

# Application Specific IoT standardisation and IETF : The Algorithm of the Ecosystem

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Internet-of-Things (IoT) or Machine-to-Machine (M2M) - whatever you may call it - essentially has created a major shift from the human-centric nature of Internet and has made machines (in many cases - tiny sensors) a major producer as well as consumer of the Internet traffic. Thanks to miniaturisation of the semiconductor devices and the innovations around wireless communication. Like the conventional Internet, this paradigm shift also needs standardisation of the Internet protocols for obvious reasons. However, IoT / M2M has opened up the possibilities of numerous application ideas utilising the Internet communications (IP-based communication - to be more generic). So, several application specific need for standardisation has also emerged. This article tries to model the interaction/ liaison pattern between these application specific standardisation efforts and the IETF.

## **The IETF at the heart of Internet**

When the Internet was migrated from a research project to a common communication mechanism to connect computers across the globe, IETF (Internet Engineering Task Force), which has been producing standards for the Internet since 1986, became a pivotal entity. Different mode of telecommunication mechanisms considered Internet as the conduit to reach peers globally. The offerings from different SDOs started to incline towards more and more 'IP-centric' approach. IETF impacted the activities of the other

SDOs as well. The collaboration between IETF and other important SDOs like ITU-T, 3GPP, etc., are started from early 1990s. There has been several RFCs describing IETF's relationship with respective SDOs. For example, RFC7241 formulates the mode of collaboration between IETF and IEEE. RFC3113 provides the set of guidelines and principles for collaboration between IETF and 3GPP. RFC6756 does the same for collaboration between IETF and ITU-T. All these guidelines are defined by the Internet Architecture Board (IAB) which acts as an advisory body to the Internet Society (ISOC). With the new paradigm of IoT, this collaboration approach has even more strengthened.

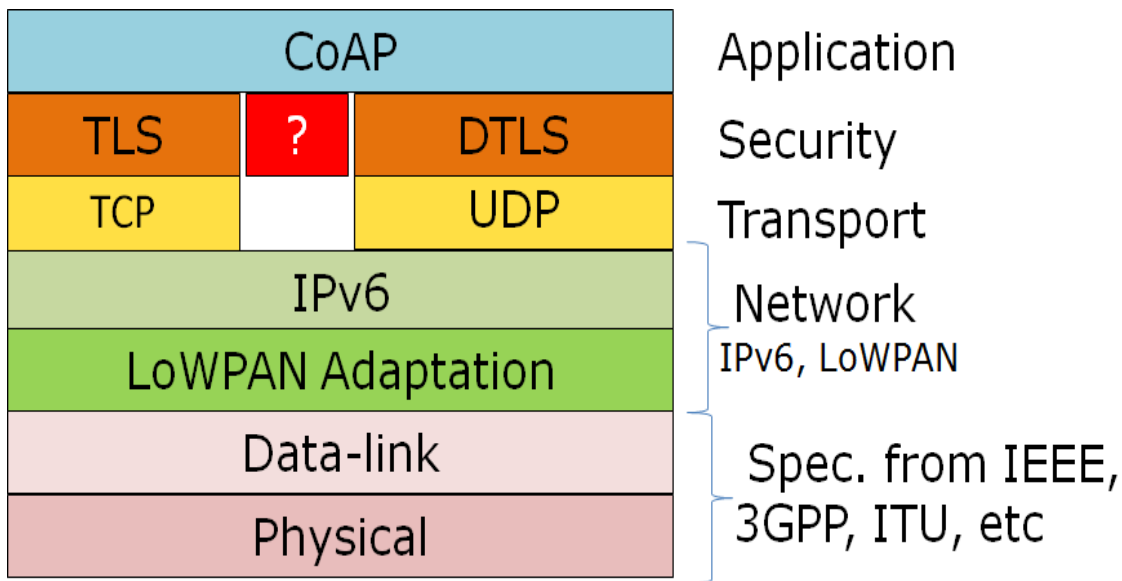
### **The generic stack for IoT from IETF**

The scope of IETF is "above the wire and below the application". Thus, IETF is a complementing organisation to IEEE, 3GPP and ITU by creating the enabling protocols that actually connect the constrained nodes in a constrained environment in an efficient manner on top of the available physical and data-link layer technologies from other SDOs working in that area. IETF has IoT specific protocol offerings for every layer within its purview.

