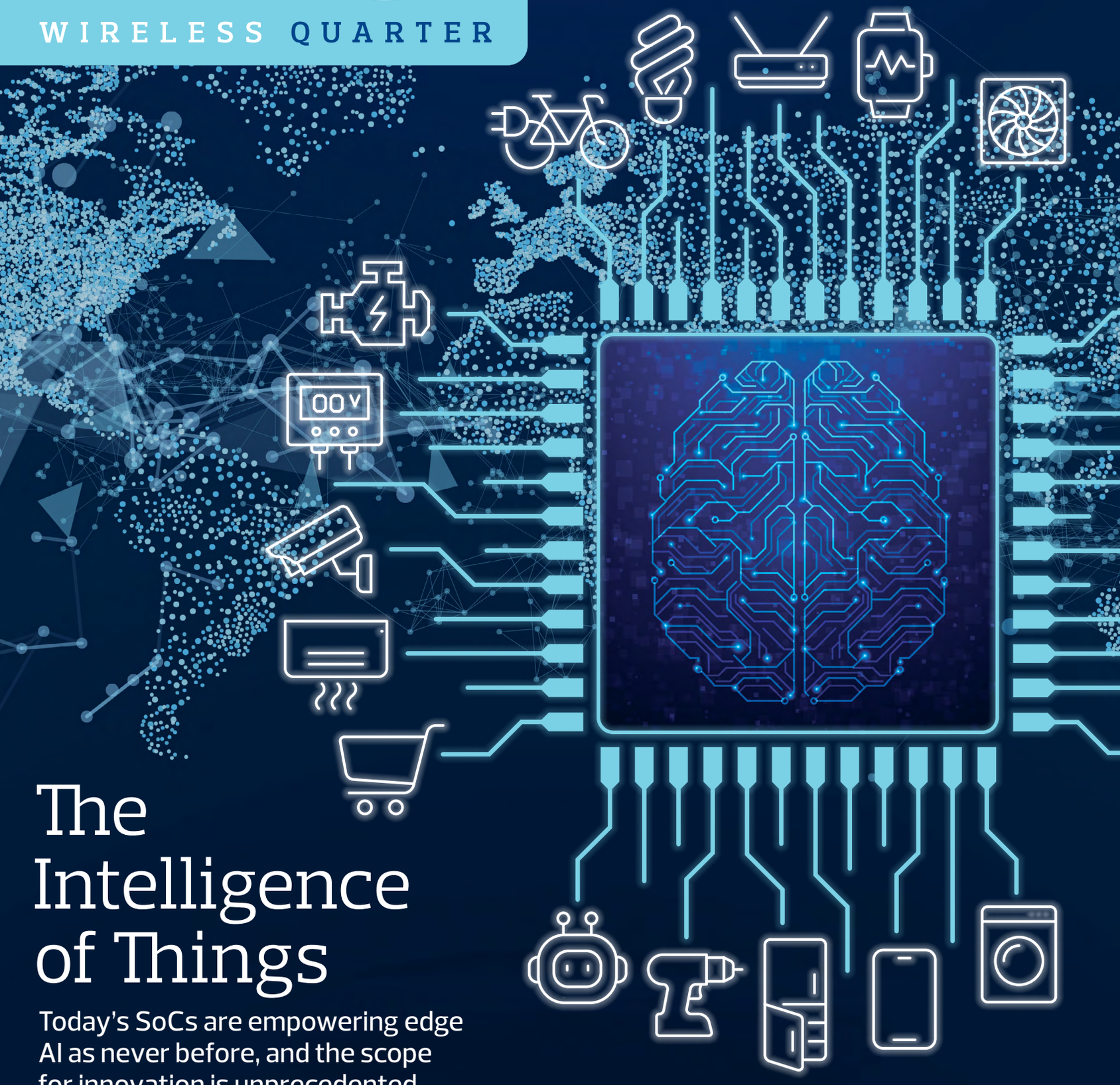
WQ
WIRELESS QUARTER

Issue 2, 2026

TIME TO ACT:
THE EU'S CYBER RESILIENCE ACT DEADLINE IS FAST APPROACHING

INSIDE MATTER:
TOMORROW'S SMART HOME



The Intelligence of Things

Today's SoCs are empowering edge AI as never before, and the scope for innovation is unprecedented

NORDIC GROWS CELLULAR IOT PRODUCT LINEUP

THREE TRENDS DRIVING BLUETOOTH LE IN 2026

HOW TO MASTER LOW POWER CELLULAR IOT

NORDIC SEMICONDUCTOR

Welcome

Vegard Wollan
Chief Executive Officer

Nordic puts intelligence in the hands of developers

Nordic Semiconductor has always believed great wireless development starts with simplicity and by removing unnecessary complexity so developers can focus on what matters. But what developers build, and how they build it, is changing fast. AI is reshaping IoT development workflows and becoming a feature of the products themselves. Nordic is responding on both fronts.

Developers need the best ultra-low-power hardware, embedded software, lifecycle services, and a faster path from idea to product. This spring, Nordic extended that further than ever with the introduction of AI-assisted development. The AI assistant developers already use now knows our chips, our SDK, and our cloud. It is like having the most knowledgeable support engineer always at your side, answering instantly. No other company offers hardware, software, and cloud services so uniquely interconnected, enabling AI assistance at every stage of the IoT device lifecycle.

Edge AI is becoming a baseline expectation too. Because ultra-low-power is in Nordic's DNA, it is now practical at the very edge of billions of connected devices without increasing power budgets or development overhead (*see page 12*).

For developers building for the EU market, the Cyber Resilience Act deadline is approaching fast. Hardware-anchored root of trust, combined with a one-time lifetime FOTA and device management license for nRF Cloud, means Nordic customers are CRA-ready from day one (*see page 16*). This enhanced security will equally benefit customers working to comply with the U.S. Cyber Trust Mark scheme.

These announcements are not isolated. They are our strategy: build the hardware right, build the software around it, back it with cloud services that last the life of the product. Furthermore, it makes the developer experience better at every step. That is what leadership in next-generation ultra-low-power wireless IoT looks like.

> "It is like having the most knowledgeable support engineer always at your side, answering instantly

Wireless Quarter is contract published on behalf of Nordic Semiconductor by MediaTurf

Editor
Chris Williams chris@mediaturf.com.au
Contributing Editor
Kalon Huett
Creative Director
Sam Grimmer
Print & Distribution
Printech Europe

nordicsemiconductor NordicSemi nordic-semiconductor @NordicTweets devzone.nordicsemi.com

To subscribe to WQ visit www.nordicsemi.com/Wireless-Quarter

Contents

News 4

News Extra 8
Nordic expands future-ready cellular IoT portfolio

Analysis 10
Three trends driving Bluetooth LE

Comment 11
The importance of power management

The Intelligence of Things 12
Edge AI is enabling real time, intelligence on billions of IoT devices

Time to Act 16
Compliance deadlines for the EU Cyber Resilience Act are nearing

Inside Matter 20
Matter adds coordinated intelligence to the smart home

Nordic Inside 24
Sphero Bolt+

Case Study 26
Non-stop, real time wireless tracking of blood sugar levels

Industry Viewpoint 27
Jerzy Bialousz, CEO, Inventia

Tech Zone News 28

Product Focus 30
nRF54LM20B

Tech Briefing 32
Mastering low power cellular IoT for multi-year battery life

Nordic Product Summary 34

News

The latest developments from Nordic Semiconductor

New Products

Nordic strengthens ultra-low-power edge AI lead with new nRF54LM20B SoC

Nordic Semiconductor has further expanded its next-generation, ultra-low-power nRF54L Series with the addition of the award-winning Neural Processing Unit (NPU) enabled nRF54LM20B SoC.

The large-memory nRF54LM20B makes high-rate sensor data, audio, and event-driven edge AI workloads practical on a tiny battery. The integrated NPU accelerates TensorFlow Lite-class models up to 15 times faster and with significantly lower energy consumption than execution on the Arm Cortex CPU, and delivers up to 7 times higher performance and 8 times better energy efficiency than the closest competing edge AI solution.

The nRF54LM20B makes it easier than ever for developers to add meaningful intelligence to their products without increasing power budgets or development overhead.

"This new generation of edge AI-enabled capabilities fundamentally transforms what small, battery-powered devices can perceive and interpret in the real world," says Oyvind Strom, EVP Short-Range at Nordic Semiconductor. "By bringing powerful intelligence directly onto the device—without compromising power efficiency, latency, or system complexity—we are enabling an entirely new class of products that are significantly smarter, more responsive, and dramatically more energy-efficient than anything previously possible."

The nRF54LM20B can provide real-time intelligence in battery-powered wearables

By combining advanced hardware acceleration, flexible model support, and intuitive developer workflows, Nordic is strengthening its edge AI offering to make on-device intelligence practical for mainstream products. The new NPU-enabled nRF54LM20B provides the performance needed for real-time intelligence in battery-powered wearables, smart home and audio devices, industrial and medical sensors, and trackers. This enables accurate activity detection, natural sound and presence response, instant anomaly identification, and movement interpretation without cloud processing.

... and expands nRF54L Series with entry-level SoCs for cost-sensitive applications

In addition to the nRF54LM20B, Nordic has also introduced two entry-level, ultra-low-power Bluetooth LE SoCs – the nRF54LS05A and nRF54LS05B. Both can serve as the main wireless SoC in single-chip systems, or operate as Bluetooth LE companion devices in multi-chip systems.

The nRF54LS05A and nRF54LS05B offer developers the key features of the nRF54L Series - robust Bluetooth LE connectivity, ultra-low-power consumption, and easy-to-use software - while optimizing for the development of simple, cost-efficient Bluetooth LE end-products.

The nRF54LS05A and nRF54LS05B combine a 128 MHz Arm Cortex M33 processor with low-leakage RAM for efficient, responsive processing. They include Nordic's 4th-generation Bluetooth LE radio, baseline security, and pin-to-pin compatibility with selected SoCs in the series for easy scalability. While both SoCs offer the same level of Non-Volatile Memory (NVM) at 0.5 MB, the nRF54LS05B offers a modest increase in RAM for applications that need additional headroom. While the nRF54LS05A SoC offers 64 KB of RAM, the nRF54LS05B offers 96 KB.

