

SEPTEMBER/OCTOBER 2016 • VOLUME 6 • ISSUE 4

IoTnow

HOW TO RUN AN IoT **ENABLED** BUSINESS

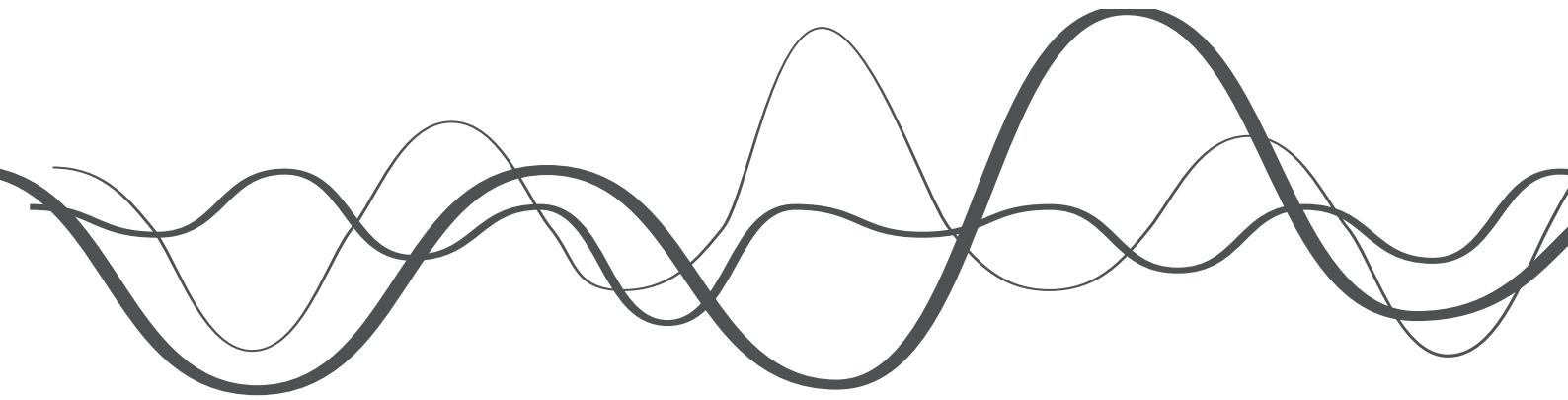
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networks mean enterprises
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Low power long-range radio networks mean enterprises are doing it for themselves

Enterprises are increasingly looking at low power radio networks to run their IoT applications and services. Here Daniel Quant, the vice president of product management and strategic market at MultiTech, tells George Malim that low power long range (LPLR) enterprise networks offers enterprises both large and small a compelling opportunity to switch from a monthly model of spiralling incremental fees to a capex up front model which puts them in control of their networks

IoT Now: What is a Low Power Long Range (LPLR) enterprise network?

Daniel Quant: The question is really one of how different an enterprise network is to an operator's network. The business model is fundamentally different. With an operator's network approach I accept that there will be a delta in my monthly cost that I have to pay. For example, there's a fee to onboard any additional device because I use but don't own the network.

This works well, particularly for enterprises that have assets dispersed across the world, because it costs a lot to cover the whole world. However, if my assets are more clustered this doesn't work well, especially for industrial applications. If I buy a mobile phone, there's a benefit but only for two years whereas with industry assets, that are being specified to run for seven to ten years, the opex cost per calendar month far outweighs any equipment capex cost.

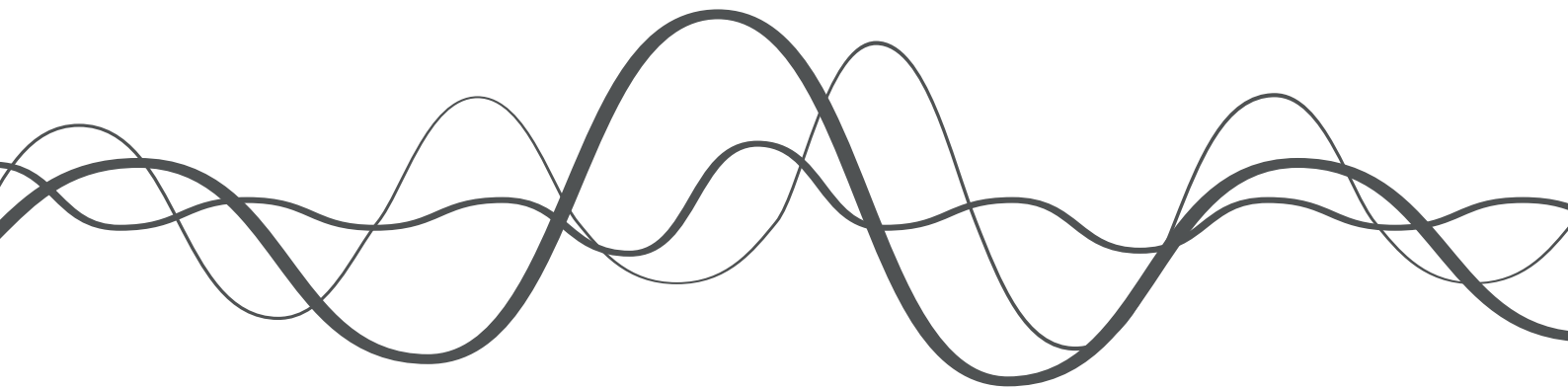
For example, if you have production facilities or supermarkets, an enterprise network has many

benefits. You can go and buy the equipment and assets you need and install them in your facilities where your clustered devices are. Although you pay a bit more up front, it's yours and low power radio effectively means you get to a wide area network (WAN) model without opex.

