FROST & SULLIVAN

2024 TECHNOLOGY INNOVATION LEADER

IN THE GLOBAL NON-CELLULAR 5G NETWORK INFRASTRUCTURE INDUSTRY

Wirepas

FROST & SULLIVAN

2024 BEST PRACTICES AWARD

Best Practices Criteria for World-Class Performance

Frost & Sullivan applies a rigorous analytical process to evaluate multiple nominees for each award category before determining the final award recipient. The process involves a detailed evaluation of best practices criteria across two dimensions for each nominated company. Wirepas excels in many of the criteria in the non-cellular 5G network infrastructure space.

What is Non-cellular 5G?

When discussing 5G networks and 5G network infrastructure, in general one is discussing the fifth generation of cellular network technologies. Now, however, a non-cellular networking technology fits under the 5G New Radio (NR) umbrella as well.

5G has three dimensions:

1. Enhanced mobile broadband (eMBB) or a faster, more efficient 4G
2. Massive machine-type communications (mMTC) enabling much higher device density
3. Ultra-reliable low-latency communications (uRLLC)

eMBB is primarily aimed at the consumer market, while mMTC and uRLLC are focused on enterprise needs. Cellular 5G can do all three, but not necessarily at the same time. Some use cases combine two or all three of these dimensions.

Standards drive 5G, just as they did for 3G and 4G. The United Nations International Telecommunication Union (ITU) set the high-level definition of what 5G will contain. The ITU defined the three dimensions above and requires that for any technology to be part of 5G, it must meet at least two of the dimensions. Working within the ITU definitions, the 3rd Generation Partnership Project (3GPP) produces the technical standards that define 5G cellular networks. The 3GPP brings together a number of regional standards organizations, including the European Telecommunications Standards Institute (ETSI). In 2020, ETSI introduced a new internet of things (IoT) standard called DECT-2020 NR that focuses on two of the above

dimensions: mMTC and uRLLC. In 2021, the ITU made DECT-2020 NR the first non-cellular 5G networking technology. (DECT-2020 NR is now commonly referred to as DECT NR+ or simply NR+.)

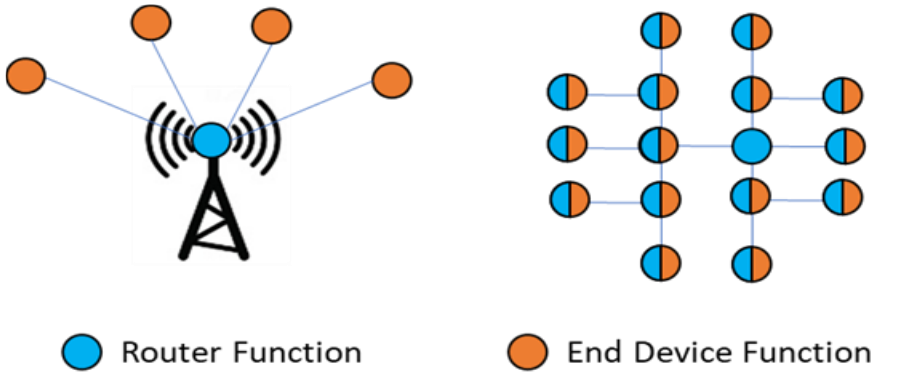
Commitment to Innovation and Commitment to Creativity

Founded in 2010, Finnish company Wirepas offers IoT solutions for enterprise, including a version that follows the DECT-2020 NR standard. (Wirepas has been contributing to the standard since 2018.) While the company is relatively small (fewer than 100 employees), its reach is wide, with many international patents (more than 100) and many partnerships (nearly 200). Wirepas has offices in North America, Asia-Pacific, and Europe. The company's networking solutions currently connect more than 8 million devices, and its sales pipeline looks to add millions more.

The Wirepas Connectivity Suite is all software; it works with partners to embed its software in devices. Since IoT use cases have diverse needs, there are three profiles that use different radio parameters and have performance metrics that differ in terms of power consumption, range, cost, and reliability:

- **5G Mesh** follows the DECT-2020 NR standard and operates at 1.9 GHz
- **2.4 GHz Mesh** operates at 2.4 GHz (Bluetooth Low Energy spectrum)
- **Sub-GHz Mesh** operates below 1 GHz (different radio frequency [RF] ranges depending on country)

The Wirepas Connectivity Suite, as the profile names indicate, is a mesh network. What is a mesh network and how is it different from a cellular network? The illustration below is a simplified view of a mesh network (on the right side) and a cellular network (on the left side.)



