THOUGHT PIECE

Choosing a Communications Protocol For Loggers

Contact us
T 02380 111 420
E info@i2owater.com
2 Vancouver Wharf, Hazel Road
Woolston, Southampton, SO19 7BN, United Kingdom
www.i2owater.com

THOUGHT PIECE:

CHOOSING A COMMUNICATIONS PROTOCOL FOR LOGGERS

This thought piece considers the communication options available to anyone deploying battery-powered sensors on water distribution networks.

INTRODUCTION

It is a difficult time for any industry to make this choice, as we are at an inflection point where existing communication standards are being turned off to be replaced by newer technologies. Rather than a smooth transition, industry inaction, along with the emergence of new competitors, means that it is unclear which options will prevail in the long-term. Any choice at this point needs to take account of timeframe and the business opportunity just as much as the choice of technology.

The only sensible choice of technology at this point for permanently deployed, battery powered communicating sensors with an anticipated life of 5 years is to utilise existing mobile communication networks. The alternative is to pay a significant premium for more expensive, longer-term mobile solutions, or take a big risk with the emerging Sigfox and LoRa standards.

CHOICE OF COMMUNICATION STANDARD

For years, the only real options for data transfer from permanently deployed battery powered communicating sensors have been SMS for very small data volumes, or GPRS for larger data transfer, both using the 2G mobile communications networks. But 2G networks are reaching their end of life or actively being decommissioned to free up spectrum for 4G. That removes the standard options for connectivity which have been in use for the past 15 years. Unfortunately, replacement cellular standards, in the form of LTE-M and NB-IoT for 4G are still in their early stages and are likely to evolve in the next few years, potentially becoming incompatible with the early products which are becoming available on the market. Other new, proprietary offerings, such as Sigfox and LoRa, have seen this gap in the connectivity market and are trying to establish rival networks for low power remote sensor applications.

MOBILE CELLULAR COMMUNICATIONS

MAINSTREAM STANDARDS – 2G, 3G, 4G, 5G

GPRS has been the M2M (Machine to Machine) communications option of choice for the past fifteen years. An extension of the original 2G GSM standard, it is relatively low cost in terms of hardware and annual data costs. The issue is that it is being, or has been, turned off by networks around the world, as mobile operators reuse the spectrum for higher capacity 4G networks.

Most network operators are also looking to turn off their 3G networks for the same reason - 4G offers more bandwidth and greater subscriber numbers for the same amount of spectrum. In Europe, it is possible that some mobile operators may turn off their 3G networks before they turn off 2G, as they focus on working out migration strategies for their M2M customers.

3G and 4G modems are more expensive than 2G modems, with 3G being less expensive than 4G. As each standard needs to be backwards compatible with all previous standards, both the cost and power consumption rises as you move from 2G to 3G to 4G. For moderate volumes, the basic modem hardware costs around $10 per device for GPRS, $20 for 3G and $35-$40 for a 4G modem.

Although it is generating a lot of media coverage, it's far too early to consider 5G. It is still largely an academic and marketing exercise, with different companies pushing their preferred technology options as the standard begins to evolve. All we can be sure of it that it is likely to be higher power and more expensive than 4G for at least the next decade.

Contact us
T (+44) 02380 111 420
E info@i2owater.com

2 Vancouver Wharf, Hazel Road, Woolston
Southampton, SO19 7BN, United Kingdom
www.i2owater.com

THOUGHT PIECE:

CHOOSING A COMMUNICATIONS PROTOCOL FOR LOGGERS

LTE-M

LTE-M is a low power variant of the 4G LTE standard which offers slightly higher throughputs than NB-IoT, and is a few years more advanced in its development. It is more complex than NB-IoT, which may limit the number of silicon suppliers, resulting in a higher hardware cost compared to NB-IoT. However, that is a consideration which is still several years in the future. More importantly, LTE-M is largely confined to the US, where it is preferred by automotive manufacturers because of its higher throughput. European operators, who are slower to turn their 2G networks off compared to their US counterparts, are generally opting for NB-IoT deployments.

NB-IoT

Narrow Band IoT (NB-IoT) has been hastily developed by the 3GPP standards group within the mobile industry as the replacement for GPRS. It is still only in the trial stage and is unlikely to be widely deployed before 2020 at the earliest. As its development has been rushed, there are likely to be significant changes before it becomes widespread and stable, raising the risk that products deployed today may not be compatible with a future network. NB-IoT will probably be the best option in the future, but it is too early to be a contender for a near term roll-out.