Asset Tracking

Cellular IoT and Wi-Fi asset tracker provides insights with nRF Cloud

Sentinum, has released a cellular IoT-powered asset tracking and condition monitoring solution built on Nordic Semiconductor's nRF9151 low power module and nRF7000 Wi-Fi 6 Companion IC. The Juno Cellular Tracker is designed to provide continuous insights on the location, handling events, and operational status of mobile or distributed assets.

Juno integrates a three-axis MEMS accelerometer to provide three key sensing functions—motion, tilt, and detection of opening or tampering—that support activity-based tracking, misuse detection, and automated event logging without the need for additional components. The sensors are supervised by the integrated nRF9151's Arm Cortex-M33 dedicated application processor, including 1 MB Flash and 256 KB RAM.

To complement its condition sensors, Juno employs hybrid positioning technologies optimized for indoor and outdoor environments. SSID-based Wi-Fi scanning using the Nordic nRF7000 Wi-Fi Companion IC is used to capture nearby MAC (media access control) addresses and resolve position with 2–50 m accuracy, ideal for indoor or dense urban areas. GNSS provides precise outdoor positioning and is used selectively to minimize energy consumption.

When Wi-Fi and GNSS are unavailable or when ultra-low-power operation is required, cell-based locationing is used to estimate position.

Nordic's nRF Cloud provides a secure, scalable, and standardized backend for device management and geolocation processing. By leveraging Nordic's infrastructure, Sentinum can offload complex operations from the device, reduce power consumption, and streamline fleet management for its customers.

For positioning, Juno devices transmit GNSS and Wi-Fi scan data directly to nRF Cloud, where the final location is resolved using Nordic's global databases.

Connected Health

Bluetooth LE Audio powers device for vascular surgeons

A Nordic-powered Bluetooth LE vascular Doppler system that has been FDA cleared for intraoperative use has been launched by medical device manufacturer, Remington Medical, Inc. VascuChek is a handheld, cordless ultrasound-based device that eliminates the need for tethered probes, and uses the Doppler effect to detect and listen to blood flow within blood vessels. This allows surgeons to check whether blood is still flowing properly in a vessel after a repair, bypass or graft.

The device emits an ultrasonic wave that detects frequency shifts caused by moving blood cells, turning these into audible sounds or signals clinicians can interpret. The Doppler audio is played either through a small speaker located internally in the transceiver handpiece, or a larger speaker in a speaker dock. Both the handpiece and the speaker dock employ a pre-certified u-blox NORA-B1 module built on Nordic's dual-core nRF5340 multiprotocol SoC, enabling Bluetooth LE Audio wireless connectivity between the transceiver and the dock.

"VascuChek is a battery-powered device, so low power consumption is important, but high sound quality and low latency are non-negotiable," says Michael Fuller - Principal R&D Electrical Engineer at Remington Medical.

"We were skeptical that LE Audio could deliver high sound quality and minimal latency while also being low-power, so we performed side-by-side testing. We were impressed the nRF5340 SoC had sound quality right on par with the best Bluetooth Classic alternative, while also having the lowest latency."

In Brief

nRF54LM20B WINS BEST IN SHOW AWARD AT EMBEDDED WORLD

Nordic Semiconductor has won the Embedded World 'Best in Show' Award from Embedded Computing Designs for the nRF54LM20B SoC. The nRF54LM20B SoC pairs an Axon NPU with 2 MB NVM, 512 KB RAM, a 128 MHz Arm Cortex-M33 plus RISC-V coprocessor, and Nordic's fourth-generation ultra-low-power 2.4 GHz radio. According to the judges, the nRF54LM20B SoC was selected for its design excellence, performance and market impact. "The nRF54LM20B is the result of both our technical ingenuity and early recognition of the impact edge AI will have," says Oyvind Strom, EVP Short-Range at Nordic Semiconductor.

NORDIC SECURES SKYLO CERTIFICATION FOR nRF9151

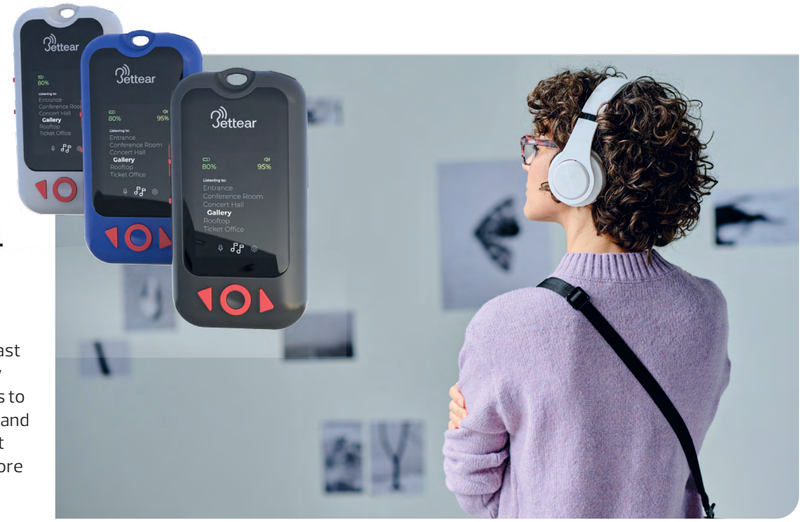
Nordic Semiconductor's nRF9151 cellular IoT module has been certified for use on Skylo's commercially-available non-terrestrial network (NTN). The certification ensures full compliance with Skylo's satellite network spanning 36 countries and more than 60 million sq km of coverage, enabling developers to build IoT devices that maintain connectivity even in areas without terrestrial coverage. NTN (satellite) support offers OEMs a production-ready solution for global connectivity. With this certification, OEMs and developers can integrate the nRF9151 module into production-ready designs for Skylo's NTN.

nRF54L15 SoC MAKES ACCESS AND IDENTITY CARDS SMARTER

A Bluetooth LE-powered 'e-ink' smart badge, designed for a wide range of access control and identity verification use cases, has been launched by Shenzhen Holyiot Technology. The Inkcard-A1 smart badge employs Nordic Semiconductor's nRF54L15 SoC that doubles the processing power and triples the processing efficiency of the previous generation of SoCs. This enables the smart badge to seamlessly perform a wide range of time critical tasks in offices or workplaces. The card can replace traditional RFID-based access control cards and is designed for identity verification, attendance checking, and security management use cases.

Bluetooth LE Audio

Auracast transceiver delivers high-quality audio in public spaces



Bettear has launched an Auracast broadcast audio-based transceiver that significantly enhances the audio experience for visitors to settings such as museums, public spaces, and guided tours. The Bettear B-RTX Auracast transceiver is powered by Nordic's dual-core nRF5340 multiprotocol SoC, and provides high quality, low latency (<40 ms) audio streaming for assistive listening and direct audio streaming applications. It can also be used as a pre-recorded MP3 files broadcaster over Auracast, as an audio guide, and as a speech-to-text optimizer.

The B-RTX Auracast device supports both transceiver (TX) and receiver (RX) modes and offers versatile connectivity options. For example it can be wirelessly connected to any other Auracast-compatible device — such as hearing aids, cochlear implants, or earbuds.

In addition to the nRF5340 SoC, the B-RTX device also integrates Nordic's nRF21540 RF Front-End Module (FEM) to enhance range and connection stability.

"By supporting Auracast, the nRF5340 SoC significantly enhances the Bettear B-RTX transceiver and addresses the limitations of previous Bluetooth audio solutions," says Yami Thor, CTO of Bettear. "It ensures easy and consistent connectivity reducing the chances of audio dropouts and interruptions, and improves low latency audio quality which is crucial for real-time applications like guided tours and live events. It also extends battery life to more than 20 hours on a single charge."

The Bettear B-RTX transceiver uses an internal, rechargeable 1400 mAh Li-Poly battery, offering over 20 hours of battery life in RX mode and over 10 hours in TX mode, thanks in part to the Nordic SoC.

Asset Tracking

Cellular IoT and Bluetooth LE monitoring solution keeps perishables in check

InVentia has released a remote temperature and humidity monitoring system designed for use in cool rooms and refrigeration units. The CoolSens system is comprised of CoolSens Nodes which can use either internal or external sensors to measure temperature or humidity, as well as the CoolSens CloudHub — which acts as a combined sensor and data concentrator, and is capable of measuring temperature, humidity, and pressure locally.

Each node is powered by Nordic's nRF52832 SoC, enabling it to collect and transmit data to the CloudHub via Bluetooth LE. The hub, which can also gather data from its own internal or external sensors, employs both the SoC to receive data from the nodes, and the cellular connectivity of Nordic's nRF9160 module to relay the data to the 'CoolSens Cloud' platform.

"This system is primarily used to monitor and ensure proper storage conditions for pharmaceuticals and medical products," explains Andrzej Paszkowski, Product Owner, CoolSens. "This helps to safeguard their quality and ensure compliance with regulatory standards.

Cellular communication to the cloud is enabled by the nRF9160's multimode LTE-M/NB-IoT modem. The data can then be accessed remotely to ensure goods monitored stay within predefined temperature thresholds, either via the Cloud platform or a dedicated app.

By the Numbers

$192 million in revenue

Nordic Semiconductor reported total revenue of $192.4 million in Q1 2026, an increase of 24 percent from Q1 2025, and a sequential increase of 14 percent from Q4 2025. The growth reflects higher demand for the company's short-range and long-range wireless technologies. With a 32 percent share of new Bluetooth SIG design certifications of Bluetooth LE products in Q1 2026, Nordic has around three times as many certified designs as any competitor.

Asset Tracking

Beacons deliver flexible and accurate indoor positioning

Minew has launched a Bluetooth LE location relay beacon powered by Nordic Semiconductor's nRF54L15 SoC. The MBM04 beacon is designed for use in large-scale indoor positioning projects, and can adapt to modern indoor positioning needs by allowing flexible role configurations.

Rather than handling anchor, relay and beacon roles concurrently, the MBM04 supports configurable working modes allowing users to optimize performance, power consumption, and deployment flexibly. As a fixed anchor, the MBM04 provides a stable reference for indoor positioning systems. In this mode, it can either broadcast its identity for positioning or scan and relay nearby Bluetooth LE tag data to the gateway, depending on configuration.

In relay mode, the MBM04 scans for nearby Bluetooth LE tags (typically 3 to 100 devices) and forwards their data to the network, thereby extending coverage and improving data-collection efficiency. In beacon mode, the MBM04 broadcasts its own identity for detection and positioning purposes. This mode focuses on visibility rather than data forwarding. The multi role architecture enables coverage expansion without deploying excessive infrastructure. The multi-anchor positioning algorithms achieve 3-5 m of indoor accuracy, with the potential for 1-3 m in optimized deployments.

