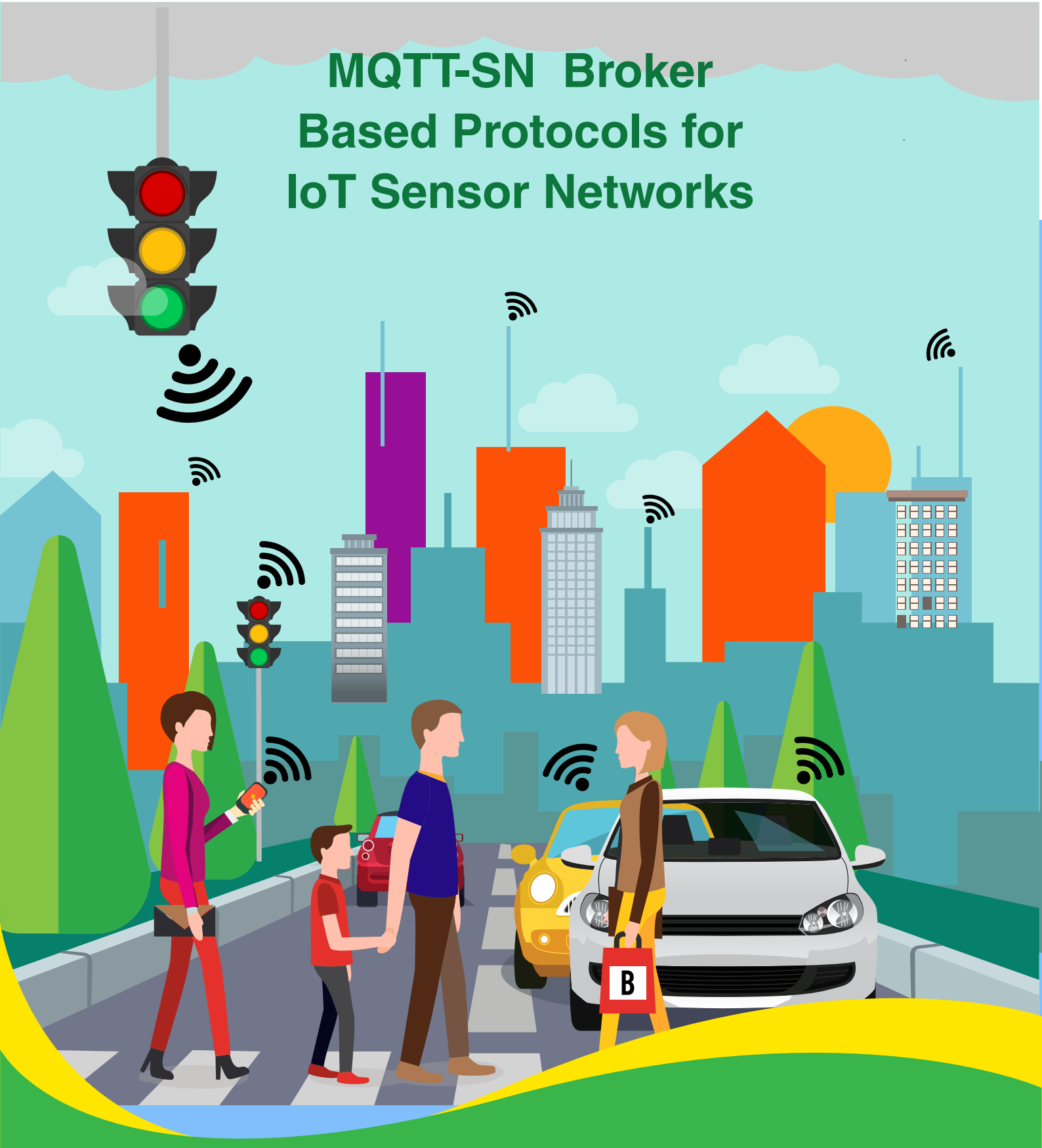


MQTT-SN Broker Based Protocols for IoT Sensor Networks



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Introduction

In the world of [M2M and IoT protocols](#), there are many competing protocols vying for attention. These protocols are designed to be light-weight for the low power devices to take advantage of low bandwidth constraints of the M2M world. One such proto-col which is specifically designed for very low power M2M devices is MQTT-SN. The SN in the name indicates that this proto-col is specifically designed for sensor networks. The fact that the headers and footers of the existing Internet based protocols is a huge overhead is taken into account while designing this MQTT-SN protocol.

