ENABLING SMART, SUSTAINABLE METERING

According to a recent Global Markets report, the smart electric meter market was worth over $5 billion in 2016 and cumulative installation is set to exceed 270 million units by 2024. Global urbanisation is driving demand for energy, water, transport, lighting and other essential services. Government, city authorities and businesses are looking to find ways of achieving more efficient management of devices such as energy metering. To enable the billions of devices forecast to be connected worldwide, the communication networks implemented need to be scalable, robust and secure.

IoT infrastructure has many challenges, one of which is that organisations have end-to-end, silo-driven business models, which use a separate communication network for each application. For example, each utility or municipality could potentially use a different type of network for their application, none of which would be able to communicate with the other.

In addition, many different vendors 'lock' their devices into their own particular network or system, even device to device, creating further obstacles for the path of communication. Meter manufacturers may also employ their own, bespoke, meter protocol and head end software (HES), adding another layer of complexity to the equation.

The ideal solution is for governments, city authorities and businesses to work with a technology provider that has an IoT platform that is communication protocol, network, and transport-layer agnostic. Many companies offer these solutions, but lack the experience of incorporating all the elements required to deliver an IoT communication platform that assimilates third party applications and technologies into a single communication network. In addition, many solutions also require significant up-front investment, which can present capex and opex challenges for businesses with tight margins and substantial overheads. Additional support, hardware and software updates, spare parts and functionality improvements necessary for the longevity of the solution, and ongoing running costs can be considerable.

A shared, city-scalable, standards-agnostic platform, coupled with a variety of networks, using a recognised transport layer (such as IPv6) can solve many of these issues and create a smart, sustainable IoT network. Such networks can begin with a vertical business model, but be opened up to future applications and devices as the needs present themselves, effectively future-proofing the system.

CyanConnode's IoT platform delivers all of the elements required to operate a highly critical private network capable of quality of service (QoS). With the technology and experience to integrate, deploy and manage networks, CyanConnode offers a protocol adaption layer, which supports other communications technologies through its IoT platform. This approach enables customers to implement a single application, such as smart metering, and leverage this investment to connect other devices or networks through the same platform, delivering a future-proof, cost effective IoT network.

A self-forming, self-healing mesh network provides additional benefits for IoT as new devices and applications can be added seamlessly and run instantly, because the network will self-configure and re-configure as items are added or removed. This means networks can be built 'as-you-go' as opposed to being deployed all at once, reducing capex and total cost of ownership.

One of the key challenges facing smart metering and IoT is the future sustainability of bandwidth needed to support solutions already deployed in certain countries. Spectrum is a finite resource and pressure on that resource from increased IoT usage requires optimisation especially if the applications – such as metering – are to be in operation for very long contract terms of 10-20 years. In parts of the spectrum currently used, there is a finite amount of bandwidth across which to send data. And with more devices being connected every year, the spectrum is filling up.

Furthermore, implementing high bandwidth networks, such as broadband, allows the transfer of large quantities of data. However, sending data from the head end to each end-device and back again increases the cost of the end-device, power consumption and backhaul.

One way to continue adding devices without further congesting the spectrum, is to send information via lower bandwidth radio frequencies or 'narrowband'. Narrowband RF technology covers sub GHz frequencies and is sufficiently efficient in its spectrum and data packets that it can operate valuable applications (such as

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smart metering) on what was previously unusable spectrum. Applications using narrowband consume considerably less power and are less spectrum-intensive than those using higher frequencies (800 MHz and above). Narrowband RF networks enable significant growth in the number of connected devices and conserve valuable bandwidth at higher frequencies which can be used for other consumer and data-intensive solutions (such as cellular).

As the IoT market grows and more bandwidth is required, companies running solutions using GHz frequencies are likely to be judged as consuming too much valuable spectrum. Networks operating at these frequencies will eventually need to become public network providers, as more and more consumer devices become available. Even if they retain use of consumer-led spectrum (such as Wi-Fi), being able to support a guaranteed level of QoS in a consumer-driven environment, i.e. not managed by the operator, will create significant problems once spectrum occupancy reaches 85% or over. Alternatively, they could choose to move their solutions to narrowband technology as private network providers will be forced to lower capacity frequencies.

CyanConnode's Omni IoT platform provides centralised command and control, combined with distributed intelligence towards the edge of the network. Moving intelligence towards the edge of the network ensures efficient use of valuable spectrum without increasing the unit cost and energy consumption of each end-device. CyanConnode's narrowband technology is optimised to collect data autonomously at the Network Access Device and end-device, such as a meter. This provides network resiliency and QoS, ensuring the data is collected and stored if a backhaul outage occurs. Once the backhaul connection is re-established, transmission is restored with no loss of data. In smart metering applications, optimising spectrum use ensures sufficient bandwidth is available for on-demand requests; configuration; and asynchronous messages for alarms, such as power outages and tamper alerts.

By optimising the data into deltas, the required data can be selected and collected, and this ensures that only the relevant data need be collected. (For example, only the data since the last reading, rather than all the data since the device was installed.) The data packets collected over the resilient mesh are small enough that 2G is more than adequate for the backhaul system, although higher cellular backhauls and Ethernet are available.

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As the IoT market evolves, co-existence is essential for network efficiency as it will support multiple applications on finite, valuable spectrum. CyanConnode's technology uses adaptive noise floor management, which provides diverse routing through self-forming, self-healing mesh networks, maximising the use of bandwidth whilst minimising power consumption. CyanConnode's solutions have the ability to dynamically change the noise floor when working in the presence of other network technologies. The noise may be another CyanConnode device; a different network; or an electrically 'noisy' motor. In all cases, CyanConnode's solutions can 'read' the noise floor and adapt, rerouting data in a noisy environment or improving range in a quiet environment.

Many narrowband networks used for smart technology apps are point-to-point (P2P). Consequently, they are expensive to install and operate. In addition, when system or device errors occur, the QoS metrics are dramatically impacted as each device has to have a direct relationship with the network. In a mesh network, as long as one mesh device can 'see' another, it will route its data accordingly, even if it can't 'see' the network access device.

CyanConnode specialises in using narrowband RF mesh technology to support IoT, providing highly efficient device-to-device communication via scalable neighbourhood area networks (NANs). CyanConnode operates in the unlicensed regulated ISM bands from 410MHz to 975MHz, depending on what is permitted in territory. Its advanced connectivity solutions support multi-application networks, enabling communication with any device, including gas, water and electricity meters, as well as street lighting and traffic lights.

The smart metering and broader IoT markets are stabilising and maturing across the globe. CyanConnode will continue to be an industry thought leader, evolving narrowband RF mesh networks to respond to developing demand and take full advantage of next generation technology. Providing customers with straightforward, sustainable solutions that meet their needs today, while helping them face the challenges of a rapidly changing world. MI

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As Head of Global Integration at CyanConnode, Graeme leads a team of highly skilled hardware and software engineers to integrate new devices into CyanConnode's IoT platform.

COMPANY DESCRIPTION

CyanConnode is a world leader in the design and development of Narrowband RF mesh networks that enable Internet of Things (IoT) communications. With a wealth of expertise and experience in smart technology, CyanConnode provides end-to-end networking solutions and high-performance applications that support enhanced service delivery, improved business efficiency and save energy.