White Paper

Introduction

Nowlog's Real Time IOT solution was built to bring the "zero touch" business model to the remote monitoring industry. To date the complexities of installing and maintaining IOT systems has meant bearing the high costs of sending personnel onto customer sites. The nowlog solution has designed out those complexities to allow an end user to self install and self maintain their systems.

There are three major business benefits to this approach:

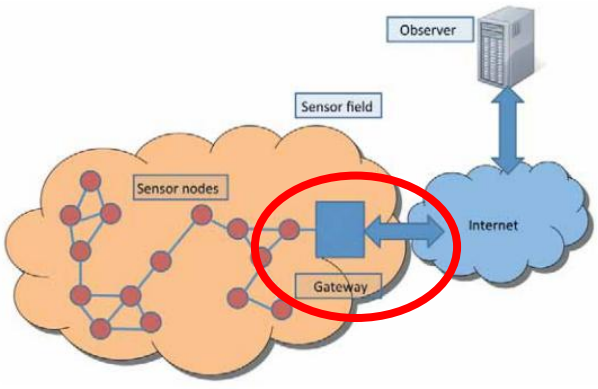
(i) Increased profitability by reducing installation and ongoing maintenance costs.
(ii) Increased sales by selling globally direct to end user.
(iii) Penetration of new markets where previous costs were too high.

[For those end users still needing [and willing to pay for] on site visits, then the simplicity and efficiency of the nowlog solution makes such visits more cost effective.]

As monitoring implies the ongoing provision of a service, sales are predominately OPEX [a service contract paid monthly]. While recurring revenue streams are a valuable asset, the initial fulfilment costs [installation and on boarding] are typically borne upfront by the seller. It can be 18 months or more before this cost is covered by the OPEX payments. In this paper, we show how this time can be reduced to 6 months or less.

Reducing Fulfilment Costs

The single largest barrier to self installation is the need for an onsite internet gateway (to collect the data from local sensor nodes and forward this to the online servers).

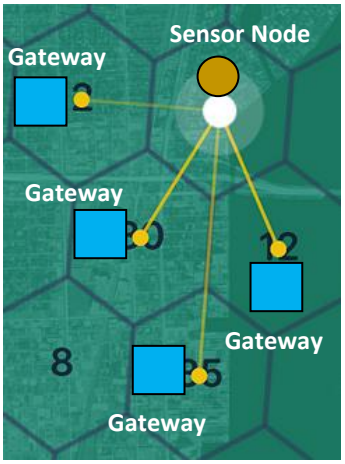


Gateways which use the customers network [WiFi or Ethernet] may have low data costs but will incur initial and ongoing IT network support costs. For this reason Gateways with cellular connectivity are preferred but these have SIM card costs. Cellular connectivity can be an issue in remote areas. An onsite Gateway is also a single point of failure and it is challenging and costly to maintain 24/7 operations.

Additionally, each sensor node must be installed on the Gateway. On large sites wireless repeaters must also be installed to ensure sensor node to Gateway connections. This means installation by a technician and more hardware to maintain.

The emergence of new LPWAN (Low Power Wide Area Network) wireless technologies now allows the sensor nodes to connect directly to public networks and obsoletes the onsite Internet Gateway approach.

As well as removing the hardware and maintenance costs of an onsite Gateway this architecture removes the single point of failure issue. Now sensor nodes can connect to multiple public gateways.



This approach means that Sensor Nodes can be preconfigured and shipped direct to the end user. The end user then simply needs to activate the node and deploy it.

To cover gaps in the coverage provided by public gateways, nowlog do provide a low cost and easily deployable LoRaWAN gateway called the “Data Center”. Details are available on request.

Reducing Maintenance Costs

While ongoing costs can never be totally eliminated, in this paper we show how the nowlog system can minimise these costs.

1. Annual recalibration costs.

Most industries require that the sensor nodes are re calibrated annually. This is driven by the need to have accurate data backed up by certificates. For instance in the Food Safety, Healthcare and Cold chain monitoring industries the required temperature measurement accuracy is +/- 0.5^{o}C backed up by a current traceable calibration certificate.

Currently, this requirement is serviced two ways:

(i) Returning the sensor nodes to a certified calibration laboratory.
(ii) Technical staff making an onsite visit to recalibrate the sensor node.

Both options are costly and disruptive to operations. Either through the provision of replacement devices for swop out or through the time and travel needed for onsite visits.

Nowlog's sensor nodes (Data Points) provision an onsite calibration process sufficiently automated that an unskilled person can perform the task. Small plug in calibrator dongles are sent to the customer site annually. When a dongle is plugged into a Data Point, a calibration algorithm executes and the Data Point is recertified. The Data Point transmits its new calibration table to an online database which updates and renews its certificate. As one dongle can certify multiple sensor nodes then the process is highly cost effective. The dongle is low cost enough to be disposable but customers willing to recycle can be incentivised to do so.

2. Hardware maintenance costs.

All hardware (& software) requires ongoing maintenance. By removing the onsite internet gateway and the local wireless repeaters, we immediately reduce the amount of equipment to be maintained. In addition the simplicity of the sensor node direct to internet approach makes for the easy swop out of a faulty sensor node.

