IP challenges in LPWANs

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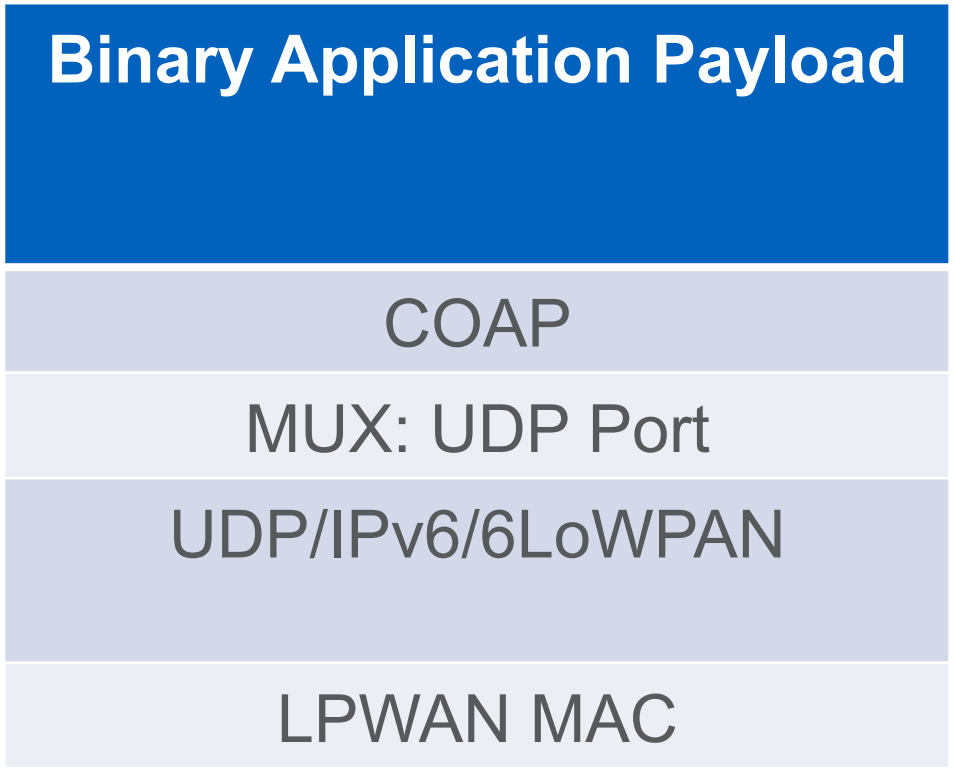
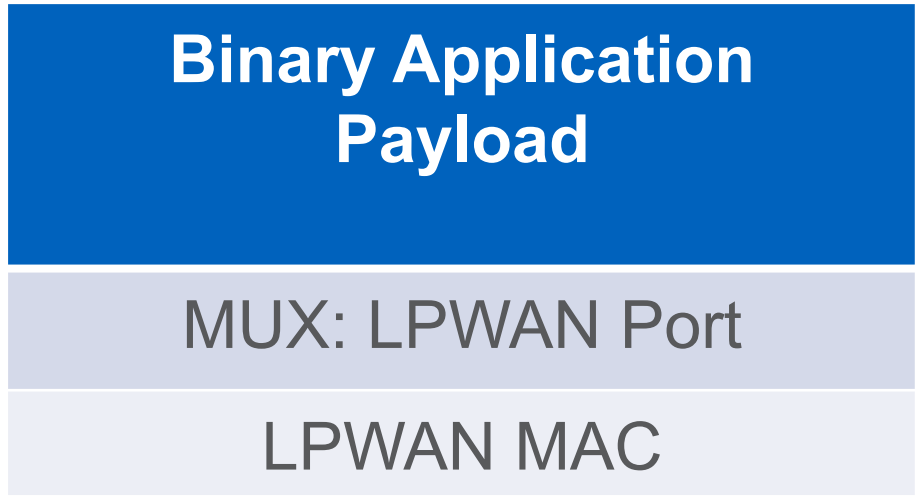
Counting the Cost of IP: Bandwidth/Power Overhead/Memory



