

IOT ARCHITECTURE PATTERNS AND DATA PROTOCOLS

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IIoT (Internet of Things) and its industrial implementation (IIoT) are mainstream technologies that change all things around us. As expected in the next ten years, more than 200 billion IoT devices will be manufactured around the world. There are some patterns for the IoT architecture: request/response (R/R); event subscription (ES); asynchronous messaging (AM); reliable messaging (RM); multicasting (MC); publish/subscribe (P/S); message brokers (MB); federation (F); discovery (D); delegation of trust (DT); queues (Q) [1]. Each of these patterns can be implemented with various data protocols (*application, presentation and session layers* in the OSI model). "Big" IIoT devices (kinds of controllers, routers, sensors, actuators etc.) use various protocols: MQTT (Message Queuing Telemetry Transport), CoAP (Constrained Application Protocol), XMPP-IoT (Extensible Messaging and Presence Protocol), AMQP (Advanced Message Queuing Protocol). For "small" smart devices with primary functions of sensing and identification this protocols may not be suitable because they are expensive for both energy and traffic consumption.

Table 1

Properties of the some IoT data protocols

Protocol	CoAP/ RESTful	XMPP-IoT	AMQP	MQTT, MQTT-SN
Patterns	R/R; ES; P/S; RM*	R/R;ES;AM; RM*; MC; P/S; MB; F; D*; T*	AM; RM; MC; P/S; Q; MB	RM; P/S; MB
Transport	UDP/TCP	TCP	TCP	TCP
Security	DTLS/ SSL	SSL, TLS	SSL, TLS	SSL, TLS
Constr. dev	yes	yes**	no	yes
QoS	yes/no	yes*	yes	yes
Header size	4 bytes /-	-	8 bytes	2 bytes
Free or OSS libs	libcoap JS(node-coap)	JS (node.js), XMPP-IoT	RabbitMQ	Eclipse Mosquitto
Free cloud	Californium	-	CloudAMQP	CloudMQTT

*Available via extensions, **Implementation depended

As shown in table 1, XMPP-IoT is most flexible protocol for IIoT, but it is less popular due there is no public business-to-customer ready-to-use solutions. Many free and open source server/client libraries are used for the rapid IoT infrastructure development. Some IoT test servers and cloud-based services are free to use, but as a rule, they has limited features – traffic, numbers of connection and data privacy.

Reference:

1. Waher P. Choose the Right Communication Pattern for Your IoT Project / Waher P. – [Electronic source]. – Available: <https://software.intel.com/en-us/articles/communication-patterns-for-the-internet-of-things>.