Nowlog's Data Points have Bluetooth to smart phone [App] communications making it simple for a customer to configure and drop in a spare part. A multi sensor deployment can now leave a spare part onsite ready for instant swop out.

LPWAN technologies

The predominant LPWAN technologies are LoRaWAN and NB-IOT/LTE-M.

LoRaWAN

LoRaWAN uses a wireless modulation technique derived from CSS (Chirp Spread Spectrum) technology. LoRaWAN transmissions are immune to interference and can be received across great distances. Originated by French company Cycleo, it was acquired by the Semtech Corporation in 2012 who developed the technology into a range of custom wireless ICs (Integrated Circuits).

Nowlog has used LoRa since 2018 using its exceptional range to remove the need for repeaters in the local wireless sensor field. At that time, we used an onsite internet gateway called the Data Center. With the emergence of LoRaWAN public gateways and for the reasons stated above we obsoleted the Data Center.

The predominant companies currently offering LoRaWAN “Network-as-a-Service” connectivity are:

helium The Helium Network was founded in 2013 to create a decentralized wireless infrastructure that could support the rapidly growing IoT industry. In 2019, Helium launched its flagship product, the Helium Hotspot. Hotspot owners are incentivised to provide internet access to LoRaWAN sensor nodes and there are now more than 1 million Helium Hotspots worldwide.

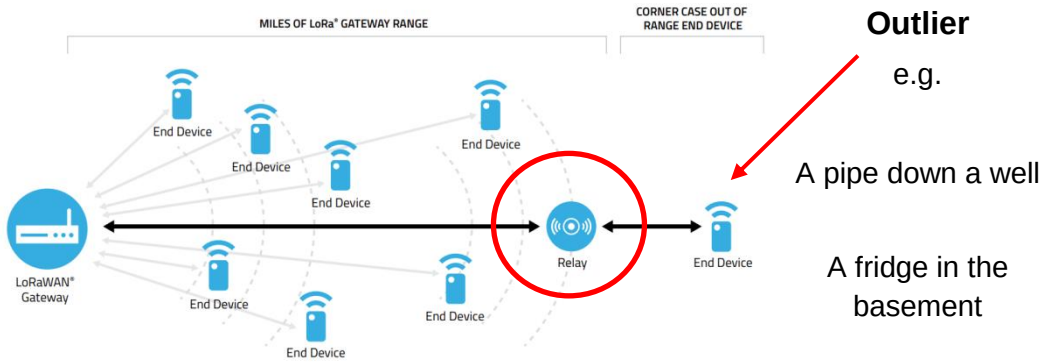
amazon sidewalk From 2021, Amazon built LoRaWAN capability into their Echo and other devices. By 2023 over 90% of the US population was covered by the Sidewalk network.

senet Senet are the leading “carrier grade” LoRaWAN provider in the US and are deploying globally. They offer guaranteed QOS (Quality of Service) connectivity on both their public and private networks.

Actility Actility are the European equivalent of Senet.

Of the above, Helium and Sidewalk have the lowest data transmission costs.

LoRa Alliance® More importantly, all of the above providers have signed roaming agreements so that Sensor Nodes can use any network to send their data. This has increased the density of coverage giving connectivity to Sensor Nodes buried deep inside buildings. Customers want all their assets monitored and there is often a difficult to connect outlier in a group of Sensor Nodes. It is noteworthy that Semtech have added relay capabilities to the LoRaWAN protocol. The relay itself can use the same hardware as a Sensor Node (End Device) and is a very low cost means to get total local coverage.



The final frontier

With its long range capabilities, LoRaWAN is now installed on a number of satellites. While a 5W transmission power requirement means that Sensor Nodes will not reach a satellite directly, Senet and others are building out their coverage by installing public LoRaWAN gateways with satellite connectivity:

https://senetco.com/about/news/senet-eutelsat-trakassure-and-wyld-networks-team-to-deliver-first-to-market-interoperable-terrestrial-and-satellite-lorawan-network-services/

https://wyldnetworks.com/blog/wyld-announces-global-lora-satellite-deal

https://lacuna.space/

https://www.echostarmobile.com/services/pan-european-lora-iot-network/

These extend coverage to remote areas globally.

NB-IOT **LTE-M**

Released in 2017, Narow Band IOT primarily promises guaranteed QOS. The public gateways are owned by traditional telecom operators who deploy them on their cell towers. Data transmission costs are higher than LoRaWAN.

The wireless technology is traditional narrow band and a higher transmission power is needed to match the range of LoRaWAN. This means bigger batteries and more costly modems in the Sensor Nodes.

The use of cell towers means a lower density of gateways. At the time of writing there are no NB-IOT relays. This makes NB-IOT best suited to in transit monitoring.