Built for scalability, the MBM04 supports real-time tracking, indoor navigation, and automated proximity-based actions. It performs reliably even in dense RF environments.

Minew selected Nordic's nRF54L15 SoC for its processing headroom, robust radio architecture, and multiprotocol support, making it ideal for relay-heavy environments where many devices operate simultaneously.

The SoC offers a next-generation Bluetooth LE platform supporting relay-based positioning, multi-role operation, ultra-low-power performance, and maintenance-free reliability.

Smart Metering

Nordic cellular IoT solution detects pipe leaks saving precious water

NOWi Sensors has selected Nordic's nRF9151 module to provide the cellular IoT wireless connectivity for its pipe leak monitoring solutions. The company has two products, a Pipe Monitor and Meter Monitor that together or individually can be deployed to track water use and detect pipe leaks on commercial, industrial, and institutional properties.

The Pipe Monitor is an advanced, ultrasonic clamp-on sensor that can be attached to pipes anywhere in a building, including risers and branch lines to help localize leaks and water usage. The Meter Monitor is a non-invasive, battery-powered water usage monitoring device that seamlessly connects with a building's utility water meter. It measures a building's total water flow, looking for abnormal usage patterns that could indicate a leak or defect in the pipes.

"Anything attached to water eventually starts to leak and it's a huge pain," says Charles Fayal, NOWi Sensors' Co-Founder. For both sensors the company originally employed a LoRaWAN-based solution, but to improve response times and deployment simplicity, decided cellular IoT was a better wireless technology. Initially the company selected Nordic's nRF9160 module before upgrading to the next generation nRF9151. Leveraging low power LTE technology, advanced processing capabilities, and robust security features, the nRF9151 offers unparalleled performance and versatility. "The nRF9151 is an amazing chip," continues Fayal. "The cost is great. The size is great. So, all around, we love it."

In Brief

EVP TO SCALE NORDIC'S DEVELOPER ECOSYSTEM

Nordic has appointed an EVP of Marketing and Developer Experience to reinforce its strategy to scale its developer ecosystem and accelerate broad markets growth. Jo Uthus brings more than 25 years of experience to Nordic, including senior roles at Atmel and Microchip — both known for developer-focused platforms. Nordic has already built one of the industry's strongest developer ecosystems, anchored by a highly engaged community and its DevZone platform. "Nordic has built a unique position of trust with developers worldwide," says Uthus. "Our focus is to expand that reach, simplify development, and reduce time from prototype to production."

nRF54L15 SoC WINS WORLD ELECTRONICS ACHIEVEMENT AWARD

Nordic Semiconductor's nRF54L15 SoC has been awarded the RF/Wireless/Microwave Product of the Year award at the World Electronics Achievement Awards, held in Shenzhen, China. Selected by a global panel of senior industry analysts and users, the nRF54L15 SoC was recognized for its impressive performance capacity in RF technology, multiprotocol compatibility, and ultra-low-power consumption. As a key member of Nordic's nRF54L Series, the nRF54L15 SoC has set the benchmark for wireless connectivity in the IoT sector since its launch. It achieves an optimal balance of performance and ultra-low power consumption.

BLUETOOTH LE ECG DEVICE SUPPORTS NON-CRITICAL CARE

Dandelion Medical Devices, in partnership with Cloud2GND, has developed a compact, disposable, wearable electrocardiogram (ECG) monitoring device for non-critical care settings. PulseTape ECG is a wireless Holter-style wearable designed to continuously record single-channel ECG data over extended monitoring periods within routine clinical workflows. Using Bluetooth LE connectivity provided by Nordic's nRF52840, sensitive medical data is securely relayed from the wearable to a smartphone, tablet, or clinical workstation for clinician review. The device is supported by an app that enables automated report routing to clinicians.

Cellular IoT

Nordic expands future-ready cellular IoT portfolio with nRF92 and nRF93 Series

The introduction of the nRF92 and nRF93 Series modules, and the expansion of the nRF91 Series, is designed to deliver secure, resilient global connectivity as cellular and satellite networks evolve

Cellular IoT is moving into a period of rapid scale and standardization driven by global LTE-M and NB-IoT rollouts, as well as growing interest in non-terrestrial networks (NTN) for truly universal coverage. What was once a trade-off between coverage, power consumption, and cost is steadily being resolved, opening the door to new classes of long-lived, widely distributed devices that can rely on consistent, global connectivity.

As these networks evolve, so too is Nordic Semiconductor, introducing a new generation of cellular IoT modules designed not just for connectivity today, but for adaptability over the decade-long lifetimes many IoT deployments demand. To that end, Nordic has announced a major expansion of its future-ready cellular IoT portfolio.

The nRF93M1 module is fully integrated with nRF Cloud and optimized for asset tracking and fleet management systems

Portfolio expansion

As part of the announcement, Nordic introduced the nRF92 Series, a next-generation low-power cellular platform combining LTE-M, NB-IoT, satellite NTN support, and integrated edge AI. The nRF92 Series introduces its smallest, highest-integrated, and most power-efficient cellular solution. It integrates a high-performance application MCU combined with ultra-low-power edge AI through Nordic's Axon NPU (Neural Processing Unit), multi-constellation GNSS receiver, Wi-Fi locationing, and sensor co-processing. This enables local, on-device AI processing in cellular IoT products, allowing intelligent decisions to be made at the edge with minimal latency, reduced data transmission, and lower power consumption. This integration of cellular connectivity, satellite fallback, location services, and embedded edge AI is designed to enable resilient and autonomous IoT systems operating in remote environments.

Nordic has also announced the new nRF93 Series Cat 1bis module, extending its cellular portfolio into higher-throughput applications while maintaining a strong focus on low power consumption, compact form factors, and ease of integration. The nRF93M1 modules deliver 10 Mbps downlink and 5 Mbps uplink throughput, robust performance, global LTE support, and built-in Wi-Fi location capabilities, while maintaining Nordic's hallmark low-power consumption and compact form factor.

Optimized for asset tracking, fleet management systems, security devices, advanced metering, and consumer devices, it offers an easy-to-integrate alternative to LTE Cat 1bis designs. The nRF93M1 is fully integrated with nRF Cloud, along with FOTA, observability, remote debugging, and location services.

In parallel, Nordic has introduced further enhancements to the nRF91 Series. The nRF9151 is already the leading LTE-M/NB-IoT module, now including 3GPP-compliant GEO and LEO satellite NTN connectivity – crucial for a range of applications including logistics, smart agriculture, energy, and remote infrastructure.

> “A unified, market-leading portfolio spanning across these technologies gives developers clarity, confidence, and a long-term roadmap they can rely on

The company is also introducing the nRF91M1 module – a compact, easy-to-use smart modem solution for customers seeking a simple and fast way to add cellular connectivity. It offers Nordic's proven low-power modem stack, AT-command interface, and secure cloud integration. It is ideal for the traditional host modem architecture and for achieving rapid time-to-market.

Cellular IoT roadmap

Together, the nRF91, nRF92, and nRF93 Series establish a scalable and well-defined cellular IoT roadmap spanning ultra-low-power devices through to higher-bandwidth applications, all supported within Nordic's chip-to-cloud ecosystem. Collectively, these announcements broaden Nordic's addressable cellular IoT market and establish a strong technology foundation for continued growth toward satellite-enabled connectivity and future 5G eRedCap, positioning the long-range business for scaling as adoption of global and resilient IoT connectivity accelerates over time.

“This expansion marks a defining moment for Nordic's long-range strategy,” says Oyvind Birkenes, EVP Long-Range at Nordic Semiconductor.

Bluetooth LE

Three trends driving Bluetooth LE development in 2026 and beyond

Bluetooth's versatility is its strength, and Bluetooth Channel Sounding, Auracast, and Ultra-Low Latency HID are all helping the connectivity standard continue to dominate

> Industrial innovation is entering a new phase of intelligence and precision, and Bluetooth is right at the center of it

Over five billion Bluetooth products shipped last year according to the Bluetooth Special Interest Group (SIG) and analyst partner, ABI Research. By comparison, Wi-Fi shipments are in the three to four billion range, and LTE-M/NB-IoT cellular IoT devices in the hundreds of millions. All these wireless connectivity standards are growing in number and importance, but Bluetooth's unmatched adoption comes down to its cost, ultra-low power, last meter connectivity, and built-in smartphone compatibility.

As we enter the second half of 2026, all signs point towards another stellar year for the leading wireless standard, with the number of Bluetooth-enabled devices shipped globally on track to exceed 7 billion units, according to the Bluetooth SIG. If this number is realized, it will represent a significant milestone. Notably, Bluetooth LE is expected to represent approximately 95 percent of those 7 billion shipped devices.

While Bluetooth's ubiquity stems from its versatility across wide-ranging consumer, commercial, and industrial markets, three trends and developments are expected to dominate the Bluetooth landscape this year.

Bluetooth Channel Sounding enables accurate distance measuring, enabling human-machine safety bubbles in industrial settings

Bluetooth Channel Sounding emerges

Bluetooth Channel Sounding is a secure, fine-ranging feature introduced in the Bluetooth Core Specification 6.0. It enables accurate and secure distance measuring with built-in security features and seamless interoperability. By introducing 'true' distance awareness to billions of everyday products, the world of possible applications expands for developers.

For example, Bluetooth can be deployed as a secure spatial authentication layer, providing not only distance-based presence capabilities, but distance-based security as well. Laptops that unlock only when you are physically at your desk, or payment authorization based on proximity, not just pairing.

Other applications include asset tracking and device-finding, human-machine safety bubbles in industrial settings, and patient monitoring to detect whether a patient has left their bed, rather than just moved in it.

"Industrial innovation is entering a new phase of intelligence and precision, and Bluetooth is right at the center of it," says Oyvind Strom, EVP, Short-Range BU, Nordic Semiconductor. "We expect to see Bluetooth Channel Sounding enabling sub-meter asset tracking and guaranteeing worker safety through geofencing and safety zone functionalities."

An improved audio experience

The second Bluetooth trend expected to make major forward strides in the second half of 2026 and beyond, is Auracast broadcast audio. Auracast enables an audio source device such as a smartphone, laptop, TV, or sound system to broadcast one or several audio streams to an unlimited number of Bluetooth audio receivers.