4 Byte COAP header
(MUX based on UDP Port)
4->20+ Byte Compressed
UDP/IPv6 Header

EU863-870 with SF10/11/12 has a maximum payload of 51 bytes, i.e., compressed IP/UDP/COAP header equate to 21% of payload



6LoWPAN IP/DTLS/COAP/LWM2M stack drives additional memory requirements, e.g., Wakaama + tiny DLTS:

+70-90 KB Flash +15-25 KB RAM

No IP: The Remote I/O model

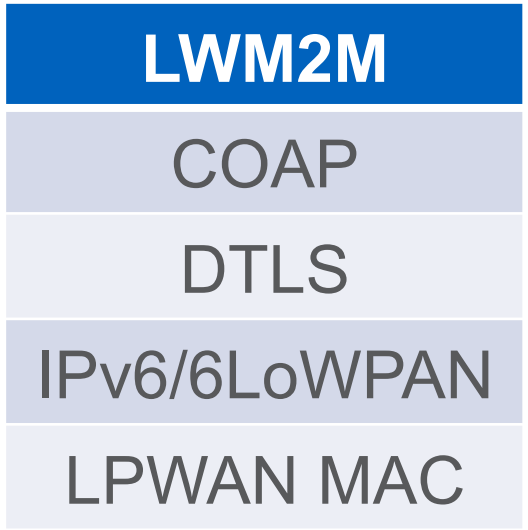
Many Wireless protocols in LPWAN and others have this non–IP last hop

e.g. LoRA, WirelessHART…

Similar to a serial port on a PC, addressable via a port number on the PC's address

Desire to insert L3/4 at the PC | G/W, but no standards for that

Counting the Benefits of IP (Device Manageability)



- OMA standard for lightweight IoT Device management
- Device reboot, factory reset
- Monitoring of network connectivity
- Firmware update
- Location

Note: non-IP alternatives include ZCL/Basic (factory reset) and ZCL/OTA Upgrade (firmware update) as well as alternative (non-IP) transports for LWM2M/CoAP being defined

Leveraging COAP and IETF

CoAP can serve as transport for the join process. Value is reuse of IETF standards for authentication and security (ANIMA, COSE…)

CoAP can also serve as application level mux, transport authentication flows, and do a minimum session level block flow Control (SNA get out of this body).

ROHC vs. 6LoWPAN? We'd want the best of both worlds.

6LoWPAN's agility to compress multiple flows and ROHC's capability to compress things down to 1-2 octets all the way to the CoAP space.

=> extend the concept of context to a whole header, reuse ROHC's thinking for the predictable fields, yet keeping a minimal signaling to indicate which context is used to enable multiple flows with preprogrammed compression.

LPWAN devices will probably have a very minimum number of headers that they can actually and repeatedly generate or parse, and these would be compressed better than what IPHC achieves.

Yet we cannot afford a permanent, on-demand for each new flow, learning phase. We want to remove the reactive learning phase completely from the runtime as the 6BBR does for address resolution. And we probably want to replace it by a proactive form of registration whereby the devices indicates a table of well-known headers (including URIs) that it can generate and another of the headers that it supports.

And these could be elided using a context ala ROHC, including the variable part when we can, or compressed to less bits like LSB in a sequence counter.

But we'd still need to carry a context index like that of IPHC as opposed to the assumption of a continuous flow. What we lose from RoHC with that index and some variable parts, we may save on COAP.

So, neither IPHC nor ROHC but a best of both worlds, IOW proactive, stateful, indexed like IPHC, and capable to compress more, and including variable parts, like ROHC.

Interacting with other SDOs

Groups such as LoRaWAN c/Should work in concert. LPWAN would help establish strong ties between the entities to share the work.

An example of such ties is the relationship between 6TiSCH and 802.15.4. IEEE has established an interest group and we have active cross participation which is really beneficial for the work, including the capacity to transfer items from one SDO to the other.