At MultiTech, we've learnt there are business cases where the operator model doesn't really match the need of the customer organisation. Enterprises don't want to be penalised for every asset they connect. They're happy to pay small opex for secure infrastructure, load balancing and some other features but the opex is quite low and the capex is quite high up front, but it's a one-off.

IoT Now: When is an LPLR enterprise network the right solution for companies considering using the IoT?

DQ: When they start to have some clustered assets – and they don't need to have very many. The cost of a gateway is somewhere between US\$200-US\$300. Over five years, that could ►



The bottom line is the technology. Digital spread spectrum and ultimately narrowband technologies have existed for some time, but the way LoRa, Ingenu and Sigfox have been put together has enabled really good noise immunity

work out very attractively if you had, say, 600 assets to connect, for example: something around US\$6 per month per endpoint.

You don't need many assets to make this start coming alive. Even if one of these assets is mobile on a truck, you could still derive value because many LoRa apps don't need to be real-time. This would mean the truck could communicate its data when it arrives at another of your locations. If you're trucking frozen shrimp, you only need to know at the end that the cold chain was uninterrupted.

IoT Now: What is new that makes LPLR enterprise networks important today?

DG: The bottom line is the technology. Digital spread spectrum and ultimately narrowband technologies have existed for some time, but the way LoRa, Ingenu and Sigfox have been put together has enabled really good noise immunity.

The 2.4Ghz band is very noisy, as are the networks of utilities in the 900Mhz range. Noise can be high, and these technologies still work and it was that that enabled us to get the long-range capability. Previous technologies like Zigbee and others didn't have the noise immunity, so you were forced to have meshing to achieve noise immunity, which didn't work well for battery consumption.

In addition, the cost of all the gateways and repeaters dented the business model a bit. You

also don't necessarily always have access to places in the middle, so the technologies didn't lend themselves to enterprise wide area deployments.

LPLR technology isn't brand new, but by having noise reduced, the link budget creates momentum for public services, and enterprises haven't missed the potential.

IoT Now: How does LoRaWAN fit into an LPLR enterprise network solution?

DG: Very nicely, and from our perspective, much better than other options. We are a company that has provided analogue modems for 40 years and there have been no real developments to speak of in that business, although it remains a nice business for us. The other area of our business is cellular, which is showing great growth - we've already outperformed 2015 and we have more than a quarter to go in 2016.

Given that, we didn't want to affect our cellular growth with unlicensed offerings. What we've tried to do with our unlicensed band strategy is open up use cases that cellular or other approaches alone can't address.

We don't subscribe to The Highlander model - that there can be only one successful option and the industry has figured out that more than one technology could be used to suit different use cases.

Unlicensed has grown our business without cannibalising our cellular business and, although ►



Daniel Quant: Although you pay a bit more up front, it's yours and you get to a WAN model without opex



cellular is growing fast, we've grown 5% of our business with LoRa. We have hundreds of design wins now so next year we're gearing up for, perhaps, more than 10% of our business being LoRa without cannibalising cellular. A lot of our wins are where the cellular signal is poor or where 4G isn't available.

For example, a sensor in a corn field or under a fruit tree simply can't make a cellular connection but you can use LoRa and pick up cellular backhaul. We see similarly strong opportunities and design wins in building automation.

What we're seeing with unlicensed band strategies is the ability to connect assets that technology or communications couldn't make work before, but they can now. In the cellular business, higher value data streams suit that technology, but not all streams are high value or addressed by cellular coverage.

IoT Now: Which applications have been early LPLR enterprise network adopters?

DQ: Smart agriculture, building management and facilities management automation are where we've clustered a lot of design wins and enterprise OEM providers.

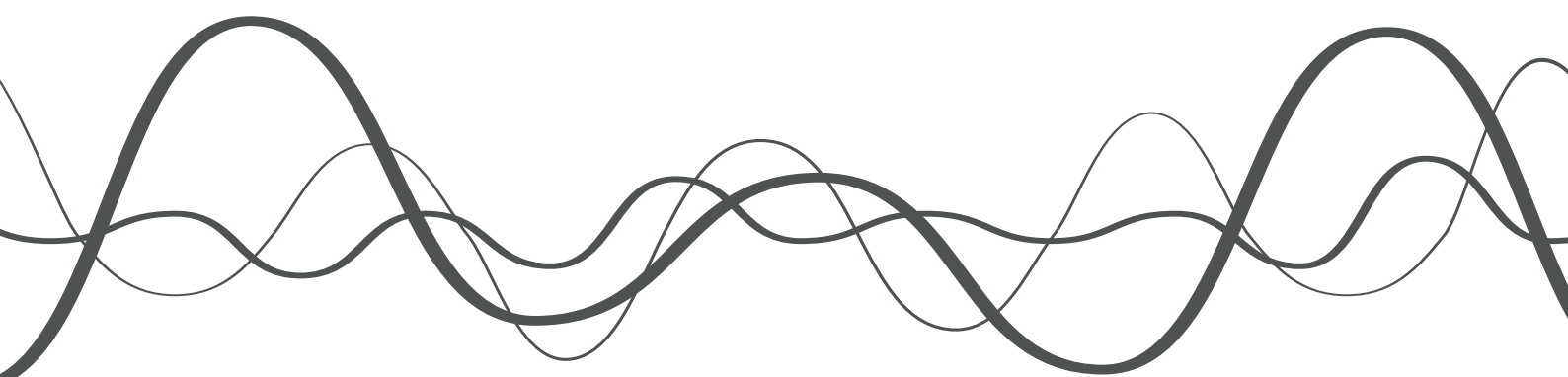
IoT Now: Why did MultiTech invest in this new offering?