This is significant because it can drastically improve the audio experience for people living with hearing loss who are reliant on augmented and assistive listening technology. For example, a theater with hearing loop infrastructure or an infrared-based accessibility system are susceptible to interference, uneven coverage and muffled or unclear sound. When deployed at a venue and in hearing aids, Auracast can eliminate this problem completely by delivering consistent, high-quality audio directly into hearing devices using Bluetooth LE Audio's isochronous channels and LC3 codec.

Ultra-Low Latency HID

Two of the Bluetooth SIG's most anticipated specification development releases are the Bluetooth High Data Throughput (HDT) and ultra-low latency (ULL) Human Interface Devices (HIDs) projects. Today, Bluetooth devices demand not only high performance, but also the ability to support streaming of larger media and a higher data rate Bluetooth LE PHY. The HDT project was established to address this growing market need and intends to support data rates up to 8 Mbps.

"The convergence of the ultra-low latency HID project, the high data throughput project, and the higher bands project is setting the stage for a new generation of Bluetooth enabled experiences," says Strom. "High data throughput will unlock new markets in data-intensive, real-time applications where bandwidth and responsiveness are critical, in high-fidelity wireless audio, and in applications requiring large media sharing over the air."

The ULL HID enhancement project aims to make Bluetooth gaming controllers, and creative tools as responsive as those using USB-wired or proprietary wireless communications. This enhancement, which intends to support polling rates as high as 1000 Hz, could also be used to improve the user experience for other latency-sensitive devices.

"These advancements are not just incremental; they are foundational to the next wave of immersive and intelligent low-latency wireless products," says Strom. "This major improvement in connection interval lengths and thus polling rates makes Bluetooth LE gaming mice and keyboards more tempting than ever for both competitive and casual gaming."

Tech Check

The nRF54LM20B integrates the Axon NPU, a dedicated processing core for running neural networks faster and more efficiently. The AI accelerator hardware, developed by Nordic, leverages unique, proprietary architecture to achieve both ultra-low power consumption and high processing performance

Comment

Geir Kjosavik
Product Director – PMIC, Nordic Semiconductor

The importance of power management

Wireless products are as strong as their weakest link, and often that weakest link is power management

Nordic Semiconductor made its reputation on ultra-low power wireless connectivity. So much so, the company's proprietary technology formed part of the first Bluetooth core specification to introduce Bluetooth LE in 2010. It's fair to say ultra-low power is both in Nordic's DNA, and the DNA of every Bluetooth LE product ever built.

Since then, many thousands of OEMs have directly employed Nordic technology in their Bluetooth LE, cellular IoT and Wi-Fi products, because it is designed to support complex IoT applications while minimizing energy use and extending battery life.

> By offering dedicated PMICs, Nordic is putting users in control of the entire energy path

But there is more to managing power than an efficient SoC or module. No matter how efficient the processor, radio and memory are, an inefficient power management system will compromise battery life. Moreover, conventional power management solutions typically comprise multiple chips—a voltage regulator, battery charger, fuel gauge, external watchdog and hard reset, just for example—which take up valuable real estate in space-constrained designs.

That is why Nordic addressed both the efficiency and space challenges of power management for low power and space-constrained IoT products with its nPM Family of power management ICs (PMICs). By offering dedicated PMICs, Nordic puts users in control of the entire energy path, enabling them to build products with the longest possible battery life and high reliability.

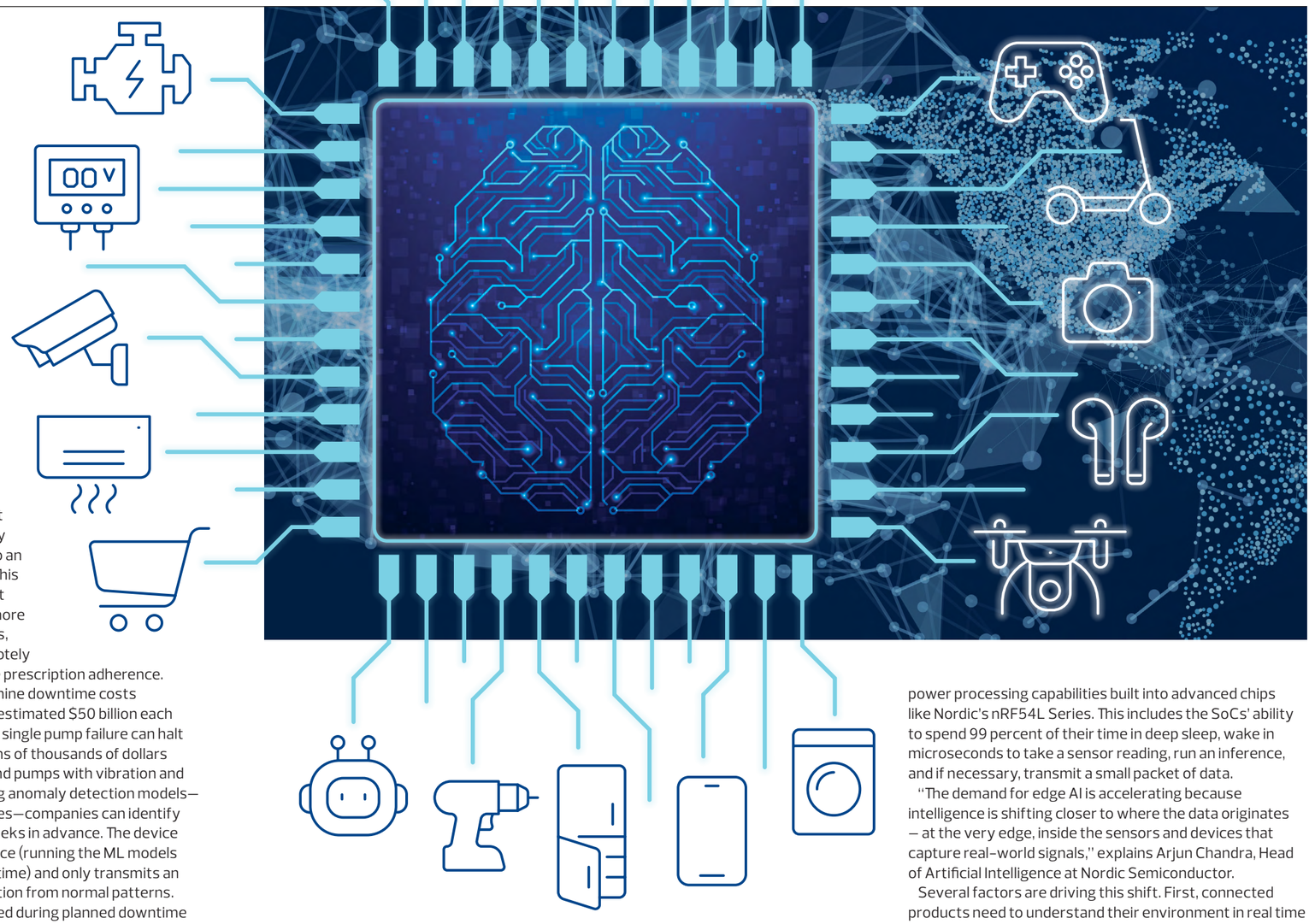
Let's use an example. Designers are always under pressure to increase the battery life of their wearables, or alternatively launch a new model with higher performance or more features in the same form factor without compromising runtime. In almost all cases, fixing bad power conversion efficiency by 'throwing milliampere hours at the problem'—i.e. designing in a bigger battery—is more costly and less space efficient than swapping the PMIC for a better one.

Another feature of Nordic's PMICs is precise fuel gauging. As consumers of IoT products we all know the frustration of a device that doesn't have an accurate idea of its remaining battery life. But in fact it's just as important to understand how the battery changes over time. Nordic's fuel gauge and battery health solutions work together to provide accurate, real time insight into both remaining state of charge and long term battery state of health. This influences runtime as well. Without accurate fuel gauging, the state-of-charge estimate must be padded in the form of under-reporting in order to prevent the product from shutting down unexpectedly whilst reporting there is still energy left.

Nordic's PMICs and accurate fuel gauging together empower OEMs to build more reliable and longer-lasting products. Products that will also meet emerging battery-replacement mandates.

The Intelligence of Things

With edge AI enabling real-time, low-power intelligence on billions of devices locally, the scope for innovation across the IoT is unprecedented



In Short

While cloud-based, generative AI dominates the headlines, the future of artificial intelligence is being shaped by the billions of connected IoT devices that already surround us

By running optimized ML models directly on-chip, it is possible to process data locally, make decisions in real time, and transmit only the results that actually matter

Nordic's edge AI solution makes it easier than ever to add meaningful intelligence to products without increasing power budgets or development overhead

Today when people hear the words 'artificial intelligence' or 'AI', they think of popular large language models and text-to-image generation systems like ChatGPT, DeepSeek and Google Gemini. But another form of AI—the meaningful intelligence that exists inside the billions of connected devices that comprise the IoT—also has a critical role to play.

The trend of AI 'inside' IoT devices is being driven by the need for real-time decisions, stronger privacy, and the sheer scale of data being generated and decisions being made on the application side. Instead of relying on the cloud alone, highly efficient, task-specific models can run locally with tiny resource and energy footprints – enabling intelligence to scale across tens of billions of ultra-low power devices.

REAL WORLD APPLICATION

To understand the scale of this opportunity, consider the real-world applications. For example, buildings account for roughly 30 percent of global energy use, with refrigeration and HVAC contributing considerably to this consumption. While a conventional smart thermostat might adjust temperatures based on a simple schedule or manual inputs, a truly intelligent thermostat processes data from occupancy sensors, external weather feeds, and real-time pricing signals from the utility grid. It learns the building's thermal dynamics and the occupants' patterns. It pre-heats or pre-cools during off-peak hours when energy is cheaper and cleaner. It reduces output when spaces are unoccupied. When those benefits are scaled across billions of systems worldwide, the potential energy savings—20 to 40 percent in many applications—translate directly into reduced operating costs and lower carbon emissions.

Alternatively, in already strained global health systems, AI-powered wearables can take the pressure off overworked health professionals by not only generating a rich data set of a patient's health markers, but also by wading through that data and determining what is likely to be relevant and what is not. It can then pass on only information of significance to an individual's health provider. This not only saves resources, but enables physicians to offer more personalized health decisions, make earlier diagnoses, remotely monitor patients, and ensure prescription adherence.