Source: Frost & Sullivan, Wirepas

A device in a cellular network connects to the radio access network (RAN), which routes the communication to the core network that may be hundreds of kilometers away from the RAN. The core network determines what to do with the communication and connects it appropriately. This may be a phone call, a text message, a connection to the internet, or something else. (The illustration above does not show the core network.) This means data from and to the device may travel a great distance, which adds latency. For most consumer applications, this does not matter. If a smartphone calls another smartphone, the latency caused by this centralized design is not noticeable, but one can see the potential inefficiency when devices are relatively close to each other. For example, if a smartphone calls another

smartphone that is in the same cell, the phones may be less than a kilometer apart but the data that makes up the call may travel hundreds of kilometers. Even with occasional inefficiencies, cellular networks work well in most cases for billions of consumers and enterprises. 5G cellular networks support all three dimensions required by the ITU, but in certain situations, the mesh network used by the Wirepas Connectivity Suite works better.

> *"With the Wirepas Connectivity Suite and its range of profiles, the application diversity of IoT expands beyond what was previously possible. Devices are less expensive, which enables connecting more to the network for tracking or more complex operations. The network is simple, requires less infrastructure, and heals itself."*
>
> ***- Troy M Morley***
> ***Industry Principal, ICT***

In contrast to the centralized nature of cellular networks, the Wirepas Connectivity Suite is decentralized; no core network handles the routing. Each device communicates wirelessly with neighboring devices, and each device can act as a router. Much less power is needed than cellular because the connections themselves are over smaller distances. The network is self-healing and has no single point of failure because traffic can be rerouted around devices that are having issues. The devices can be simpler than cellular devices, which reduces costs, and much less infrastructure is needed, which also makes the network less expensive to install and operate. The Wirepas Connectivity Suite network also features almost unlimited scalability—much higher than 5G cellular (or 4G before it).

Innovation is a constant process of making something better and better. An idea becomes a product. The product becomes a better product. The better product becomes an even better product. And on and on. Creativity is required to continually innovate.

Before Wirepas was founded in 2010, the ideas for making a better, more scalable IoT network started at the University of Tampere as a research project. Once Wirepas was founded, ideas became what is now the Wirepas Connectivity Suite. This mesh network solution is constantly being improved, now with feedback from hundreds of customers and partners.

One concrete example is the 5G Mesh profile of the Wirepas Connectivity Suite. While the solution operates differently than 5G cellular, it still requires a radio, and that requires RF spectrum. Spectrum is controlled by country, but making different devices for each country can be difficult and expensive. The DECT-2020 NR standard and the 5G Mesh profile of the Wirepas Connectivity Suite make use of an RF range (1.9GHz) that is globally available and recognized everywhere. Hence, the radios and devices are less expensive because they work everywhere, with no need to customize by country.

Application Diversity

The Wirepas Connectivity Suite has three separate radio profiles because different use cases have different requirements. Do the devices connecting to the mesh network have access to power or are they battery operated? If battery operated, it is likely that the goal is to have the batteries last as long as possible (up to 10 years), so the device will spend much of its existence in a low-power mode that will limit some of its capabilities. If power is not a concern, the device will be able to communicate across greater distances and be able to do more.

Wirepas focuses on four broad areas.

- **Smart tracking**: Imagine trying to find that one thing in a warehouse that contains millions of things. With smart tracking, that is now easy. Everything can be tracked—even low-cost items. To make that possible, the devices must be low cost and battery operated, and the batteries need to last a long time.
- **Smart energy and smart cities**: Connecting smart electrical meters or controlling streetlights requires longer-range connectivity, but power is readily available. With smart tracking, connections are typically measured in meters, but in smart energy and smart city use cases kilometers may separate some devices. Electrical meters used to be manually read once a month or so. With smart meters, electrical usage can be read every few minutes, giving a consumer—and an electric company—a much better view of consumption.
- **Smart buildings**: In a smart building, some devices likely are connected to power and others battery operated. This is somewhat of a combination of the first two areas of focus.
- **Smart manufacturing**: In addition to tracking assets in a manufacturing facility, machines must be monitored and/or controlled. One example is monitoring the lubrication on a machine so that it operates at peak efficiency for as long as possible, and knowing when maintenance is required so that the machine does not unexpectedly break down.

With the Wirepas Connectivity Suite and its range of profiles, the application diversity of IoT expands beyond what was previously possible. Devices are less expensive, which enables connecting more to the network for tracking or more complex operations. The network is simple, requires less infrastructure, and heals itself.

Commercialization Success, Customer Acquisition, and Growth Potential

These criteria are highly correlated and will be discussed together.

> *"Smart electric meters have been an area of focus and success for the Wirepas Connectivity Suite. Its biggest mesh network to date is a smart metering network that contains nearly 1 million devices and has been operating successfully for a few years in the Nordics. This success has led to work with smart meters in India, which has the potential to be a much bigger market. Frost & Sullivan believes this is only the beginning—and this is only one use case."*
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Bringing new technology to the market is never easy, no matter the size of the company. Think how many new things are announced by giant companies, yet most fade away and only a few become "the next big thing." It is even harder for a small company to find success. Yet Wirepas continues to defy the odds.

Growth is the ultimate goal of any company that wants to remain in business; to grow, one must acquire new customers or expand with existing customers.