DQ: We got into this simply because we needed to and we knew there were markets that were untapped and not going to be addressed by cellular technologies for technical and commercial reasons. We knew that Zigbee and others wouldn't work because of the requirement for meshing. We looked at SigFox and Ingenu but they wouldn't work for us because of the service model – even on ten devices over five years, it just doesn't work.

We wanted to put our resources into a technology that wasn't operator driven, which narrowed the choice to weightless or LoRa. LoRa is a better choice because its ecosystem is better developed and it suited the business model and the target customers. The Link budget is good, the battery performance is good and availability is easy.

IoT Now: What are the business models that you see as best served by LPLR Enterprise networks? ►

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DG: We have a number of design wins in large and small enterprises that don't want to be nickel and dimed on every endpoint. If I came to your house and used your Wi-Fi, would you expect to have to pay your provider? You wouldn't so I think that enterprises should have the same option.

You built a Wi-Fi network so you have a better product as a company and visitors can access it to tell you things when they visit. In IIoT, it's exactly the same. For example, if I want to connect a few more pumps in a production environment and I've paid for the network, why should I be paying for adding them? If I put 2,000 pumps in, yes I understand that I should buy another gateway and balance the load a bit more but for a small increase I don't think it's fair to be charged.

Our strategy is to provide customers with capex strong investment in all the equipment, the modules and the gateways and our Device HQ platform for monitoring the assets. We were first to announce an IIoT app store that enables us to push customer applications into our equipment.

For example, in a situation where rat traps are monitored in a food and beverage facility, it can be easy to put intelligence at the edge to monitor when a trap is triggered if you own the network and have access to specific apps to run the equipment. However, in a network where I don't know what the equipment or app is, I can't put intelligence at the edge.

We're trying to distribute resources better through the enterprise and trying to establish things more effectively. To imagine enterprise networks are deployed and never changed is a little ludicrous. What the enterprise is looking for is something that enables product lifecycle management for the equipment that it has bought and enables this at very low cost.

IoT Now: Do you see network operators getting involved in LPLR enterprise networks?

DG: Yes, for sure. Every enterprise that deploys its own network weakens the business case of the cellular operator and that is not a fact that's

wasted on them. This is why operators have made very loud low power radio announcements about what they're doing – the launches are loud because every enterprise that takes a DIY approach potentially hurts their business.

The difference for enterprises in low power, which wasn't seen in cellular, is that you can bring your own gateway.

IoT Now: Enterprise networks like Wi-Fi are in the IT domain. Does an LPLR EN follow the same path or does the IoT edge aspect put it in the OT domain?

DG: There is definitely an IT and OT (operations technology) play going on. Part of driving success in enterprise markets is focused on IT because the network will site in the IT department and be managed by IT even though network services are more of an OT offering. OT is essentially using the service and IT is hosting the service. This is a fundamental shift because when you use an operator you bypass IT, so IT starts to become involved if you do this yourself and build your own network.

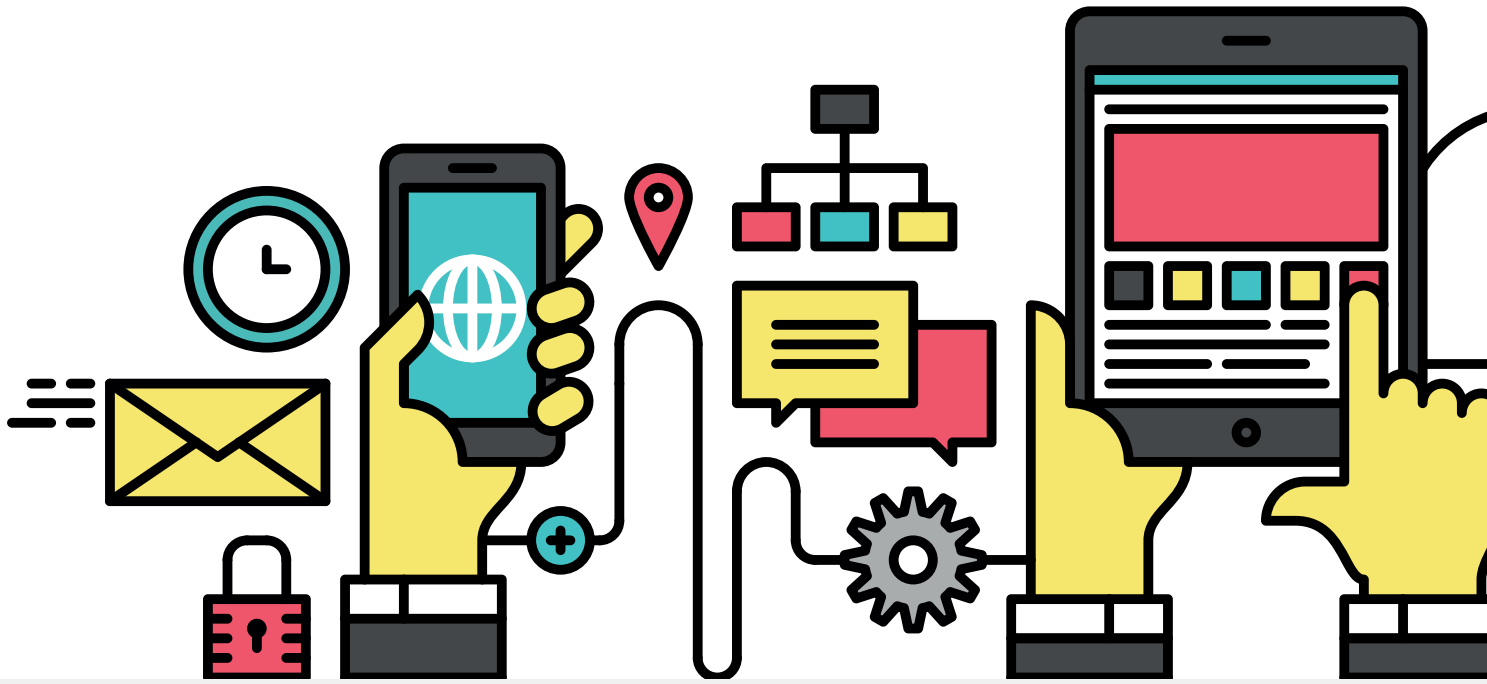
IoT Now: When is LPLR enterprise network operation a make decision and when is it a buy decision?