Elsewhere, unplanned machine downtime costs industrial manufacturers an estimated $50 billion each year, according to Deloitte. A single pump failure can halt a production line and cost tens of thousands of dollars per hour. By fitting motors and pumps with vibration and temperature sensors running anomaly detection models—some as small as five kilobytes—companies can identify emerging failures days or weeks in advance. The device performs continuous inference (running the ML models and making decisions in real time) and only transmits an alert when it detects a deviation from normal patterns. Maintenance can be scheduled during planned downtime and catastrophic failures are avoided.

These scenarios represent a fundamental shift in how we think about AI – away from massive, cloud-dependent models, and toward something far more distributed, far more intimate, and far more consequential.

SHIFTING INTELLIGENCE

For most of the IoT's history, connected devices across industries have collected raw data, shipped it to the cloud, waited for processing, and then acted on the response. This approach has been broadly effective, but consumes enormous bandwidth and introduces latency ranging from hundreds of milliseconds to several seconds – an eternity for applications that require near real-time action.

The solution is to move the intelligence away from the cloud to where data is created – inside the device itself. This 'edge AI' is the fastest-growing segment of AI because it enables even the most modest IoT device to become smarter, more autonomous, and more energy efficient.

Ultra-low-power edge AI can be delivered through complementary technologies offered within the same ecosystem – for example, Nordic Semiconductor's custom Neuton models and Axon Neural Processing Unit (NPU) (*see Nordic Inside, p.15*). Hardware-flexible across Nordic's portfolio, Neuton models are built through an automated, neuron-by-neuron process that produces highly compact, efficient neural networks without the overhead of traditional architectures. This drastically reduces memory and compute demands, making them ideal for constrained devices. The Axon NPU—Nordic's AI accelerator core integrated directly into select devices such as the nRF54LM20B SoC—accelerates more demanding workloads with far greater speed and energy efficiency.

None of this could be achieved without the ultra-low-power processing capabilities built into advanced chips like Nordic's nRF54L Series. This includes the SoCs' ability to spend 99 percent of their time in deep sleep, wake in microseconds to take a sensor reading, run an inference, and if necessary, transmit a small packet of data.

"The demand for edge AI is accelerating because intelligence is shifting closer to where the data originates – at the very edge, inside the sensors and devices that capture real-world signals," explains Arjun Chandra, Head of Artificial Intelligence at Nordic Semiconductor.

Several factors are driving this shift. First, connected products need to understand their environment in real time – whether that's motion, sound, presence, health signals or anomalies. Processing that information locally, on the device, enables immediate response without relying on cloud latency or network availability. Second, transmitting data continuously to the cloud consumes significant energy and cost. By running AI on-device, developers can reduce data transmission dramatically and extend battery life. And third, privacy and security are becoming essential design criteria. Keeping data on the device instead of sending raw sensor data to the cloud improves user trust and reduces regulatory complexity.

BUILDING PHYSICAL AI

Taking advantage of this AI evolution requires a solution that simplifies the entire development process, from data collection and model training to deployment and over-the-air updates. This is where the conversation moves from

what edge AI can do to how engineers actually build it.

Rather than treating AI as a cloud-bound capability, Nordic has re-engineered it as a native function of embedded systems, operating within tight power, memory and latency constraints without compromising performance. "Nordic is specifically focused on enabling this 'physical AI' layer – the point where sensing, compute, and real-world interaction converge," says Chandra.

"AI factories train intelligence, but Nordic deploys it – on device, at the edge, where the world happens," adds Vegard Wollan, Nordic Semiconductor CEO. "Nordic's edge AI solution enables millisecond decisions without round-trip latency to the cloud, ensures compliance through local processing, and delivers radically improved battery life for billions of connected devices. This is the new standard for ultra-low-power edge AI and Nordic is defining it."

Nordic's philosophy to remove friction at every stage of the development lifecycle is further realized through the Neuton models and Axon NPU offerings. With Nordic-unique Neuton models, embedded developers can generate optimized models from their own datasets that fit into extremely small memory footprints without requiring machine learning expertise. And with the Axon NPU they get hardware that is optimized for common AI workloads.

Complementing this hardware, Nordic's software environment provides a smooth onramp for developers.

> The demand for edge AI is accelerating because intelligence is shifting closer to where the data originates – at the very edge

With support for TensorFlow Lite/LiteRT models and tight integration with the Nordic Edge AI Lab, embedded engineers can build, optimize, test and deploy models seamlessly and effortlessly.

The size and efficiency of Neuton models make running edge AI applications on the CPU of any Nordic SoC or cellular module viable for solving AI challenges based on time-series sensor data, like the outputs from accelerometers, IMUs, PPG, or temperature- and electricity-measurement sensors. Anomaly detection, gesture recognition, activity classification and biometric monitoring can be executed continuously, in real time, without draining the battery or cloud connectivity.

While Neuton models enable efficient AI on the CPU, certain applications demand more computational power. High-frequency sensor data, audio processing, and image classification all place heavier demands on processing speed, memory, and energy efficiency. In such instances, Axon NPU can unlock high-performance AI workloads on resource-constrained devices. Designed specifically for ultra-low power environments, it provides dedicated hardware acceleration for TensorFlow Lite-class models, delivering up to 15 times faster inference and with lower energy consumption compared to CPU execution.

This acceleration is not just about speed; it fundamentally changes what is possible at the edge. Tasks that were previously impractical on battery-powered devices, such as keyword spotting, sound classification, and image-based detection, can now be executed locally with minimal latency and energy consumption.

A common question is whether Neuton models can be accelerated by the Axon NPU. "The answer is no – and that's by design," explains Chandra. "Neuton models are already so computationally lightweight that they do not require hardware acceleration. Their efficiency allows them to run entirely on the MCU's CPU while keeping power consumption extremely low.

"This opens the door for a wide range of real-world applications, including custom Neuton-based models such as gesture remote control, activity recognition, anomaly detection, predictive sensing and more – all on devices with very limited resources."

PERFECT MATCH

Nordic's flexible, scalable edge AI architecture allows developers to match the right level of intelligence to the right hardware, application and energy budget, ensuring intelligence moves from concept to reality without complexity. By combining ultra-efficient models with dedicated acceleration, Nordic's edge AI solution unlocks a wide range of applications where IoT devices are deployed. Across all use cases, the benefits are consistent: lower latency, reduced energy consumption, improved privacy, and greater system resilience.

Importantly, developers are not locked into one approach. Instead, they can choose the most appropriate technology for each use case, or even combine them within a single system. For example, a device might use a Neuton model for continuous anomaly detection, while leveraging the Axon NPU for more detailed analysis when an event is detected. This layered approach ensures that intelligence is applied precisely where it delivers the most value.

THE NEXT ERA

For years, adding AI capabilities to wireless IoT devices meant choosing between acceptable battery life and performance. Now it's possible for developers to have both.

The era of the dumb sensor is ending, to be superseded by a world where the billions of devices around us do not just collect data but understand it, act on it, and communicate only the information we need. The technology to build these devices exists today, the tools are accessible to any embedded engineer, and the economic and competitive arguments for adopting them are compelling.

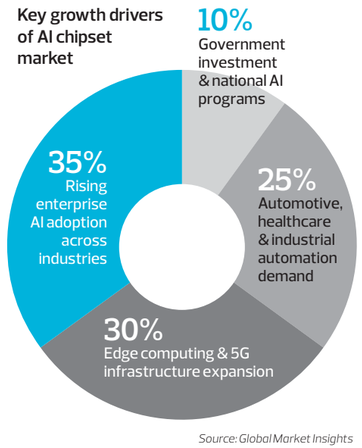
Need to Know

The number of IoT devices worldwide is forecast to more than double from 19.8 billion in 2025 to over 40.6 billion by 2034, according to Statista

State of Play

Expanding AI chipsets market – the backbone of global AI innovation

The AI chipsets market is entering a period of extraordinary expansion. The global market size is expected to rise from $58.2 billion in 2025 to $1.1 trillion by 2035 at a CAGR of 33.9 percent, according to data from Global Market Insights' *Artificial Intelligence (AI) Chipsets Market: Global Market Analysis & Forecast 2026–2035* report. This growth will be driven by surging demand for high-performance computing, generative AI, edge intelligence, and AI-enabled enterprise solutions across various sectors. While cloud-based AI remains the largest segment by processing type at $31.6 bn (2025), edge AI is the fastest growing segment with a forecast CAGR of 36 percent that will push its market value to $582.6 bn by 2035.



Source: Global Market Insights

Nordic Inside:

Neuton Models

Traditional neural networks face a fundamental challenge: they require manual architecture design and rely on methods that often produce bloated models with millions of parameters. Data scientists must painstakingly tune dozens of variables, from learning rates to layer depths, in a trial-and-error process that's both resource-intensive and imprecise. Nordic's custom Neuton models take a radically different approach. Instead of starting with a predetermined structure, it grows neural networks neuron-by-neuron, automatically determining the optimal architecture as it learns. This granular construction process, combined with a patented global optimization algorithm that avoids the pitfalls of gradient descent methods, produces remarkably compact models without sacrificing accuracy. The result is a fully automated system that requires minimal expertise to use. The framework delivers models that are dramatically smaller than conventional neural networks, enabling faster predictions and deployment on resource-constrained devices, all while maintaining excellent accuracy and generalization capabilities.

Axon NPU

For years, adding AI to wireless IoT devices meant trading battery life for performance. Running TensorFlow Lite on a CPU was often too slow and memory-intensive, while discrete NPUs added cost and complexity. Although Neuton models enable efficient edge AI, demanding workloads like audio, imaging, and high-rate sensor data need dedicated acceleration. Axon is Nordic's proprietary NPU. It accelerates TensorFlow Lite models with up to 15x faster inference than the CPU, and delivers up to 7x higher performance and up to 8x better efficiency than the closest competing wireless NPU, bringing powerful edge AI to ultra-low-power devices. By integrating the NPU on-chip, Axon removes the need for discrete accelerators, reducing power, BoM cost, and development complexity. Axon enables industry-leading energy efficiency across use cases ranging from anomaly detection and biometrics to sound, keyword, and image recognition – leveraging fully accelerated edge AI.

Time to Act

Compliance deadlines for the European Union's Cyber Resilience Act are fast approaching, and OEMs of wireless IoT products need to act now. Help is out there.