Security consideration is an integral part of any IETF document. IETF uses standardised transport layer security protocols like Transport Layer Security (TLS) and Datagram Transport Layer Security (DTLS) depending on whether Transport Control Protocol (TCP) or User Datagram Protocol (UDP) is used respectively. The security mode (pre-shared key, certificate based security, etc.) needs to be chosen depending on the device and network capability.

However, proper security protocol solution, optimised for constrained devices, is still an open issue as TLS and DTLS are primarily not designed for constrained environments. It is an open area of research and the question mark

in the figure below indicates this open aspect. Solutions are now being discussed in relevant working groups to fill this gap.

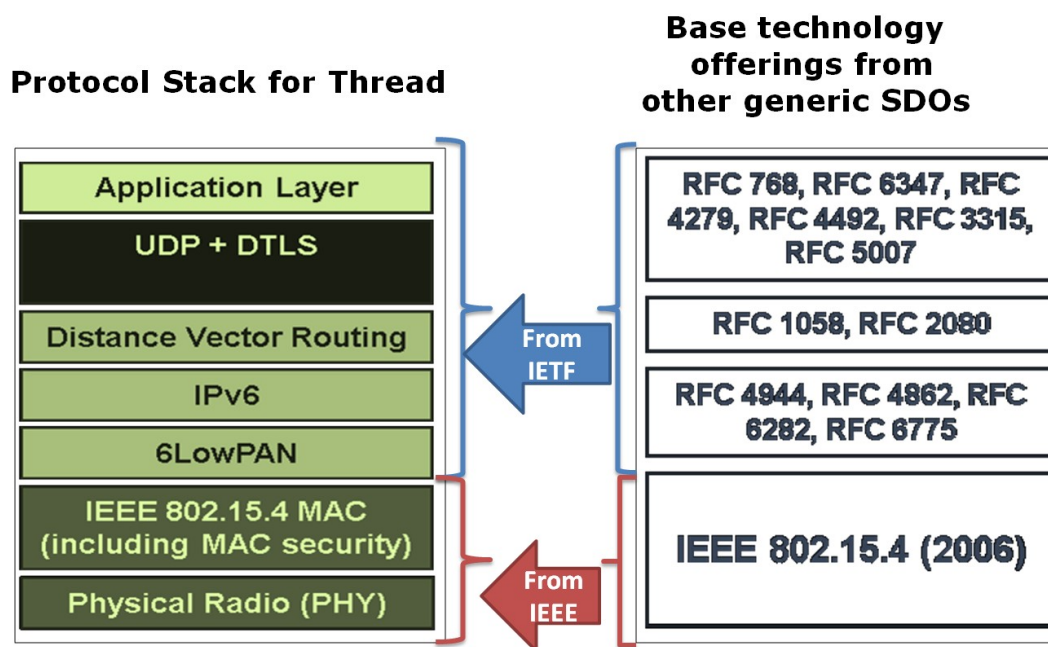


In recent times, IETF has been active in creating specific standards for wide area technologies for IoT known as LPWAN. The IPv6 over LPWAN Working Group has been formed to optimise the IETF protocol offerings for the different lower layer technologies on Low Power Wide Area Network, as well as to define the upper layer exchanges and signalling using the existing protocol offerings. The objective of such initiatives is to tailor the existing IETF offerings in order to cater the specific requirements to enable IP compatibility for specific access technology. We need to watch out for the progress.

### **What exactly the application specific standardisation efforts try to do?**

There are alliances and SDOs with a specific task to fill up certain gaps while using the standard offerings for a specific technology. One example is the Fairhair Alliance which is dedicated towards standardizing the technologies for lighting control and building automation (specific security handshakes, typical

supports for multicast, exclusive protocol level optimizations, etc.). The core technologies and protocols are based on the generic IoT specific offerings from IETF, IEEE, 3GPP, etc. Another important participant in this alliance is the 'THREAD Group' which is developing standard technologies behind Home Automation / Smart Home solutions. These alliances are bridging important application specific gaps for interoperability of edge devices in smart homes. The following figure shows how the THREAD-group stack depends on the IETF RFCs.