DG: It's super easy to make the calculation as I did at the start. There's some maths in IT and management and little bit of opex in enterprise deployment, just as there is in Wi-Fi. You might see services such as managed onboarding at a small cost per user. There is an opex component, but I think you can see that you don't need many assets to justify buying that infrastructure and running it over a five-year period.

Low power might be a bit more industrial than connecting people and printers, for example, but it is still in the enterprise domain. Smart enterprises have already made up their minds to deploy low power solutions. The case for smaller enterprises is perhaps a bit more marginal because cellular operators make it easy for them to have connections without having to build networks but I think the business case speaks for itself. ■

Our strategy is to provide customers with capex strong investment in all the equipment, the modules and the gateways and our Device HQ platform for monitoring the assets

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LPWA: a market in the making

Whenever a new concept like IoT comes along, there is always speculation and conjecture over how the market for it will develop, particularly when there are competing technologies involved and LPWA is proving to be no exception. At present, how the market for IoT systems and devices evolves and what its eventual shape will be depends, as ever, on who's doing the talking. It is already possible however, even though IoT is still a relatively nascent concept, to discern the dynamics at work as the industry moves ahead, writes Peter Dykes

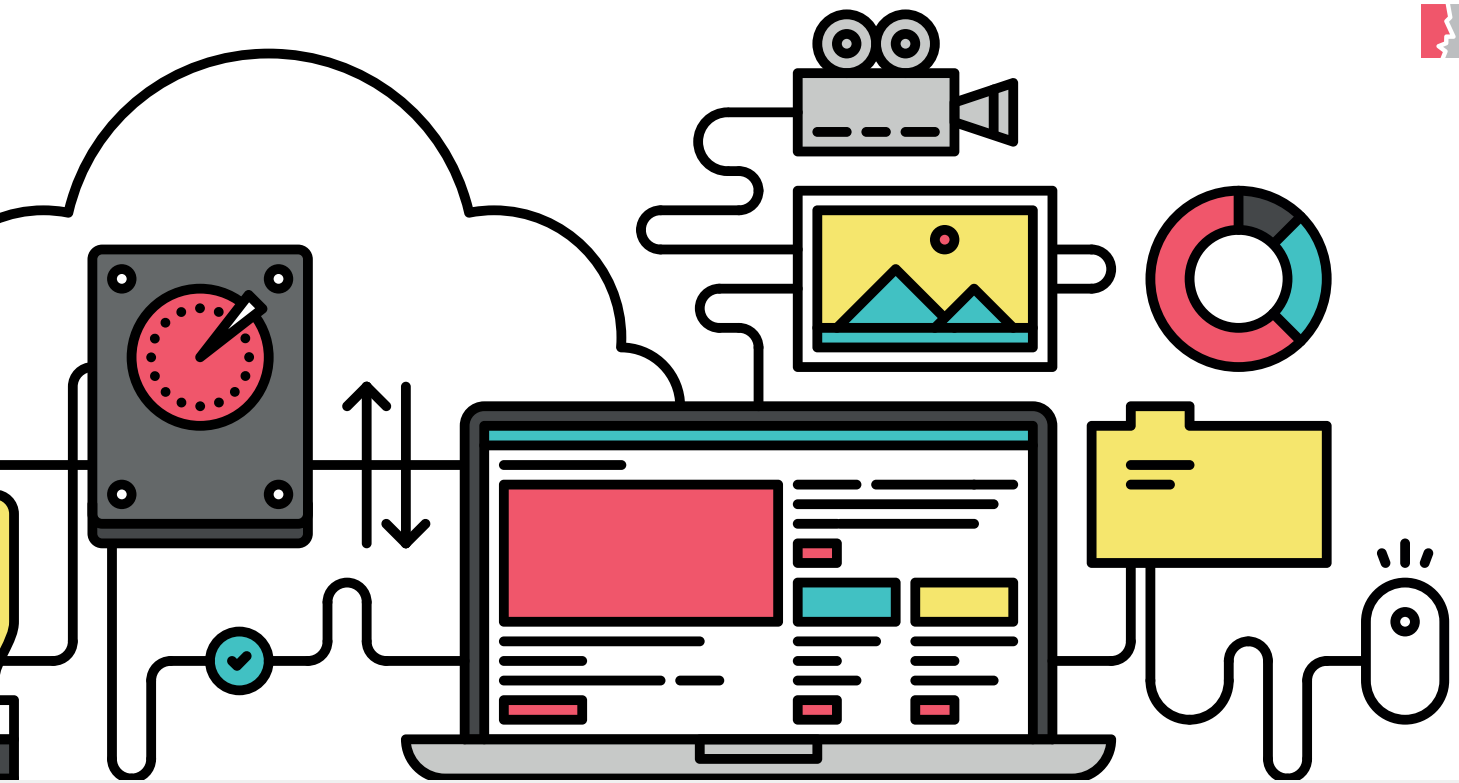
From the communications perspective, IoT is all about connecting hundreds of millions of diverse, battery-driven devices which require secure bi-directional communication, mobility and localisation services over wireless networks. IDC forecasting is predicting 30 billion connected objects by 2020, with the sector worth US\$2.75 trillion by that time and competition for a slice of the potentially lucrative LPWA market has, unsurprisingly, been hotting up for some time.