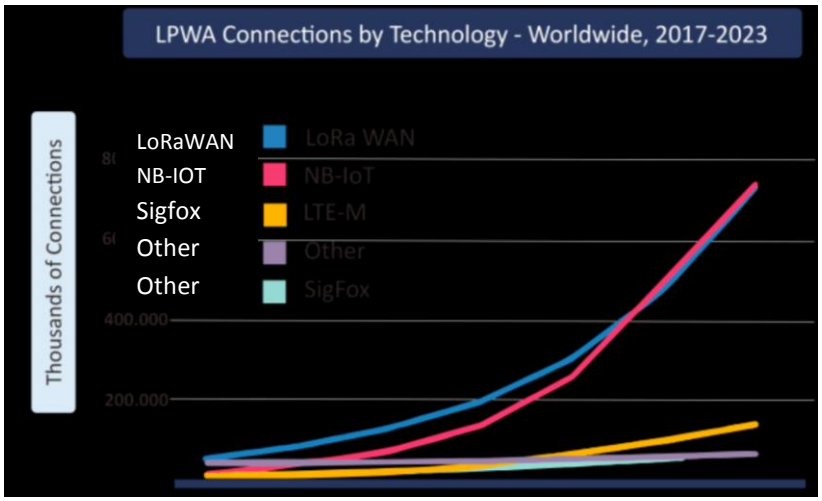
The predominant companies currently offering NB-IOT “Network-as-a-Service” connectivity are:

verizon T-Mobile AT&T

Nowlog will release a DP with a NB-IOT and LTE-M modem in Q4 2024.

LTE-M is a variant of the NB-IOT protocol that is being deployed by cellular operators in some countries. The dual capability is useful to ensure global coverage.

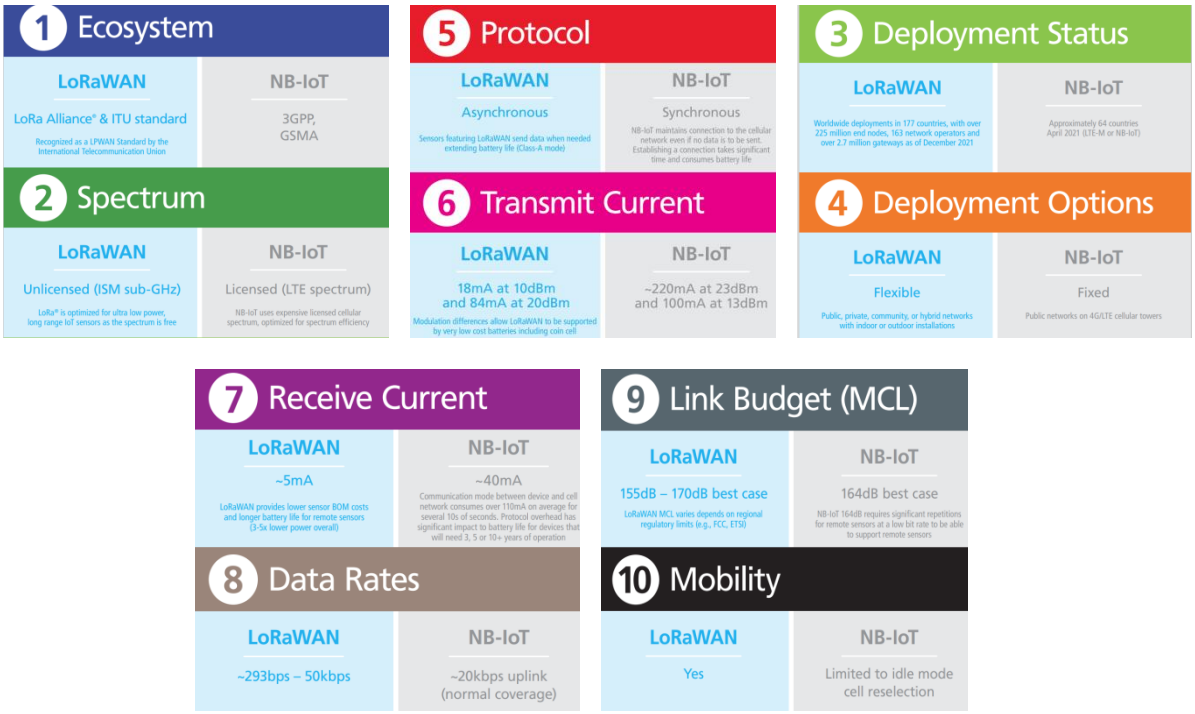
Market uptake of the two competing technologies to date:



Note that if China is excluded, then LoRaWAN dominates.

LPWAN technology comparison

The infographic below shows the perfomance of the two technolgies in 10 key areas.



LPWAN cost comparison

	LoRaWAN	NB-IoT
Chip	$1 to $2	$5 to $10
Device	$4 to $6	$6 to $12
License	Free	Built Into Chip
Frequency	License-Free (Sub-GHz)	Licensed (>1 GHz)

Overall, LoRaWAN is considerably cheaper than NB-IoT. Not only are upfront costs lower thanks to higher market adoption and falling chip prices, but its open standard means bare minimum licensing fees.

By contrast, NB-IoT can be more expensive, especially if you factor in the connectivity costs from cellular providers.