In Short

The CRA introduces mandatory cybersecurity standards for all hardware and software products sold in the EU, from consumer IoT to industrial wireless devices

Manufacturers will be required to certify the cybersecurity of their products across the entire lifecycle from design and development to post-market support

A hardware-anchored root of trust paired with nRF Cloud gives Nordic customers a chip-to-cloud foundation for CRA readiness — secure by design, auditable, and supported in the long term

Back in 2015, two security researchers wirelessly hacked into a Jeep Cherokee as part of a controlled test, first taking over the entertainment system and windshield wipers, then disabling the accelerator and brakes. All the test driver could do in response was slide the 2-ton SUV uncontrollably into a ditch. What started as a harmless experiment resulted in the recall of some 1.4 million vehicles.

In the intervening decade, there have been countless other examples of cybersecurity failings, some far more serious, and often at the hands of bad actors not security researchers. At the time of the Jeep Cherokee test case, it was argued "connectivity has outpaced security", that in the rush to add connectivity to everything, insufficient attention was being paid to cybersecurity.

Ten years later, that rush is now a stampede. Connected devices have ballooned from six billion IoT connections in 2015 to as many as 30 billion today, with around 70 percent of those using short range wireless connectivity protocols. That's an additional 24 billion connected endpoints introduced into the global attack surface in a decade, and unsurprisingly the number of cybersecurity threats has risen in parallel. It is also why—in part—the European Union (EU) introduced the Cyber Resilience Act (CRA).

BUILDING TRUST

The CRA is a landmark regulation adopted in late 2024 that introduces mandatory cybersecurity standards for all hardware and software products sold in the EU, from consumer IoT to industrial wireless devices. Under the CRA, manufacturers will be required to certify the cybersecurity of products before they can be sold in the EU, imposing mandatory cybersecurity requirements across the entire lifecycle: design, development, and post-market support.

It addresses what the EU says is an inadequate level of cybersecurity in many products, and a lack of timely security updates. It is also designed to help consumers and businesses determine which products are cybersecure and how to set them up securely.

One of the key elements of the CRA is its classification of digital products into four categories based on their cybersecurity risk level – Default, Important Products Class I, Important Products Class II and Critical Products. Each classification determines the level of security measures, certifications requirements and regulatory scrutiny the product must undergo before entering the EU. The higher the risk, the more rigorous the compliance (*see State of Play, p.18*). The manufacturer also needs to indicate the support period, i.e. how long the product will be supported, and provide information and instructions for use of the product.

Eighteen months on from the CRA entering into force, key compliance deadlines are fast approaching. On September 11, 2026, mandatory reporting begins, meaning manufacturers must report actively exploited vulnerabilities and incidents to the European Union Agency for Cybersecurity (ENISA) as well as national authorities. To do so effectively, developers need to establish and refine systems for incident detection, vulnerability reporting, and risk management, train their personnel on reporting protocols and responsibilities, and continuously review and improve their incident response strategy.

On December 11, 2027, full compliance will become mandatory. Most obligations—CE marking, technical documentation and design requirements, for example—will take effect for all products with digital elements. Non-compliance carries penalties ranging from a fine of 5 million euro ($5.8 million) or one percent of turnover (if higher) for incorrect, incomplete, or misleading information, to 10 million euro ($11.6 million) or two percent of turnover (if higher) for non-compliance with obligations. The penalty for a serious violation is 15 million euro ($17.4 million) or 2.5 percent of annual worldwide turnover (if higher).

Punitive measures aside, there are other incentives for manufacturers to beef up their cybersecurity offering. Security itself can be a market differentiator, and potentially provides easier entry into already regulated sectors. It also aligns with similar schemes in other international markets, such as the U.S. Cyber Trust Mark in the U.S., and the Product Security and Telecommunications Infrastructure Act in the UK.

NO TIME TO LOSE

While full enforcement is still 18 months down the track, if you haven't begun your compliance process now, any further delay is risky, according to François Baldassari, VP Software Services at Nordic Semiconductor. For many wireless OEMs, product development cycles run 18–36 months. That means devices launching around the time the EU CRA is enforced are being architected today. "For makers of connected hardware, 18 months is a relatively short window," says Baldassari. "Because development projects for connected hardware are typically measured in years, now is the time to start preparing."

One issue is that key security capabilities are fundamentally hardware-dependent. Secure boot requires root of trust support in hardware, encrypted storage depends on secure key handling, FOTA (Firmware Over-the-Air) updates require sufficient non-volatile memory (NVM), RAM, and partitioning, and device identity may rely on secure elements or hardware-backed keys. If those decisions aren't made upfront, they may be difficult or impossible to reverse later.

There is also supply chain inertia to consider. Under the CRA, secure boot, vulnerability handling, SBOMs, and long-term patching support aren't just OEM responsibilities – they depend on what suppliers can provide. Once a design is in motion, changing anything upstream becomes slow, expensive, and sometimes impossible.

For example, a smart meter manufacturer that began development in 2024 using a low-cost MCU, and is only now realizing that CRA compliance requires secure firmware updates with cryptographic signing and a documented vulnerability handling process, has a problem. This company faces a difficult decision that in practice leaves it with three unattractive options: redesign, accept non-compliance, or restrict market access.

Developers should also consider that compliance capacity is finite, and certification bottlenecks are likely. Higher risk products may require third party assessment, formalized testing and documentation, and ongoing auditability. If everyone holds off, testing labs and notified bodies may become overloaded, and lead times could stretch dramatically. For OEMs that creates risk. Acting now isn't just about compliance – it's about avoiding the queue.

Nor is it only third parties OEMs need to worry about, they have to get their own house in order. The CRA doesn't just require security features – it requires ongoing processes: vulnerability monitoring, coordinated disclosure, timely patching, secure update delivery, and lifecycle support that can span years. Many OEMs—especially those historically hardware-focused—simply aren't set up for this.

A TEAM EFFORT

Although the CRA places legal responsibility on the manufacturer of the final product, hardware vendors are also a critical part of the compliance chain. If the chipsets, protocol stacks and SDKs developers depend upon aren't secure or maintainable, their end product can't comply. In the case of many resource-constrained wireless devices, product lifecycles can be as long as 15 years, meaning OEMs will rely on their chip vendor for that entire

> By unifying hardware, software, and cloud, Nordic makes regulatory readiness practical on day one and sustainable for years

period to maintain and patch software, as well as support vulnerability reporting and fixes.

While this will have real cost implications for vendors as well as OEMs, it will also weed out cheap but insecure chipsets from the EU market in favor of compliance-ready platform vendors who can deliver hardware, software and cloud integration as well as security documentation, vulnerability disclosure processes and long term support commitments. And that is ultimately a good thing for everyone – including consumers.

Nordic Semiconductor has been working towards meeting the requirements of the CRA for its customers since it came into force, and its approach deliberately spans hardware, software and cloud. At the hardware end of that chain is Nordic's secure firmware and root of trust solution. This secure subsystem is designed for PSA Certified Level 3—the tier of the PSA Certified IoT security standard that evidences resistance to substantial software and physical attacks, including side-channel and fault-injection techniques—and is architected to be extended across the nRF54 Series and beyond, giving OEMs a consistent security foundation regardless of which Nordic solution they choose.

Back in March the company announced it had introduced a one-time, upfront, lifetime FOTA and device management license for its nRF Cloud lifecycle services. This allows developers to meet CRA secure update requirements in minutes instead of months for a simple one-time cost. At the same time it allows them to avoid the complexity of building their own update infrastructure.

"Preparing for compliance with the EU Cyber Resilience Act is going to add significant operational overhead and project complexity for device manufacturers," continues Baldassari. "With the enforcement of the CRA approaching quickly, Nordic is providing solutions that simplify and accelerate the compliance process for its customers."

Tech Check

Nordic's secure firmware and root of trust solution is designed for PSA Level 3 certification – the PSA tier that evidences resistance to both software and physical attacks. Updated independently of the application, it provides hardware-anchored secure boot, cryptographic services, secure storage and attested device identity – the hardware foundation on which CRA-grade products are built

THE NORDIC DIFFERENCE

Nordic 's nRF Cloud is a full solution that includes device observability, management and location services, enabling OEMs to efficiently monitor, manage and update their devices. Combined with the root of trust in hardware, it provides OEMs a turnkey foundation for EU CRA and U.S. Cyber Trust Mark readiness by ensuring secure boot, secure updates, auditability, and long-term support are straightforward and cost-predictable across the product lifecycle.

Integrated with the nRF Connect SDK, Nordic's unified and scalable software development kit, nRF Cloud delivers a proven chip-to-cloud FOTA solution already deployed at scale. It incorporates the MCUboot bootloader directly within the SDK, alongside a global FOTA delivery network optimized for low-power devices and ready-made libraries for gateway-based updates.

It also supports automated staged rollouts with built-in analytics, health monitoring and rollback capabilities, supported by an intuitive fleet management console and robust governance features such as approval workflows and immutable audit logs.

Traditional FOTA approaches require ongoing cloud fees or expensive custom infrastructure. Nordic's lifetime FOTA model replaces this with a single upfront fee that covers secure updates and device management for the device's entire lifespan. This ensures long-term maintainability and regulatory compliance. Users will benefit from a system that has been field tested across millions of devices and refined over years of development.

"Lifetime FOTA turns long-term device support from a cost burden into a competitive advantage," explains Baldassari. "Manufacturers can maintain device security, and ship features, fixes, and improvements to deployed devices without worrying about costs and complexity. Furthermore, by unifying hardware, software, and cloud, we make regulatory readiness practical on day one and sustainable for years, reducing total cost of ownership and accelerating time-to-market."

CHANGING THE PARADIGM

Ultimately, the CRA isn't about adding another layer of security features – it's about changing the operating model for connected devices. It's a shift from 'ship-and-forget' to secure-by-design backed by continuous, demonstrable responsibility. That means risk assessments before a product ever reaches the market, structured secure development practices, clear vulnerability handling and disclosure processes, and the ability to deliver timely security updates over defined lifecycles. It also introduces strict incident reporting obligations that demand visibility and responsiveness many organizations simply haven't needed before.

For wireless device makers, these requirements cut across firmware, device identity, OTA update mechanisms, and the supporting cloud infrastructure. This is where integrated solutions can quietly reduce complexity. Solutions like Nordic's root of trust secure subsystem and nRF Cloud, in tandem with development frameworks such as the nRF Connect SDK, enable a cohesive chip-to-cloud approach that can help address several CRA requirements at once – from secure device provisioning and identity management to scalable, cryptographically secure firmware updates and lifecycle management.