Essentially, players fall into two camps. On the one hand there are proprietary technologies such as SigFox and Ingenu, and on the other there are the standards-based technologies such as LoRa, backed by the LoRa Alliance, and LTE-based systems developed by the 3GPP group. Experience teaches that ultimately, the standards-based technologies will win out because they are vendor and technology agnostic, and while LoRa is arguably behind LTE-based standards in terms of large-scale infrastructure availability, it is beginning to

overtake the likes of SigFox and Ingenu in market positioning.

Indeed, the lack of in-situ infrastructure is holding back the deployment of LoRa at present. Exponentially rising demand for LoRa hardware and gateways is swamping vendors with the knock-on effect of delaying network rollouts, according to Nigel Chadwick, the chief executive of **Stream Technologies**. He says, "This can be frustrating for platform vendors who, while they may be receiving orders for large-scale networks, are having difficulties getting the hardware from the vendors." Chadwick adds however that the situation will be resolved in 2017 when production volumes come into line with demand.

Infrastructure availability is not such a big problem for the 3GPP systems as they are primarily aimed at cellular operators and consist of little more than enhancements to existing networks. That said, end point hardware in the form of LTE chipsets only began shipping at the ►



beginning of September 2016, following Release 13 earlier in the year, but it does mean that commercial cellular-based IoT solutions will probably be first to market ahead of LoRa networks, given the reduced infrastructure rollout requirement.

Once both technologies have begun to roll out, likely market shares going forward will become easier to predict. This is because the true cost of IoT modules will become clear and it will be far easier for end users to calculate the TCO for an LPWA network. Currently however, there is some dispute over the price of modules. Shane Rooney, the executive director of IoT at the **GSMA**, says, "A lot of attention has been focused on the module costs and some of the others such as LoRa and SigFox have been saying sensors will only cost one or two dollars each, but this is simply not true. Module costs are actually a lot higher than that and realistically, they are all going to be a similar price, so the actual cost ultimately depends on scale."

Rooney believes that module costs for cellular-based systems will be far lower because operators will be able to access much greater economies of scale than will buyers of LoRa-based networks.

Customers for LoRa-based systems do have an option to reduce network TCO by becoming operators themselves however. Most LoRa deployments are expected to be in large-scale industries, agriculture, utilities and to some extent smart buildings and smart cities. Among the larger private utilities companies who have the ability to roll out a network for their own use, LoRa network suppliers are reporting that these customers are realising they can sell access to their networks to third parties and thus recoup their initial investment. As a result, it becomes far easier for a large private organisation to roll out a nationwide network and reduce the total cost of ownership (TCO) of hardware and network management platforms. Then they can calculate for example, the cost of millions of sensors over a

fixed period and from that work out how much they can charge for access to each one. In addition, deployments in towns and small areas which have poor cellular connectivity but which require M2M and sensor connectivity could also enable enterprises to make a similar offering.

Rooney admits that the argument is valid, but has reservations. He says, "Monetising third party access over what is essentially a private network definitely has potential for recouping the original investment, but we've yet to see it happen. It will all depend on the application and what else is being offered because it won't be achieved on connectivity alone."

That IoT is a global phenomenon is beyond doubt, with demand coming from most parts of the world for both LoRa and LTE-based LPWA networks, however LoRa is likely to face stiff competition from 3GPP vendors who feel they have all the bases covered with three standards ranging from EC-GSM IoT, which is aimed at cellular operators running 2G in developing markets such as Africa, India and South America where infrastructure rollout costs are high, through to Cat-M1 for operators who are LTE-ready. The intermediate standard, NB-IoT is probably the most ubiquitous of the three and could prove to be a disruptive influence, as it has advantages over the other 3GPP standards and meets the challenge of LoRa head on. That said, in markets such as North America and Europe, where 2G networks have been or are in the process of being rolled up, LTE-based solutions are likely to dominate.

The weight of argument seems to be that the cellular-based standards will dominate in the medium to long term, with technologies such as LoRa confined largely to private installations such as industrial and agricultural complexes, however the market will remain fragmented for the foreseeable future and there should be room for all. It's just that some LPWA technologies might not get as big a slice of the market than they are currently predicting. ■

Once both technologies have begun to roll out, likely market shares going forward will become easier to predict



How can you ensure end-to-end interoperability between products and services?

