WHITEPAPER

FIERCE Wireless

A New Cellular IoT Development Platform Reduces Risk, Complexity, and Time to Market

NXP SEQUANS AVNET Reach Further Microsoft Azure verizon

CONTENTS

INTRODUCTION

For years now, the Internet of Things (IoT) has been touted as the technology of the future—the multifaceted engine that will power smart cities and connected cars and telehealth and AI-driven industry to create a seamlessly interconnected world. But the truth is that IoT is already upon us. The communications landscape is exploding with myriad intelligent devices, from smartphones and tablets to connected printers and thermostats and vending machines—and that explosion is ever-expanding.

IoT technologies and devices are deployed in many ways, depending on the needs of the network—and particularly on the needs of the given application. Some use cases might favor greater bandwidth, whereas others might put a priority on power usage or security. To achieve these ends, most common IoT network implementations have relied on a combination of wired and wireless connections in the form of Ethernet cables and Wi-Fi, Bluetooth, and RFID, all of which have their advantages and disadvantages.

The key to opening up the vast potential of IoT's future, however, is cellular.

CELLULAR IoT USE CASES

"There are so many IoT devices and applications that need to transfer limited amounts of data to and from the cloud," says Imad Mikaiel, Director, IoT Product Marketing, 5G/4G IoT Solutions, Sequans. "These kinds of devices are ideal for cellular. They aren't dealing with megabits per second; they don't need broadband. These are the thousands of devices that have low power needs and are connected to the cloud for sending and receiving updates."

Cellular is ideal for these kinds of devices, and the good news is that cellular IoT boasts several advantages over the traditional Ethernet and Wi-Fi connectivity routes. Cellular already offers ubiquitous coverage, and its deployment and support costs have been rapidly falling—not to mention hardware and data costs. "It's similar to the direction Wi-Fi has taken," says Jim Beneke, VP, Products & Emerging Technologies, Avnet. "Wi-Fi was expensive once, but now it's everywhere and it's simply expected."

The same is true today when it comes to cellular. "Cellular IoT has the potential to free up a lot of endpoints and go beyond the constrictions of traditional Wi-Fi or Ethernet or any other connectivity option," says Pete Bernard, Senior Director, Silicon and 5G Connectivity Partners, Microsoft. "It's going to empower the path toward all sorts of verticals, from health care to transportation, and from large campuses to industry. Traditional connectivity options have been limited, but now we're seeing an ecosystem build up around cellular, and customers are starting to think about what's possible with infrastructure-less IoT that radically reduces deployment costs and leverages hyper-scaler cloud capabilities for AI and other scenarios."

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"There are countless use cases," says Alexandre Moulinet, Systems and Software Engineer, NXP. "Network-connected smart meters, appliances in the home, construction automation, control panels … The medical vertical is also very interesting in this respect: Networks in hospitals are very secure, so imagine cellular-connected devices on a parallel network that don't interfere with the medical network."

And that brings up another important aspect of cellular: It can be more reliable and secure than Wi-Fi connections—for example, in smart building applications where the customer needs to collect data or control apps for enabling and disabling machinery. "In that kind of scenario, you don't want to connect to an existing company's network," says Beneke. "Rather, you'd look for a cellular type of connection. And that applies to so many situations, from smart agriculture and industry to remote control, security, medical, and even the home, where you can't rely on the customer having Wi-Fi or knowing how to connect to the Wi-Fi network—but you *can* rely on cellular."

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CELLULAR IoT DEVELOPMENT CHALLENGES

Given cellular IoT's potential, the key problem is that many developers regard cellular as complex, esoteric, and difficult. "A lot of developers are comfortable working with Wi-Fi or Bluetooth," says Michael Arenas, IoT Business Development, Verizon, "but once you mention cellular to them, many questions arise about design complexities and the certification process."

IoT development is an inherently complex task even before the cellular component is in the mix. It involves such multifaceted tasks as systems engineering, networking, device programming, security, and cloud enablement. Most often, it's a collaborative effort involving multiple teams, depending on the complexity of the application that a given customer is pursuing or the system-level challenge the company is facing.

"If you're developing an IoT platform," says Moulinet, "your goal is to choose the right protocol to use for your application, as well as make sure you understand the needs of the environment and the needs of your users. If you want to use a connected refrigerator in a smart home, for example, there's a specific set of protocols that are key standards for that use case, and if you want to track something using IoT systems, then you also need to choose the correct protocol and system for that."

