The drastic limitations of Sigfox and LoRa that nobody is talking about

ANTHONY GLUCINA, PRESIDENT, DEFINE INSTRUMENTS

In the last year there has been much discussion about the increasing demand for low power long-range wireless devices to serve the need of the emerging IIoT market.

This technology is collectively known as LPWA (Low Power Wide Area) and the main players (and unsurprisingly, those making the most noise) in this category are Sigfox, LoRa, CAT-M1 and NB-IOT technology.

While evangelists for these respective technologies naturally claim that theirs is the one true solution, all is not as it seems.

This paper discusses the issues surrounding Sigfox and LoRa specifically – another article will examine those around CAT-M1 and NB-IOT.

The goal of LPWA technology

LWPA technology used in Sigfox and LoRa is low cost, straightforward and requires no deep technical knowledge.

The proposition is that LPWA devices can be deployed in the field without needing connection to a power source and will continue to function on battery power for around 10 years.

Connected directly to a sensor (e.g. temperature sensor) or attached to an existing device (e.g. water or electricity meter) these LWPA instruments forward meaningful data to a base station which then transmits to the Cloud.

Deployment can be handled by those with basic technical knowledge and skills (No Engineering BSc required) and when the devices come to the end of their decade of service, they can either be disposed of, or have their battery replaced.

How the issue of compromise compromises these LPWA technologies

As with all technologies compromises have to be made to achieve the required results. Here are the notable ones.

The first major compromise that both Sigfox and LoRa have made is to elect to create products that only use unlicensed ISM (Industrial, Scientific, Medical) radio bands. These radio frequencies are freely available for anyone to use (provided they obey their country's RF regulations).

For SigFox and LoRa, the use of free ISM radio bands avoids the otherwise hefty license fees required for exclusive use of frequencies. Additionally, through this method they have garnered an advantage over competitors like cell phone companies who may have spent billions of dollars buying licenses for exclusive use of frequencies.

But herein lies the downside: by using unlicensed radio bands, control over bandwidth is lost. Even players as big as Sigfox and LoRa cannot force users of the same frequencies to curtail their usage should it become harmful or disruptive for their customers.

And with this volume of users no assumptions can be made about their behaviour, making it impossible to make future predictions. So the question is, will these providers be able to guarantee quality of service in decades to come?

Elimination of cell technology

Both Sigfox and LoRa use simple radio designs which use less silicon and therefore cost less to make. These designs deliver signals over very long distances, eliminating the need for cell type technology as signals can be picked up from a few gateways scattered around a city (this is referred to as a star topology).

In theory this reduces infrastructure costs enormously compared to cell technology but one of issues with this is that the devices continuously transmit on the highest power whether they need to or not (this is sometimes called “shout loud”) and has obvious negative implications for power savings, which will be discussed later.

The benefit of the shout loud approach means data can be picked up by distant gateways, however, this could - in the end - limit the amount of connections and data in the network.

Control of usage vs freedom of use

One of the big differences between Sigfox and LoRa is that Sigfox controls the base stations themselves whereas LoRA allows anyone to set up a network.

With Sigfox managing their own network they have some control over aspects like how many nodes are allowed to connect and the location of base stations.

By contrast many LoRa deployments are demonstrated on a building-wide network, using it simply as a local collator of data. This is a direction that LoRa seem to be increasingly heading towards.

This in some ways negates the benefits of reducing infrastructure costs by having long range devices. Using LoRa as a short range radio should at the very least deliver deep coverage across the building location. But what might be the consequences of such deployments using the unlicensed band?

An unlicensed radio band Deathmatch?

If this scenario is widely adopted and 10,000's of LoRa networks appear in buildings throughout a city, what would be the result? Will they potentially interfere with each other? Will they cause problems with other networks including Sigfox who are competing on the same band?

Research on this scenario is scant. However one paper concludes that this could potentially become a major problem for both these technologies.

The paper: *Bad Neighbours? A comparison of LPWA technology options* (see https://www.real-wireless.com/bad-neighbours-a-comparison-of-lpwa-technology-options/) suggests that LoRa and Sigfox do not play nicely together and that it is hard to predict the performance of both these systems, particularly if they intend to operate with many 100's or 1000's of concurrent networks in a city scenario.

Understanding some of the other compromises related to low power operation will be my next topic.