LPWAN STANDARDS

Sensing the gap in the cellular market, a number of companies and organisations have started promoting Low Power Wide Area Networks (LPWANs) as a more efficient alternative to the cellular standards. These are proprietary systems which generally operate in license-free spectrum, typically the 868 MHz band in Europe and the 915MHz band in the US and much of Asia. This choice means that the operators do not need to pay any license fee for the wireless spectrum, but as these LPWAN transmisisons need to coexist with other users in the same spectrum, they may face capacity and interference issues. The two most prominent LPWAN options are Sigfox and LoRa.

SIGFOX

Sigfox is a proprietary low power wide area network (LPWAN) that attempts to fill the gap between GPRS and a successor network. It is designed to be low cost, both in terms of hardware and data contract. However, that comes with two compromises. The first is a limit of data throughput. The second is that it is one way, with data only being sent by the sensor. This is a major problem for applications which need to time-stamp data, as it is not possible to synchronise the device clock with an NTP time server. Sigfox is therefore best suited to devices which send occasional event data, not larger quantities of time-series data.

LoRa

LoRa is another LPWAN network which is competing with Sigfox. Whereas Sigfox owns all network access via agreements with network operators, LoRa allows individual users to install gateways, allowing private networks to be set up to augment operator provided ones. Unlike Sigfox, LoRa allows two-way communications. This adds flexibility and helps to protect against future changes, should an operator turn off their LoRa network. However, taking that route would impose a significant additional task (with time and money implications) if a business decided to install its own network.

IP

The GSM mobile networks have built up a formidable number of patents covering mobile communications, which are licensed to companies providing hardware for the 3GPP standards. It is difficult to gauge the risk, but the cellular industry is very protective and may use its patent pool against companies using alternative technologies if it feels that competitors are taking away its IoT revenue.

Contact us
T (+44) 02380 111 420
E info@i2owater.com

2 Vancouver Wharf, Hazel Road, Woolston
Southampton, SO19 7BN, United Kingdom
www.i2owater.com

SECURITY

All Internet of Things (IoT) applications need to consider their end-to-end security model. The communications link is just a part of that, but must be robust. The GSM standards are well tried, with many years of experience, giving confidence that both the wireless protocol and SIM based authentication are secure. The newer LPWAN offerings are relatively untried. Whilst they offer security features, there is a greater burden of proof needed for any critical deployment, as they have had limited scrutiny from the security industry at this stage. This may increase development times and require new commissioning procedures for product deployment.

The network based 3GPP mobile communications standards make solutions quicker to deploy. Speed of deployment has another indirect advantage: the real value is in how you process data from sensors to deliver actionable insight and automated control. So getting on with it, learning and improving, brings important value to the business. As new communications come along, they can replace the current ones, building the fundamental value of an ever-growing database.

Communication type	Pro	Con
Mobile communication	• Pervasive • Infrastructure already exists • Modem prices are kept low by high volumes • Well tested security	• Some variants are not available or are being turned off • Requires more power to energise the modem
Proprietary LPWAN solutions	• Designed specifically for IoT applications and hence requires less power • Simple radio designs result in low cost modems	• Not pervasive - Limited coverage • Infrastructure cost if run as a private network • Relatively untried security - needs careful implementation and analysis • Risk of IP infringement

PREDICTIONS

The mobile communications industry consists of a relatively small number of global giants. They have deep pockets and a large and reliable revenue base from mobile phone subscribers. They will watch the proprietary players carefully, help make their solutions possible where it gives them a commercial advantage, but stand ready to take over that market if it proves to be substantial.

It is likely that the proprietary solutions will gain a foothold in a number of applications and geographies where the dynamics exist for them to be deployed cost-effectively. For example, in a new smart city development where all industries agree on and share a communications infrastructure. Mobile communications 'standards' which are not forwards-compatible will also be used by those who cannot wait and are willing to experiment.

Contact us
T (+44) 02380 111 420
E info@i2owater.com

2 Vancouver Wharf, Hazel Road, Woolston
Southampton, SO19 7BN, United Kingdom
www.i2owater.com