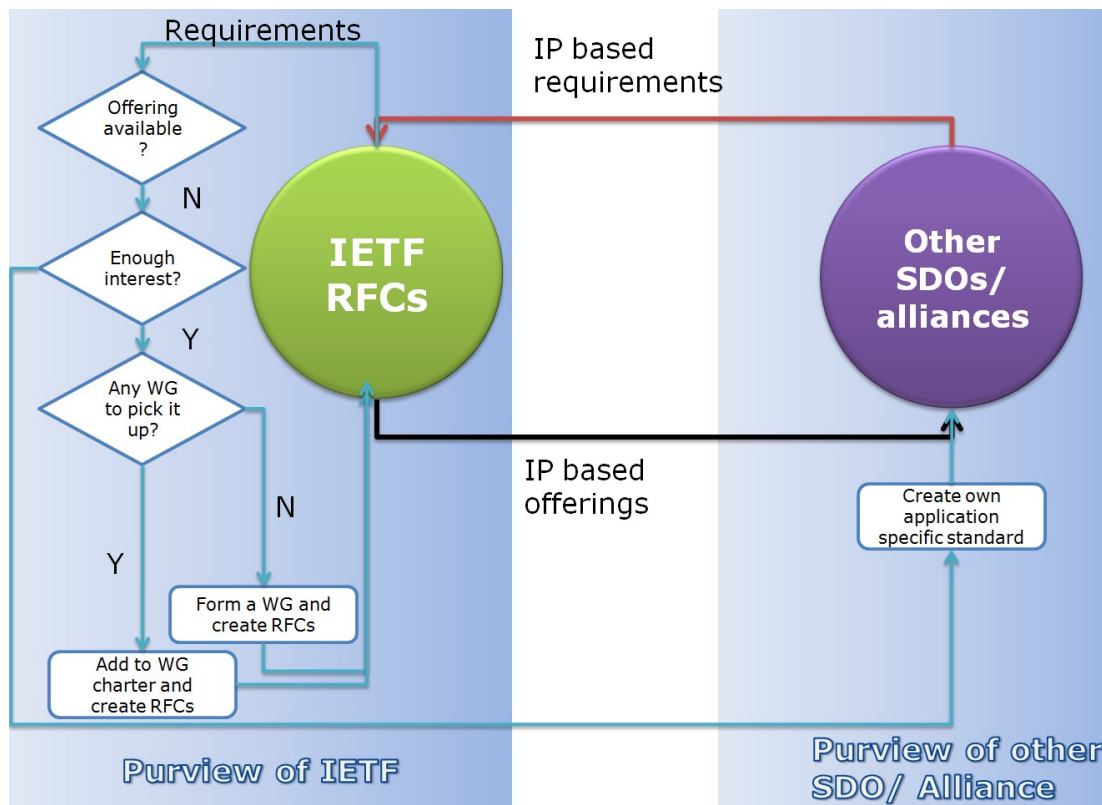


### The Mutual Interaction Mechanism

While there are specific modalities of operation between IETF and other SDOs like IETF, ITU, 3GPP, etc., such formal arrangement may not be specified for all the efforts sprawling for different applications. However, all of them have to depend on IETF for the core Internet protocols and the interaction happens as voluntary efforts from people with common interest in both IETF and the respective alliance/ SDO. Sometimes, the WG charter is enhanced with specific requirements from such SDOs if the sought after solution has a large enough

impact to cover several application domains to justify it as a work item in IETF. Sometimes the interested people in the community form a new WG if the initiative gets a significant support from the community around IETF. The LPWAN WG is such an example. Sometimes, the individual SDOs create bridging specifications to fill in the required gaps on top of the relevant IETF offerings if the sought-after solution is too application specific.

The interaction can be modelled as shown in the simple figure below:



In today's rapidly progressing world this loosely defined interaction model between IETF and other SDOs is poised to create lot more future standards dealing with specific problems in the IoT domain.

(To read more about current status and future direction of IoT standardisation, including Indian perspective, stay tuned for the upcoming book chapter: A. Pal, H. K. Rath, S. Samar, A. Bhattacharyya, "IoT Standardization - the Road Ahead

", to be published in the upcoming book "The Internet of Things" (ISBN 978-953-51-5945-2) .