Mikaiel poses the example of a printer or vending machine that a customer wants to connect to the cloud. "For something like that," he says, "you need a person to do hardware development, you need someone to build device hardware like an antenna, and you need a team to perform

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software development to make the system work. Then, you have to create a prototype, and *then* you need certification to make the prototype work. That's already a lot of time and expense—and then the developer has to face the prospect of cellular."

Cellular brings a whole new level of complexity to the development process. "Adding cellular connectivity to an embedded IoT product introduces challenges that aren't typical," says Beneke. "If you add Wi-Fi to a device, you have to add FCC certification because it's a radio. The same is true of cellular—but in addition to FCC certification, you need cellular network certification, and that's where the complexity and cost are even greater."

By and large, developers are armed with excellent skills, but when it comes to cellular IoT, either the customer is too small to consider the unwieldy maze that is cellular certification, or the customer simply lacks the necessary knowledge about the process. Or the entire prospect is simply too expensive.

THE POWER OF AN ALL-IN-ONE SOLUTION

An IoT development platform that combines universal cellular connectivity with a powerful MCU and device-to-cloud capabilities can significantly reduce the complexity and cost usually associated with cellular device design and operator certification. With such a solution—based on best-in-class components—developers can be assured of not only security, reliability, and low power consumption, but also the ability to create products of great usefulness for a wide range of IoT applications, thereby improving competitiveness and increasing revenues.

"The key is pre-integration," says Mikaiel. "Collectively, we want to do all the work for the final user so that he or she can simply turn on the device. An all-in-one solution brings simplicity, optimizes performance and power, eliminates complexity, and shortens time to market. The user can take this solution off the shelf and enable it onsite in a few days and have the solution working—and that solution will immediately have the connectivity it needs to go to the cloud. Not only that, but the user can start creating prototypes to improve it and get it to production quickly."

Engendering a powerful, comprehensive cellular IoT development solution requires the participation of strong, collaborative partners. As maintained in the *Forbes* article "Why Partnerships Are Key to IoT Success," cross-functional collaboration is essential. The complicated mix of technology expertise required for cellular IoT development—digital hardware design, RF design, embedded software design, networking/communication protocol knowledge, and cloud integration and application development—as well as the

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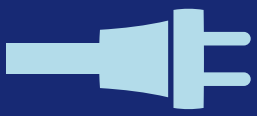
vast amounts of data involved—makes it impossible for one company to produce a solution that makes sense. Only a carefully built partnership can bring the right components to the table and offer a platform to IoT developers that assembles all the capabilities they need in one solution so that they don't need to create it from scratch.

"There's a lot of cool aggregation going on in the ecosystem right now," says Bernard. "Microsoft works with silicon partners, module markers, development kit and reference platform providers, ODMs and OEMs up the stack, and I can tell you that the more you can aggregate a solution, the faster a customer can get to its business outcomes. We're trying to take friction out of the ecosystem. Microsoft doesn't want to be in the business of selling chemistry sets; we want to sell people things that they can plug in and work with immediately."



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THE MONARCH GO CELLULAR IoT DEVELOPMENT KIT

In early 2020, Sequans and NXP collaborated on a development platform that combined Sequans' best-in-class LTE-for-IoT technology with NXP's excellent low-power MCU, resulting in a pre-integrated kit that device makers could use to easily add LTE-M or NB-IoT connectivity to their designs and get to market quickly. That collaboration has paved the way to a broader cellular partnership that holds even more promise.

Monarch Go is a comprehensive modem component that offers the world's most efficient method for developing a cellular-IoT connected device. It's the key piece of a development kit that is the result of a five-pronged partnership between Sequans, NXP, Verizon, Avnet, and Microsoft.

Sequans. Chip/module maker Sequans is the creator of Monarch Go, the LTE cellular connectivity modem component inside the development kit. With Monarch Go, Sequans simply wanted to make the communications aspect of IoT connectivity easier for customers—in short, to give its customers a solution that was ready to go live and to easily connect to the cloud. "We essentially wanted to streamline a process that normally requires a lot of time, expertise, and investment cost," says Mikaiel. "Our main goal was to give customers a complete modem, equipped with an antenna, powerful onboard software, seamless cloud connectivity, a data plan—everything! And from there, they'd be able to choose the best MCU for their system-level needs."

NXP. For its part, NXP—already a major MCU player finding great success in the IoT market—had been on the lookout for the component that it felt was the missing piece in its portfolio: LTE-M communications. NXP began looking for a connectivity piece that it could pair with its MCUs, and it landed at Sequans. "Instead of building the knowledge around connectivity ourselves and developing that component," says Moulinet, "we thought it would be better to partner with Sequans, the leader in the market segment. So we started with our latest MCU, the LPC55S69, a high-performance low-power device, and added the Monarch Go modem component. After all, a system with IoT connectivity needs a strong low-power CPU that will control the system."