In July Actility, a provider of low power wide area (LPWA) networking and the company behind the ThingPark LPWA IoT platform, launched the ThingPark Approved programme. Actility also welcomed the first partners to achieve ThingPark Approved status. Here, Jeremy Cowan of IoT Now asks Christophe Francois, the vice president of Ecosystem at Actility, how to ensure service interoperability

Covering the solution spectrum from sensors and modules to gateways and ultimately applications, ThingPark Approved products are evaluated across a range of interfaces and integration points to ensure interoperability within an end-to-end solution. Highlighting the diversity of partners in the ThingPark Ecosystem, Actility announced ThingPark Approved status for **Adeunis RF, AllThingsTalk, ATIM, Daliworks, Expemb, Finsecur, Flashnet, Foxconn, Globalsat, IMST, Kerlink, Microchip, MultiTech, MyDevices, Nemeus, NKE-Watteco, Omniimpex, Rising HF** and **Sensing Labs**.

IoT Now: What is Actility's goal with the ThingPark Approved programme?

Christophe Francois: Actility aims to help its partners simplify IoT deployment, accelerate IoT roll-out, and grow IoT revenue. The goal of the ThingPark Approved programme is to help our partners (device manufacturers, gateway manufacturers, design house, solutions providers, application developers) to fast-track their IoT solutions to market. ThingPark partners can connect and conduct interoperability testing of their products with our platform to achieve

ThingPark Approved status, interact with other solution providers in the ThingPark ecosystem, and then market and sell their solutions in the ThingPark Marketplace.

The ThingPark Approved programme also gives our Partners the opportunity to participate in co-marketing activity, join the ThingPark Approved partner catalogue, and all will be able to display the ThingPark Approved logo on their products, collateral and web-sites.

Lastly, the ThingPark Approved Programme will give confidence to the operators of a ThingPark-powered IoT network that a product to be connected to their network is fully functional and will inter-operate with the network without causing any network issues.

IoT Now: When did work start with programme partners on their Approvals? How long do Approvals generally take to complete?

CF: The first partners' products began testing around six months ago, in February 2016. Approvals will usually be completed within two weeks (depending on how often the end device ►



application can be set to send an uplink message). Activity is currently working on automating this test procedure, so that in the medium term, it will be executed directly by the partner through a user dashboard in the ThingPark Partner web site.

IoT Now: What is the process that partners must go through for Approval?

CF: The partner must first join the Partner Programme on-line through our ThingPark Partner web site (trial periods are available for developers or device partners). When joining the programme, the partner agrees and signs the Partner Agreement online. Then the partner:

- Pays at least the annual subscription fee (€500) and the test package fee (€500 per device/channel plan).
- Submits a description of its product on line
- Provides sample device(s) to Activity for testing
- Tracks and manages the evaluation process to achieve ThingPark Approved status through a Partner Dashboard

After becoming ThingPark Approved, the partner can join the Marketplace to promote and market its products with the ThingPark Approved logo.

IoT Now: You describe this as a business enabler, not a certification programme. Can you expand on that?

CF: The ThingPark Approval programme is not a replacement for the LoRa Alliance LORaWAN Certification process, which is aimed at radio and network behaviour rather than end to end service interoperability. It is complementary to it, by ensuring that the ThingPark approved product can easily be connected to the ThingPark platform and provide the application data to where it is needed.

IoT Now: In the absence of global IoT standards we are seeing the rise of ecosystems. Will they remove the need for some standards?

CF: The global IoT market is growing very fast and the big challenge for the normal standards bodies is to be able to ratify, implement and productise IoT standards in a timely manner. In the meantime, market driven industrial alliance standards are available to bridge the gap until they can be incorporated by the formal standards bodies. Activity believes that open innovation around shared standards is the proven way of growing a market, and we can see examples of both formal standards-body driven success stories and industry alliances such as the internet or global mobile telephony, and the Bluetooth protocol.

IoT Now: The ThingPark ecosystem covers a wide spread of solutions. Can you give our readers an idea of the range? What types of solution are included?

CF: Thanks to its partners' diversity, the ThingPark Ecosystem covers a wide range of products from sensors and modules, through

gateways and connectivity, to application platforms, data analytics and end user applications. As a result, the full breadth of IoT vertical markets are covered: Smart Cities, Factories and Industrial applications, Agriculture, Facility Management, Health care or dedicated networks for specific verticals, such as airport management.

Examples of applications include air quality measurement, cattle tracking and health monitoring, energy efficient street lighting solutions, smart parking, monitoring wind turbine performance and maintenance requirement, and even better mousetraps – which report when they have trapped a rodent, optimising the efficiency of the pest control operatives that empty them.

IoT Now: Can you give examples of how the scheme has accelerated IoT deployments?

CF: The ThingPark Approved programme guarantees easy and quick connection of any Approved product to a LPWA Network to provide the desired service, without any risk for the manufacturer nor for the network operator. This programme also accelerates the partner on-boarding to ThingPark, builds market awareness for them through our partner catalogue and grows their business through ThingPark marketplace.

This scheme and its associated tools (web site with partner zone, interoperability procedure partially automatised, etc.) constitute a way for our partners to fast-track their IoT projects to Market. The ThingPark Approved programme optimises and industrialises a process that has already supported accelerated deployments such as the national LoRaWAN IoT networks rolled out by **KPN** in the Netherlands or **Proximus** in Belgium, both of which are already supporting applications such as smart parking, airport asset tracking and facilities management – including better mousetraps.