Compliance will not be achieved through last-minute additions, it will come from aligning hardware choices, software architecture, and operational processes as early as possible. Under the CRA, security is no longer a 'nice to have' feature, it's a commitment that extends across the entire product lifecycle. It's not a compliance exercise – it's a redesign of how connected products are built, shipped, and supported.

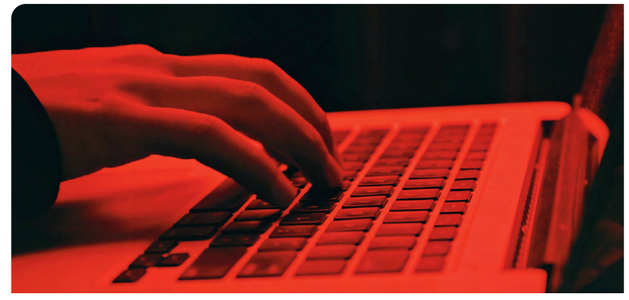
State of Play

CRA conformity assessment procedures by product category

The EU Cyber Resilience Act (CRA) classifies products with digital elements (PDEs) into different categories based on their perceived risk level, with each classification determining the level of security measures, certification requirements and regulatory scrutiny the product must undergo before entering the European market. The higher the risk, the more rigorous the compliance process. These categories are generally divided into Default (Low Risk), Important Class I, Important Class II, and Critical products. For Important Class II and Critical products, manufacturers will have to either apply harmonized standards or undergo an assessment by a third party called a notified body (a conformity assessment body that is notified under the CRA). In some cases, products will be subject to mandatory third-party conformity assessments.

Certification Type	Assessment	Example Product Categories
Default	EU Declaration of Conformity (self-assessment)	Memory chips, mobile apps, smart speakers, computer games
Important Class I	Conformity assessment based on internal control following harmonized standards (self-assessment)	ID management systems, access control and biometric readers, smart home general purpose virtual assistants, smart home products with security functionality, smart toys with social interactive features, wearables with health monitoring functionality
Important Class II	Requires third party assessment	Tamper-resistant microprocessors and microcontrollers, intrusion detection and prevention systems
Critical	Compliance to certification ENISA schemes at a minimum "substantial" level	Smart meter gateways within smart metering systems, smartcards or similar devices, including secure elements

Source: European Commission



Not all hackers wear hoodies

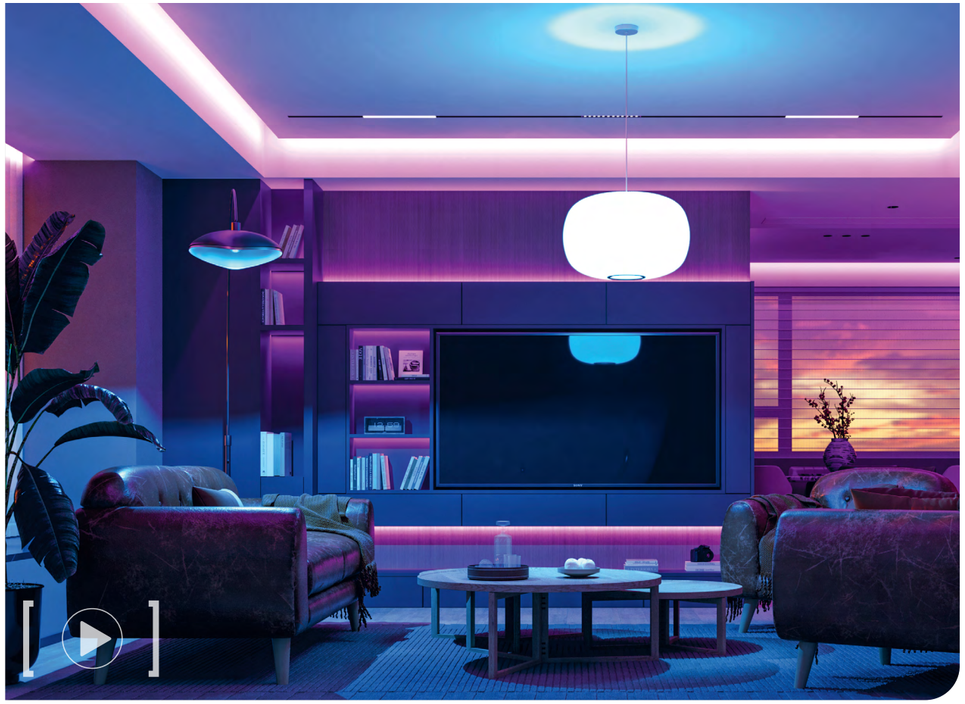
We've all seen the stereotypical depiction of the malicious hacker, a shadowy, hooded figure hunched over his keyboard, inflicting cybersecurity mayhem. Sammy Azdoufal is not that guy. Nevertheless Sammy—a software engineer who works as the head of AI at a holiday rental company—gained notoriety earlier this year when he thought it would be fun to steer his robot vacuum cleaner with a PS5 controller.

To do so, Sammy used Anthropic's Claude Code AI coding assistant to reverse engineer his robot vacuum's wireless communication protocols. It worked, but a little too well. It turned out Sammy could not only control his own robot vac with his gaming controller, but also around 7,000 other robot vacs in 24 countries around the world. He could watch their live camera feeds, listen through onboard microphones to what they were saying, generate floor plans of all their homes, or in his own words: "launch deep cleaning for everyone at 4:30 am."

Thankfully Sammy did none of those things, but rather reported the security failing to the manufacturer who has since resolved the issue. Given enough time and effort, other hackers—ethical or otherwise—have found their way into all manner of other smart home devices from lighting systems to baby monitors, but it's a timely reminder of why the EU's Cyber Resilience Act is on the way. Not all hackers are as innocent, or as well meaning, as Sammy.

Inside Matter

By adding coordinated, system-level intelligence to device interoperability, unifying connectivity standard Matter is powering the next generation of smart homes



In Short

While connectivity standard Matter began as a solution to smart home fragmentation and incompatibility, the focus has shifted from individual devices to coordinated systems

New Matter specification updates enable seamless cross-platform control, unlocking whole-home automation and energy orchestration

Nordic's Matter-ready solutions including the nRF54L Series SoCs help developers create secure, low-power and future-proof smart home products

Our homes are getting smarter all the time. Over 35 percent of households in developed markets use at least one smart home device, with adoption growing 12–15 percent annually, according to recent data by Intel Market Research. Yet overall, the journey to full smart home implementation has been more gradual than groundbreaking. When the Connectivity Standards Alliance (CSA) introduced unifying connectivity standard Matter back in 2022, the vision was to provide interoperability across ecosystems, and finally unlock a smart home dream that had been stalled by fragmentation and incompatibility.

To that end, each successive Matter specification update expanded the list of supported categories — from command-and-control devices such as lighting and locks, to robot vacuums and smoke alarms, and later large appliances like refrigerators, dishwashers, washing machines and ovens. Each new device type pushed the industry closer to the target of universal interoperability. While progress was tangible, it was still measured largely in terms of coverage; essentially, what devices could now connect that couldn't before? But more recently the center of gravity has shifted. The conversation is no longer anchored in what devices Matter support, but in how those devices behave collectively. Interoperability, once considered the end goal, has become the baseline.

BEYOND CONNECTIVITY

Over the past few years, Matter support for complex device categories has continued to grow at pace. Matter 1.4 introduced new device types such as batteries, heat pumps and water heaters. Matter 1.5 featured a revamped approach to smart closures, as well as soil sensors that measure moisture and temperature. Significant new Matter capabilities include EV charging, solar integration, and enhanced power consumption tracking.

At the same time, Matter has been evolving from a device interoperability layer into a broader smart home platform. Together, Matter 1.4 and Matter 1.5 moved beyond simply onboarding new device types to enabling richer interactions between them.

A key feature of the Matter 1.4 update was 'Enhanced Multi-Admin', allowing devices to operate seamlessly across multiple ecosystems with a single consent flow. Improved multi-admin capabilities, while still not perfect in practice, remove the need for users to 'choose a side' when building a smart home.

Matter 1.5 then introduced more efficient and reliable TCP (Transmission Control Protocol) transport for data-intensive devices (such as cameras), as well as improvements for firmware updates.

These updates signal a transition toward coordinated system behavior rather than isolated device control. In practical terms, this is most visible in the emergence of whole-home energy orchestration. Early Matter discussions treated energy devices such as smart plugs, thermostats and EV chargers as discrete endpoints. Now, they are increasingly part of a dynamic system that manages energy flows across the home. Matter 1.5's support for dynamic energy tariffs and shared energy data models enables devices not just to report consumption, but to coordinate around it. Solar generation, EV charging, HVAC operation and appliance usage can be aligned against real-time signals like tariff pricing or carbon intensity.

This reflects a broader industry shift toward home energy management systems (HEMS), where the value lies in optimization rather than control. Instead of asking whether a smart plug can be turned on remotely, the system determines when it should be turned on to minimize cost or maximize sustainability.

A similar dynamic is emerging in everyday, whole-home automation. What was once a series of discrete commands—turn on lights, lower blinds, adjust temperature—has become a synchronized response to context. The emphasis is now on 'scenes' and 'command batching', enabling users to create a desired state across multiple endpoints.

For developers and manufacturers, this changes the nature of product design. Devices must be conceived not as isolated endpoints, but as participants in a broader ecosystem capable of sharing data, responding to external signals and contributing to coordinated behaviors. The smart home, in effect, becomes a distributed system of systems. Taken together, these developments mark a clear thematic shift: the question is no longer 'does it connect?', but 'does it coordinate?'.

DESIGNED TO MATTER

Underpinning this evolution is Matter's response to network infrastructure challenges and the normalization of cross-platform control. The early Matter experience was often undermined by inconsistent Thread setups, fragmented networks and onboarding processes that varied significantly between ecosystems.

These issues have been addressed through the Thread 1.4 specification. Its headline feature is credential sharing between border routers: when two Thread 1.4-capable border routers are on the same IP network and Matter fabric, one is elected as the credential authority and shares its network dataset with the other. Rather than each platform creating its own isolated Thread network, they join and extend a single shared mesh. A device commissioned through one platform can now operate more reliably across others, because it is part of a shared network fabric rather than a siloed environment. Multiple border routers contributing to the same mesh also improve coverage and resilience, reducing single points of failure. The major ecosystems are completing their transitions to Thread 1.4, and the fragmented multi-network experience that frustrated early adopters should become the exception rather than the rule.