Verizon. Verizon is the first operator to certify the Monarch Go modem device, which comes with a Verizon SIM card and can be easily activated on a variety of data plans. But not only does Verizon provide the built-in cellular connectivity, it also brings its ThingSpace platform for device management, over-the-air updates, security, and other services. "Verizon had been working closely with Sequans on Monarch Go," says Arenas. "For this cellular IoT development kit, we had strong input about what it would look like, and we helped develop it. But the big deal is that Monarch Go is fully cellular-certified, so customers don't have to go through that process. All the complexity and cost barriers are removed."

Avnet. Avnet is the kit's distributor/marketer, and it's also a co-developer of the solution itself, performing design of both hardware and onboard software, as well as the cellular connectivity component. "Avnet created the Arduino shield carrier board that the Monarch Go gets mounted on," says Beneke. "We're also working with NXP on the customer-facing application example, so while NXP did the bulk of the software development for the MCU, we're helping to refine it for a true out-of-the-box experience for the customer with a targeted application." Avnet is also developing a dashboard application on Microsoft Azure to show how to build an example cloud app that works with the kit. Dashboards for both Azure IoT Central and Avnet's own IoTConnect platform are available to help customers get started.

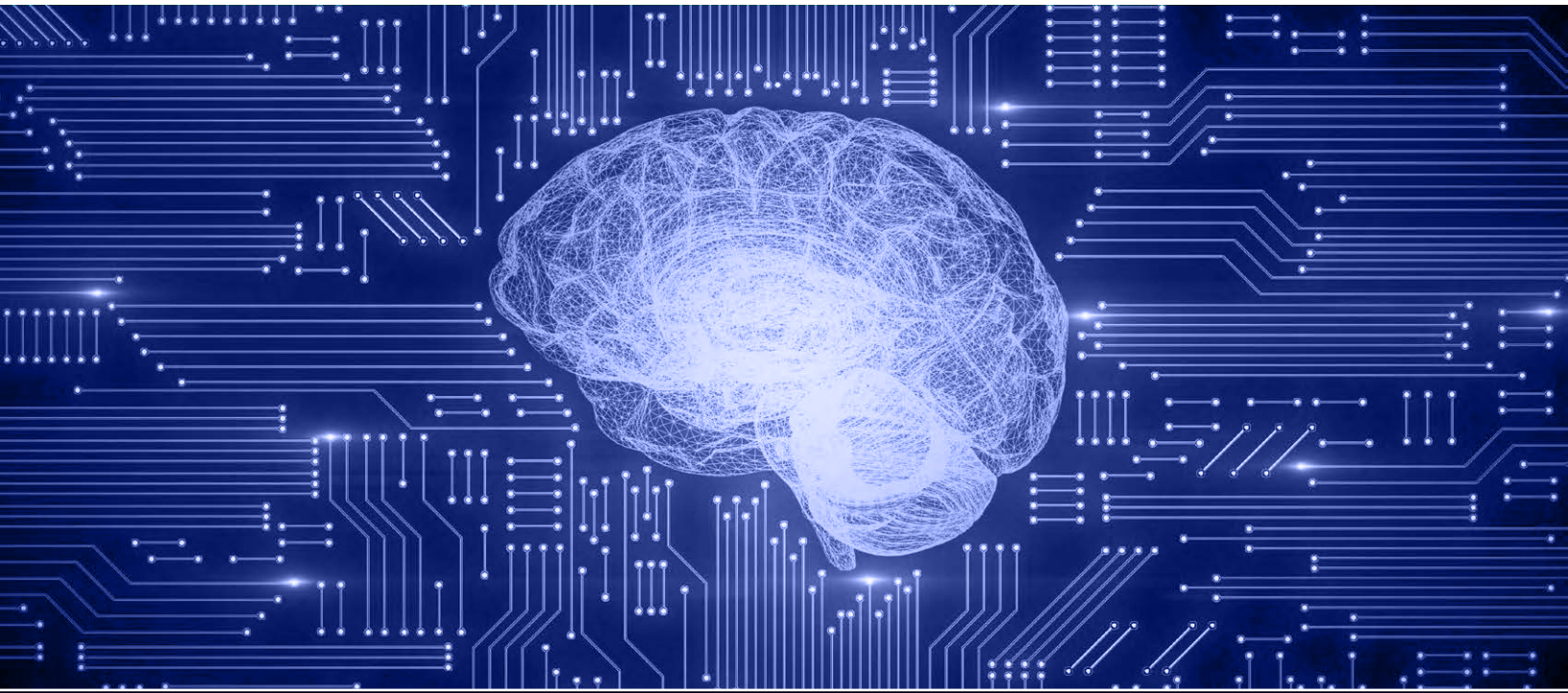
Microsoft. Microsoft not only brings the essential device-to-cloud connection to Monarch Go with its Azure IoT platform, but it also offers a top-notch commercial-grade hyper-scaler cloud platform, and a range of Power Platform capabilities that already supports 95% of the Fortune 500. The company has been helping many industries around the world with their digital transformations for years. "Microsoft has the tools and the experience to take IoT data with Azure IOT and IoT Central, use it in Microsoft Dynamics, manipulate it in the Power platform, AzureML, use it in Teams for notifications, and so on," says Bernard. "If you're a customer that needs to solve a business problem, you need a whole portfolio of top-tier technologies and cloud platform capabilities to do that, so that's what Microsoft brings to the kit."