IoT Now: What are the next steps for Activity and ThingPark?

CF: The ThingPark Approved programme is the latest stage in the development of Activity's ThingPark IoT solutions platform. Alongside ThingPark Marketplace, the platform comprises the ThingPark Wireless LPWA network, providing long-range coverage for low-power consumption sensors, and ThingPark Mash-up, enabling developers to create applications using the installed base of ThingPark Approved sensors, exposing sensor capabilities and access to sensor data through open APIs.

With large scale national IoT deployments continuing around the globe, the footprint of ThingPark powered networks is expanding rapidly. Activity will also now begin to target enterprise customers and solutions with our partners such as **Cisco** and **Inmarsat**.

The author of this article is Jeremy Cowan, the editorial director of IoT Now & VanillaPlus. ■



Christophe Francois:

Open innovation around shared standards is the proven way of growing a market

The global IoT market is growing very fast and the big challenge for the normal standards bodies is to be able to ratify, implement and productise IoT standards in a timely manner

Low power connections open up powerful options for enterprise IoT

As low power wide area (LPWA) radio technologies and LoRa WAN in particular start to take off organisations are benefiting from wider connectivity choices and reduced barriers to entry. These new connectivity options are vital to stimulate further utilisation of IoT, Stream Technologies' Mohsen Shakoor and Niall Strachan tell George Malim

The arrival into commercial reality of low power radio technologies is democratising access to connectivity. Where once enterprises would have had to engage with cellular network operators or specialist providers of traditional, high power radio networks or rely on the limited characteristics of VHF radio, they are now enabled to deploy LPWA technologies quickly and simply themselves. This gives greater control to the organisation and enables it to maintain security across its deployment sites.

"We're sat at a different level in the industry to most IoT technology vendors and that means we see different approaches from larger enterprises that are properly considering LPWA as part of their strategy and rolling it out to their customer base," says Mohsen Shakoor, who leads strategic partnerships for Stream Technologies' IoT-X platform. "That has been a significant development in the last six to eight months."

Shakoor says the rise of new connectivity options such as LoRaWAN have made it easier for companies to consider deploying their own wireless networks because there are fewer intricacies involved in setting up networks based on these technologies. "With LoRaWAN, you can own every element inside a privately run network by developing the software and then building and deploying the gateway, or you can outsource various components or all of it," he adds.

Part of the appeal of technologies such as this is that these are not theoretical solutions that are untested. "LoRaWAN, for example, was ratified more than a year ago and, while it may have taken some time for vendors to initially develop their solutions to comply with the LoRaWAN specification, in the last year there has been a massive wave of traction due to the solutions and gateways coming to market with full interoperability," says Niall Strachan, the chief software architect at Stream Technologies. "There has been an acceleration of interest over the last six months and that is becoming progressively more intense as enterprises and network operators use Stream's IoT-X platform to manage

their private or public networks – and not just low power ones."

That's an interesting development that is seeing the stranglehold of cellular networks on IoT device provisioning at the lower data end of the sector start to erode. "The cellular players are beginning to be challenged significantly by LPWA," confirms Strachan. "Low power challenges the traditional low use cellular market place and, with 2G sunsetting starting to appear in network operators' strategies, we're seeing customers migrate to alternative technologies."

"With traditional cellular data being provided on a national network run by an incumbent cellular operator, the trade off between cost and the quality is not necessarily making all users happy," he adds. "Some of our customers don't require all the capabilities of cellular so are now considering or in the process of deploying their own LoRaWAN or paying for access to a public LoRaWAN if it's available. When customers start to crunch the numbers for deploying a network privately for their exclusive usage it starts to become attractive."

Both Strachan and Shakoor agree that organisations which choose to build a private network could see it pay for itself by selling access for different solutions. "Customers can start off with a single account that manages a private network but then migrate to a platform as a service offering with customer segregation, subscriber management and billing services to enable the customer to generate revenue from selling network access to third parties and using the profit to subsidise running their own solution on the same network," Strachan says, emphasising the substantial security and resilience benefits in operating a private network via the IoT-X platform.

The versatility of the low power technologies is part of their appeal. "With LoRaWAN, and LPWA in general, the market will be driven by locations where people need to get data from," Shakoor says. "Once a LoRaWAN is deployed and ►

With traditional cellular data being provided on a national network run by an incumbent cellular operator, the trade off between cost and the quality is not necessarily making all users happy

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Niall Strachan: There has been a global avalanche of new deployments and a push to commercialise existing networks over the last six months



Mohsen Shakoor: We see many different approaches from larger enterprises that are considering or deploying LPWA as part of their IoT strategy



solutions are available, it is then relatively easy to begin to commercialise and monetise these solutions as the market appetite gathers momentum."

Nevertheless, LPWA technologies will not be the only option. Shakoor points to narrowband IoT (NB-IoT), the LPWA technology that is being developed as a 3GPP standard. "The reality is this could enable low power networks over existing cellular infrastructure and that is a good offering to have and co-exist beside other technologies," he explains. "However, a lot of people still want the ability to deploy privately. In addition, the cost of NB-IoT hasn't been defined yet so we could see national LoRaWAN networks compete with national NB-IoT networks on both a technical and commercial basis."

"The main driving factor behind technology choice will be the price, but I don't believe that if an operator announces an NB-IoT network tomorrow that there will be many solutions available," he adds. "However, there are already a significant and growing number of LoRaWAN solutions ready to be commercialised."