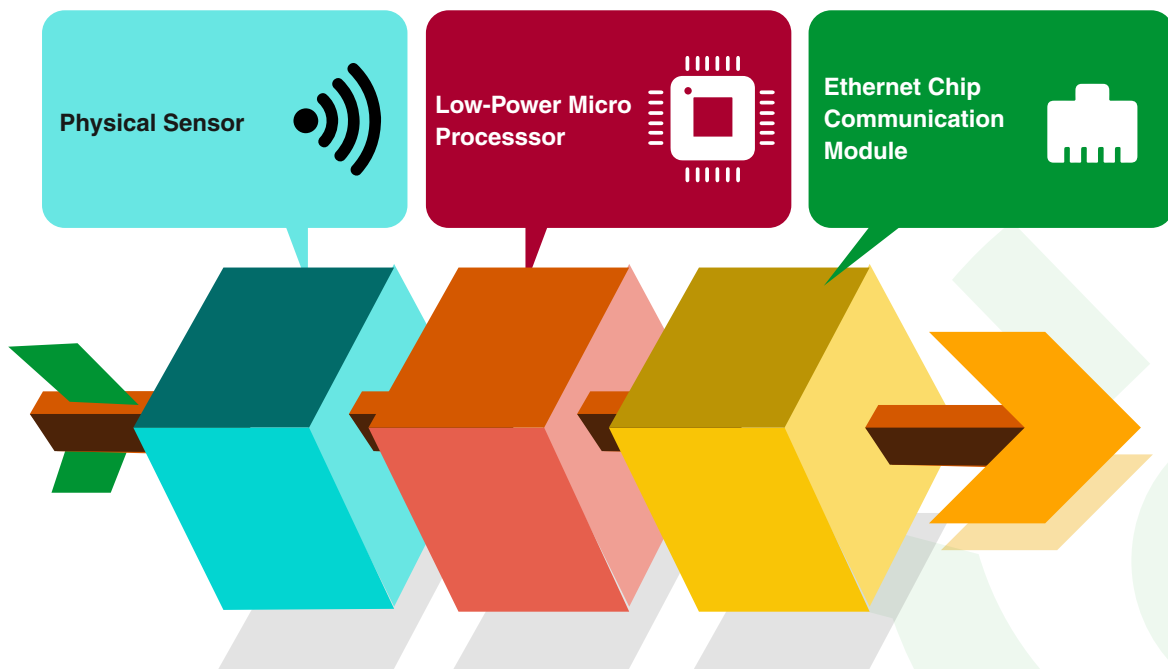
MQTT and MQTT-SN

People usually confuse themselves when they hear about MQTT and MQTT-SN. Both are not same. MQTT is the protocol which was designed to be light weight protocol for [M2M](#), but it needs TCP-IP to operate. Even though MQTT is claimed to be a light weight protocol which is the reality, however it is not suitable for sensors and devices that cannot hold their own TCP-IP stack. As all know, TCP is a heavy protocol which guarantees, among other things, time to live for the packets, retry mechanisms, big payload etc., which are not specifically required for some M2M networks.

Hence the MQTT-SN was born. The MQTT-SN was specifically for sensor networks and does not depend on TCP-IP for it to operate. It can operate over any transport layer such as ZigBee as well.

Why TCP is heavy for sensor networks

The sensor networks typically will have a node with a low power processor, and the flash memory will be of few KB. For the sensor node to communicate, which is mandatory to any sensor node, it needs at least an Ethernet chip or a GPRS modem. These two are way more complex in operation, power consumption etc. the cost of the whole set-up usually jacks up a few order of magnitude. The complexity of the design increases and each and every node needs to have a TCP-IP stack based sub-unit to function effectively. This is illustrated in the diagram below.



Depiction of the flow from the sensor to the processor and to the cloud.

Hence a need was felt to create a protocol which does not rely on TCP-IP and still provides value in terms of being robust enough to carry data in the M2M domain.

MQTT-SN to the rescue

As seen earlier, the guarantees provided by TCP-IP protocol is rather heavy weight for the M2M sensor networks. So the solution seems to be a protocol which can ride on top of any other light-weight protocol. But there is a catch. Where will be the requirements fit in and how they will be implemented when the base protocol does not guarantee those robustness? The answer is that these will be implemented as and when required, in the application layer. Neat.

The communication with different entities in a network will take place without TCP-IP and when the communication with the cloud or certain such entity is required, then a gateway with MQTT-SN at the one side of the suite and the TCP-IP and the other end of the suite will be the requirement of the day.

Now – Details

At the core, the MQTT-SN is a broker based protocol. MQTT-SN improves upon the base MQTT by adding many new features such as error status, concise message header etc. The broker acts as a conduit and controls the message to and from the client based on pub-sub mechanism and registration of topics. Even if very few clients are connected, the above said mechanism is necessary to support robustness. To reduce the size of the payloads, the data packets are numbered by numeric topic ids rather than long topic names. This particular feature which is different from the MQTT reduces the readability of the topics, but elegantly reduces the size of the packets. The negotiation for the topic ids has to happen from the client side. The protocol does not guarantee any kind of operation when a restart happens, which might have erased all the topics. These kind of operations has to be taken care at the application level.

Conclusion

This summarises the MQTT-SN protocol and is supported by few platforms. This may change in future when the traction for light weight protocols accelerate in the M2M domain. There are many other protocols which does not need TCP, but need IP to co-ordinate, but MQTT-SN protocol seems to be the only kid in the block which does not even need IP for communication.



About the Author



Shanmugasundaram M

Shanmugasundaram.M (Shan) is a prolific inventor and creator of many products and who possesses 15 patents in the areas of telecoms, automotive (OBD II, J1939 etc.), M2M etc. Possess 14 years of IT industry experience in the areas of R&D (telecoms, automotive, M2M etc.), filing patents, inventions, converting inventions to successful products, customer Projects and maintenance Projects. An accomplished master and successful implementer in M2M (**Machine to Machine**) technologies who proved himself again and again in creating and deploying real world cutting edge M2M products. Some of the products are Logica EMO, Static Asset Monitoring, and Retail Innovations etc.

These inventions won numerous awards including Golden Peacock award, Nasscom award, The Economist award etc. These inventions provided Logica with much needed global exposure in many different domains including automotive technologies.

Shan and his inventions have been covered in leading publications in India and abroad such as in

- Times of India (<http://bit.ly/ROS43M>)
- Hindustan Times
- The Economist (<http://bloom.bg/Uvg74g>)
- Electronics for You
- The Live Mint (<http://bit.ly/VHsW02>) etc.

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Headquartered in Bangalore, India; Happiest Minds has operations in USA, UK, The Netherlands, Australia and Middle East.

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