Smart electric meters have been an area of focus and success for the Wirepas Connectivity Suite. Its biggest mesh network to date is a smart metering network that contains over 1 million devices and has been operating successfully for a few years in the Nordics. This success has led to work with smart meters

in India, which has the potential to be a much bigger market. Frost & Sullivan believes this is only the beginning—and this is only one use case.

Wirepas's business model keeps with the idea that its mesh network is inexpensive and simple to operate, and solves problems that could not previously be solved economically. There are no ongoing fees for devices—just a one-time fee for the software that is embedded in the network devices. Wirepas offers tools and services to customers and partners to help them use the network to its maximum effect, which provides additional revenue for Wirepas. The company has done an excellent job in working with partners to expand its reach and grow its customer base—and demonstrate its growth potential.

Conclusion

Wirepas focuses on IoT networks for enterprises that utilize a mesh network to solve problems that could not be solved economically with other technologies. Many millions of devices are already connected with Wirepas's technology, which is a testament to the ease of deployment, versatility, and economics of the company's next-generation IoT solutions. The company offers the Wirepas Connectivity Suite: one set of software with multiple profiles depending on the use case, including a non-cellular 5G option.

Wirepas earns Frost & Sullivan's 2024 global Technology Innovation Leadership Award for its strong overall performance in the non-cellular 5G network infrastructure industry.

What You Need to Know about the Technology Innovation Leadership Recognition

Frost & Sullivan's Technology Innovation Leadership Award recognizes the company that has introduced the best underlying technology for achieving remarkable product and customer success while driving future business value.

Best Practices Award Analysis

For the Technology Innovation Leadership Award, Frost & Sullivan analysts independently evaluated the criteria listed below.

Technology Leverage

Commitment to Innovation: Continuous emerging technology adoption and creation enables new product development and enhances product performance

Commitment to Creativity: Company leverages technology advancements to push the limits of form and function in the pursuit of white space innovation

Stage Gate Efficiency: Technology adoption enhances the stage gate process for launching new products and solutions

Commercialization Success: Company displays a proven track record of taking new technologies to market with a high success rate

Application Diversity: Company develops and/or integrates technology that serves multiple applications and multiple environments

Business Impact

Financial Performance: Strong overall financial performance is achieved in terms of revenues, revenue growth, operating margin, and other key financial metrics

Customer Acquisition: Customer-facing processes support efficient and consistent new customer acquisition while enhancing customer retention

Operational Efficiency: Company staff performs assigned tasks productively, quickly, and to a high-quality standard

Growth Potential: Growth is fostered by a strong customer focus that strengthens the brand and reinforces customer loyalty

Human Capital: Commitment to quality and to customers characterize the company culture, which in turn enhances employee morale and retention

About Frost & Sullivan

Frost & Sullivan is the Growth Pipeline Company™. We power our clients to a future shaped by growth. Our Growth Pipeline as a Service™ provides the CEO and the CEO's growth team with a continuous and rigorous platform of growth opportunities, ensuring long-term success. To achieve positive outcomes, our team leverages over 60 years of experience, coaching organizations of all types and sizes across 6 continents with our proven best practices. To power your Growth Pipeline future, visit Frost & Sullivan at http://www.frost.com.

The Growth Pipeline Engine™

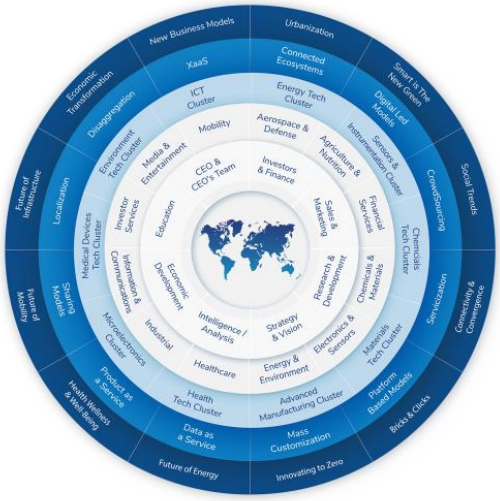
Frost & Sullivan's proprietary model to systematically create ongoing growth opportunities and strategies for our clients is fuelled by the Innovation Generator™.
Learn more.

Key Impacts:

- **Growth Pipeline:** *Continuous Flow of Growth Opportunities*
- **Growth Strategies:** *Proven Best Practices*
- **Innovation Culture:** *Optimized Customer Experience*
- **ROI & Margin:** *Implementation Excellence*
- **Transformational Growth:** *Industry Leadership*

The Innovation Generator™

Our 6 analytical perspectives are crucial in capturing the broadest range of innovative growth opportunities, most of which occur at the points of these perspectives.



Analytical Perspectives:

- **Mega Trend (MT)**
- **Business Model (BM)**
- **Technology (TE)**
- **Industries (IN)**
- **Customer (CU)**
- **Geographies (GE)**