Strachan nevertheless sees both technologies co-existing. "NB-IoT is coming and of course we will support and integrate it," he says. "Our philosophy has always been to remain technology agnostic, supporting the widest range of connectivity protocols. In the future narrowband IoT devices will be managed on our IoT-X platform with the same dashboard, APIs and billing system exactly the same as any existing cellular, satellite or LPWA subscriber today. Because of this approach we can make it very easy set up a network regardless of technology or geographic location. IoT-X also future-proofs the incumbent organisation in terms of its choice and variety of deployed connectivity types."

That is where Shakoor and Strachan see Stream Technologies adding the most value. "We have no axe to grind," confirms Shakoor. "We want to enable a secure and reliable network connection for all our customers. We won't push one technology over another. We will recommend services and technologies so long as they are resilient and fit the specific needs of each partner."

Strachan adds that the company's wealth of experience in IoT is in strong demand from customers. "People ask for our professional services and advice because we support so many different connectivity options that may suit their requirements, and we have seen many different approaches; both good and bad," he says. "We have a deep understanding of connectivity and can advise and help find and deploy the right solution that fits their needs. In some occasions there can be a higher level of complexity to consider with a lower power solution. In theory they're simpler and cheaper to operate but, when people start to think of deploying their own networks and the subsequent management of that network, it can become more difficult than simply paying to use a pre-deployed public network."

Low power technologies are ushering in a new era of greater connection choices, some of which are bewildering to a market that has been constrained by technical limitation up to now. It's clear that there are now solutions available to suit most use cases and it is the use cases that will determine technology selection and drive wider adoption. Only a little more guidance is needed to truly enable IoT users to gain the optimum performance from their LPWA strategy. Flexible platforms such as Stream Technologies' IoT-X platform provide the means by which non-specialised enterprises can become commercial network operators. ■

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Worried about 2G turn-off? 4G standards have IoT covered

Among the billions of devices predicted to make up the Internet of Things (IoT), many demand range and mobility that suggest a low-data-rate GSM connection is the ideal M2M data channel, writes Joerg Koepp



The author, **Joerg Koepp**, is market segment manager at Rohde & Schwarz

2G offers adequate performance and great coverage and reliability, but some operators are keen to turn these off to concentrate resources on their higher-value 3G and 4G subscribers. A press release issued last spring by Ovum analyst Nicole McCormick added an extra dose of uncertainty by suggesting that some might axe their 3G networks first, without suggesting any reprieve for 2G.

Fortunately, GSM standards makers have considered the needs of IoT applications and made provision for machine-type communications (MTC) within the latest LTE Releases, 12 and 13, which are now being finalised. These standards have not been easy to establish, and neither are they extensive, because the types of applications likely to communicate over cellular networks are extremely diverse and have a wide variety of requirements.

Power and cost concerns

To provide broad support, the specifications now emerging are focused on a small number of optimisations. The latest Release 12 document, for example, establishes a Power-Saving Mode (PSM) and a new class of simple, low-cost LTE devices known as Category O. PSM is especially important for battery-operated devices. Device category O addresses the requirement for low cost by having only 50% of the complexity of a category 1 modem.

In PSM the front-end circuitry is turned off, but the device remains registered in the network and so is always ready to send messages. This saves power in applications that must send data

periodically, but is not suitable if a fast response or time-critical reaction is required. End-to-end tests are essential for matching the application behaviour to the network behaviour, such as to determine the optimal timer values for idle mode and power-saving mode.

The Category O specification supports data rates up to 1Mbps, which allows low-cost LTE modems by minimising processing power and memory

requirements. Manufacturers can also eliminate full duplex mode and multiple antennas, hence saving the requirement for the duplex filters that are otherwise needed to prevent interference between the transmitter and receiver. Some Category O devices are already being developed and will probably be introduced in 2016. More and better

Release 13 is where the march towards LTE for M2M really hits its stride and assumes the title LTE-M. Significant changes including lower uplink/downlink data rates, lower bandwidth and reduced transmit power will all contribute to lowering cost. Further reductions in power consumption are also planned. LTE-M will thus offer a solution for applications with response-time requirements that prevent the use of PSM as provisioned in Release 12.

LTE-M will introduce other techniques to increase range, such as multiple repetitions of data or less stringent time and error requirements. These will be useful for devices that are dispersed over a large geographical area – sensors in agricultural applications, as just one example – or smart meters installed under extreme receive conditions such as in a basement.

Low-Power WAN (LP-WAN) technologies have been presented as alternatives to GSM, as industries seek a future-proof network free of the threats of closure that surround 2G and 3G. Sigfox and LoRa are among the most widely known, while others include Weightless-N and RPMA.

At this point it is worth noting that the GSM Association (GSMA) has launched its own LP-WAN initiative. Infrastructure, modem and chipset manufacturers are currently working on this with mobile service providers. Field trials are under way, and the committee has already put forward a narrowband IoT standard, NB-IoT. NB-IoT aims to ensure extremely low power consumption and costs, while maximising reception in buildings and supporting large numbers of devices with very little data traffic.

Clearly the GSMA has identified tremendous value in the opportunities the IoT can offer for its members, and is working hard to ensure the data from as many of the IoT's billions of nodes as possible will be carried over GSM networks. We can expect the results of the current initiatives to have a powerful influence on the new 5G standards as these emerge. ■

