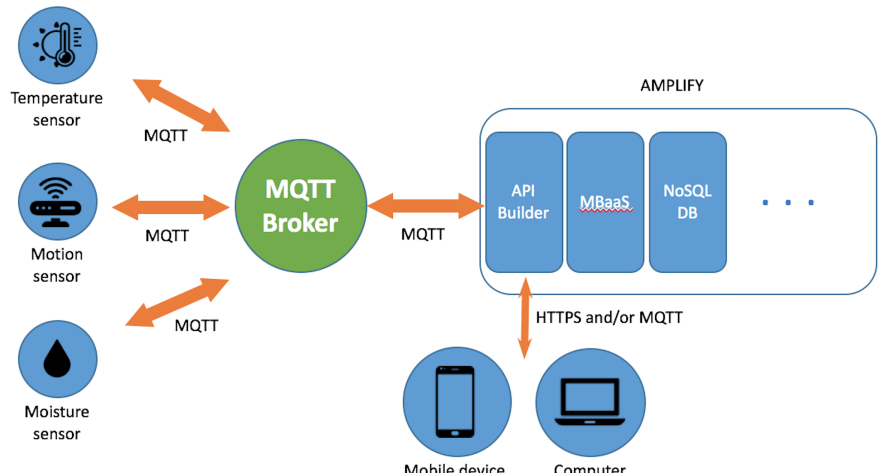
- MQTT is well suited for constrained environments where the devices have limited processing and memory resources and the network bandwidth is low.


Temperature sensor
MQTT
Motion sensor
MQTT
Moisture sensor
MQTT
MQTT Broker
MQTT
AMPLIFY
API Builder
MBaaS
NoSQL DB
HTTPS and/or MQTT
Mobile device
Computer

WebSocket

WebSocket protocol allows full-duplex communication over a single socket connection for sending messages between client and server. WebSocket is based on TCP and allows streams of messages to be sent back and forth between the client and server while keeping the TCP connection open. The client can be a browser, a mobile application or an IoT device.

Extensible Messaging and Presence Protocol (XMPP)

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- In the context of IoT, XMPP allows real-time communication between IoT devices.

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- DDS provides quality-of-service (QoS) control and configurable reliability.

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- Messages are either delivered by the broker to the consumers which have subscribed to the queues or the consumers can pull the messages from the queues.