The result of this unique partnership is a development kit that takes all the guesswork out of cellular IoT development. The kit provides customers with a working cellular IoT example that they can customize and build upon. All the necessary building blocks are provided: hardware in the form of a secure MCU, fully certified production-ready cellular connectivity, embedded software components and various communication stacks and security stacks, and a selection of cloud implementations.

To that end, the Monarch Go cellular IoT development kit is also a good representation of the bleeding-edge technologies on the market—including Sequans' Cat-M chipset for IoT applications, NPX's Cortex M33-based MCU, and Avnet's Arduino carrier board, not to mention a premier carrier in Verizon and Microsoft leadership position with Azure. That's a lot of new and powerful technologies all packaged together for the customer's convenience.

The truth is that a vast majority of companies in need of such a solution aren't interested in the technical details of developing one on their own. They have their business outcomes to achieve: They have to manage their business, reduce costs, and continue to digitally transform their business. That's the reason aggregated solutions like the Monarch Go cellular IoT development kit are becoming increasingly popular.

"Pulling all these great partners together is probably unique," says Beneke. "There's a broad set of customers that don't have the expertise that some big-tier customers have, so they need tools like this development kit that provide all the various building blocks, integrated together to accelerate the design and development process."



CONCLUSION

Combining technologies such as cellular and IoT is a potential game-changer in an already burgeoning market. “This isn’t just some off-the-shelf solution where we’re writing a little software and shipping it, says Beneke. “We’re talking about customers who are looking for full-blown embedded cellular connectivity from a solutions or applications perspective. The reason we’ve come together to create this kit is because it’s very broad in terms of applications.”

Developers who are poised to be creative in the face of a new era of communications will be thrilled with power of the Monarch Go cellular IoT development kit. “We’ve taken all the complexity out of the process because we’ve partnered with all the right partners,” says Arenas. “All you need is the right application, and you’re off and running.”

As for what the future holds, the sky is the limit. “I don’t think we’ve fully realized the opportunity that we’re facing,” says Bernard. “We’re on the cusp of something radically new and different, where people are beginning to understand that cellular networking combined with IoT and technologies like AI can open up new solutions that people haven’t even imagined. This kit might be seen as one of the first steps on that path.”

To learn more about the Sequans/NXP Cellular IoT Development Platform, visit the Avnet product page.

To learn more about Verizon’s connectivity plans visit https://thingspace.verizon.com/iot-marketplace/

SEQUANS

About Sequans Communications

Sequans Communications S.A. (NYSE: SQNS) is a leading developer and provider of 5G and 4G chips and modules for massive, broadband, and critical IoT. For 5G/4G massive IoT applications, Sequans provides a comprehensive product portfolio based on its flagship Monarch LTE-M/NB-IoT and Calliope Cat 1 chip platforms, featuring industry-leading low power consumption, a large set of integrated functionalities, and global deployment capability. For 5G/4G broadband and critical IoT applications, Sequans offers a product portfolio based on its Cassiopeia Cat 4/Cat 6 4G and high-end Taurus 5G chip platforms, optimized for low-cost residential, enterprise, and industrial applications. Founded in 2003, Sequans is based in Paris, France with additional offices in the United States, United Kingdom, Israel, Hong Kong, Singapore, Sweden, Taiwan, South Korea, and China. Visit Sequans online at **www.sequans.com.**