Updates to both Matter and Thread have also streamlined the onboarding process, introducing more robust discovery, clearer commissioning flows and better handling of edge cases. The result is a more predictable and user-friendly setup experience, even as the underlying system becomes more complex.

Another key development is the emergence of Matter-certified routers and access points. These devices combine traditional Wi-Fi functionality with integrated Thread border router capabilities, effectively unifying the home's IP backbone with its low-power mesh network. By embedding Thread support directly into widely deployed infrastructure such as home routers, the industry is reducing the likelihood of fragmented networks forming in the first place. While largely invisible to end users, these improvements address one of the most critical barriers to Matter's success: the reliability of the network itself.

MEETING DEMANDS

If Matter is redefining the smart home as a coordinated system, then the hardware underpinning that system must do far more than simply connect. It must manage concurrent wireless protocols, process richer data models and support increasingly sophisticated application logic at the edge — all while maintaining the ultra-low power operation that battery-powered devices demand. As the specification matures, end devices are increasingly expected to interpret context—including energy signals, occupancy and environmental data—and act accordingly, rather than simply responding to commands. Supporting

By the Numbers

$169.9 billion
Expected value of global smart home devices market in 2026
Source: Persistence Market Research

1.1 billion
Estimated global smart home device shipments in 2028
Source: International Data Corporation

15.1%
Projected CAGR of Matter-enabled device market between 2026–2034
Source: Market Intelo

Tech Check

Nordic's advanced wireless SoCs, including the nRF54L Series, combine with the nRF Connect SDK to offer a robust platform for building Matter-compliant devices using Thread and Bluetooth LE. Additionally, the nRF7002 Wi-Fi companion IC extends Matter support to Wi-Fi-based applications

Matter requires handling secure communications, maintaining device state within a broader system, and enabling real-time responsiveness across ecosystems.

Nordic supports this shift by providing integrated Matter-ready solutions that help developers create secure, low-power and future-proof smart home products. The nRF54L Series represents the next step in this integration. Built on advanced process technology and supporting Thread 1.4, Matter and Bluetooth LE concurrently, devices like the nRF54LM20A, nRF54LM20B and nRF54L15 SoCs are engineered for demanding Thread applications where performance, memory and energy efficiency must coexist. They provide significantly more headroom for complex firmware, enabling developers to embed more intelligence directly within the device.

Crucially, Nordic's multiprotocol heritage remains central. Matter over Thread relies on a low-power, self-healing mesh network for device-to-device communication, while Bluetooth LE ensures seamless onboarding and user interaction. The ability to run these protocols concurrently, without compromising power consumption, allows developers to build devices that are both responsive and energy efficient – an essential requirement for sensors, locks and other battery-operated nodes that form the fabric of a modern smart home.

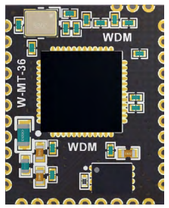
Looking ahead, the convergence of Matter with emerging standards such as Aliro points to even deeper levels of integration. Developed by CSA, Aliro addresses industry fragmentation by replacing proprietary, incompatible mobile credential systems with a standardized approach. Complementing this, Matter enables reliable command-and-control functions. Nordic's nRF54L Series supports simultaneous Aliro and Matter operation, reducing hardware complexity and maximizing interoperability, while its new reference design illustrates how these technologies can support each other.

In practical terms, this could enable scenarios where access permissions are dynamically integrated into the smart home system. Granting a visitor temporary access might not only unlock a door, but also trigger predefined automation states. Security systems will benefit from Matter 1.5's expansion to cameras, with live video streaming, two-way audio and pan-tilt-zoom (PTZ) control capabilities transforming cameras into active participants within the smart home system.

For now, the smart home story remains one of evolution. While Matter is expanding rapidly, rollout and real-world maturity lag behind its ambitions. Nevertheless, the trajectory is clear. Matter is evolving from a connectivity standard into something closer to a systems framework for a more intelligent home. It now sits not just at the edge of individual devices, but increasingly at the center of how those devices interact, coordinate and respond to broader conditions.

> The question is no longer 'does it connect?', but 'does it coordinate?'

Nordic Inside:



Last year China-based company Wisdom launched a Bluetooth LE and Matter over Thread compatible module, designed for use in space-constrained, low-power smart home and lighting applications. For Matter applications, the W-MT-36 module uses the Nordic nRF52840 SoC's Thread connectivity for transport and Bluetooth LE connectivity for commissioning new devices to a network. The combination of wireless technologies enables applications such as smart home controllers and bridges, ON/OFF switching for smart lighting, and various IoT smart sensors.

Sensereo has unveiled a smart smoke alarm that works seamlessly across all leading smart home platforms, including Apple Home, Samsung SmartThings, Homey, and Home Assistant. The MS-1 smart smoke detector employs a photoelectric smoke sensor for early detection of smoldering fires. When smoke is detected, the device triggers a high-volume local alarm while simultaneously sending alerts to the user's smart-home ecosystem via the Nordic nRF52840 SoC's Matter over Thread connectivity. This enables remote alerts in the event the homeowner is not on the premises.

Kwikset has released a touchscreen-enabled, Wi-Fi and Matter over Thread-compatible smart lock. The Halo Select gives homeowners the option to connect their lock via Matter over Thread within their smart home ecosystem or use the Kwikset App for Wi-Fi-based operation. To achieve superior wireless connectivity, Kwikset integrated the Nordic nRF21540 RF FEM alongside the nRF5340 dual-core SoC. The +20 dBm TX output power and 13 dB RX gain significantly improved link budget, increasing range up to 10 times.

Education

Sphero Bolt+

This Nordic-powered educational smart robot helps teach coding to students across a wide range of ages and ability levels

According to the Organization for Economic Cooperation and Development, digital technologies in primary and secondary education hold significant potential for enhancing teaching and learning processes, fostering student engagement, collaboration and self-regulated learning. A survey of younger pupils found 76 percent reported classroom tech made lessons more engaging, with teachers observing increased participation from pupils hesitant in more conventional settings

Educational technology company Sphero's Bolt+, is an updated version of its Bolt smart robot, designed to help students learn how to code. Aimed at grades three to ten, BOLT+ can be programmed via a smartphone or tablet app to perform a variety of tasks, such as following a path, changing the colors of its lights, or updating its display, all using Nordic Semiconductor Bluetooth LE wireless connectivity

The world's first widely recognized educational robot was the Logo Turtle, developed in the late 1960s at MIT. Designed to work with the Logo programming language, children wrote simple commands like FORWARD 50 or RIGHT 90, and the robot would move around the floor drawing shapes with a pen. The goal was to help children learn mathematics and computational thinking by experimentation. Instead of abstract equations, students could see geometry happen as the turtle moved

In 2018, the Guinness World Records title for the largest robotics lesson was set when 1,021 students gathered in Pernambut, India. Working in groups, students were tasked with programming small-wheeled robots from laptops and guiding them around a course, learning how sensors, motors and code combine to bring machines to life

Today tech education includes a broad range of coding, computer science, robotics, digital design, electronics and IoT, but the first 'technology' classes in the late 1700s, were basic woodworking shops designed to prepare students for industrial jobs. Computers entered the school curricula in the 1960s following the creation of the programming language BASIC in 1964. But it wasn't until the late 1970s that the microcomputer revolution enabled schools to finally have PCs such as the Apple II and Commodore PET inside classrooms

Powered by Nordic's nRF5340 SoC and using the nMP1100 PMIC for power management, the BOLT+ can be programmed in one of three ways, depending on the user's coding experience. In Draw Canvas mode, students can simply sketch the path they would like the device to follow, while Block Coding mode allows users to drag and drop modular commands to create programs visually. Finally, in Text Programming mode, more advanced coders can write their programs in JavaScript or Python

The BOLT+ links with the user's smartphone via the nRF5340 SoC's 2.4 GHz multiprotocol radio. Once connected, students can use the Sphero Edu app to program the device to move, change the color of its lights, trigger light displays or matrix animations, illuminate the display, emit sounds, or combine multiple actions using if/then statements. It also includes a convenient shake to wake function for quickly powering the device back on after periods of inactivity

Tech Check

The nPM1100 is a dedicated power management IC (PMIC) with a highly efficient dual-mode configurable buck regulator and integrated battery charger. It is designed as a complementary component to Nordic's nRF52 and Series SoCs to ensure reliable power delivery and stable operation, whilst maximizing battery life. Its extremely compact form factor makes it ideal for advanced wearables, connected medical devices, and other size-constrained applications such as Sphero's Bolt+

Smart Health

Non-stop, real time wireless tracking of blood sugar levels

SiBionics' GS3 CGM system not only empowers diabetics, but any health-conscious individual who wants to monitor their blood glucose

According to the World Health Organization the number of people with diabetes rose from 108 million in 1980, to 830 million in 2022. The disease is a major cause of blindness, kidney failure and heart attacks, and is responsible for some 750,000 premature deaths every year.

Deeper knowledge of how the body uses and stores glucose and the impact of different types of food, exercise and sleep has allowed physicians to refine treatment, while technological developments focused on the 'artificial pancreas' have also progressed rapidly. The term describes closed loop control of blood glucose using a system comprising a constant glucose monitor (CGM), a control algorithm, and an insulin infusion pump, and wireless technology is proving the key to closing the loop.

Blood glucose measurement for all

But it is not only diabetic patients with access to infusion pumps that can take advantage of this wireless technology. Last year Chinese MedTech company, SiBionics, unveiled its latest CGM solution consisting of a physically applied sensor employing Nordic Semiconductor's nRF54L15 SoC and a companion app.

Weighing less than two grams and with a profile of under three millimeters, the SIBIONICS GS3 CGM is promoted as "the world's thinnest" CGM. In use, a sterile disposable electrochemical sensor is applied to the user's upper arm by a minimally invasive method, measuring glucose levels in the interstitial fluid between capillaries and cells. Data is wirelessly sent to the user's smartphone via Nordic-powered Bluetooth LE connectivity, allowing the user—or a clinician—to proactively manage their blood glucose levels based on customizable alerts and actionable data.

While marketed primarily towards people afflicted with diabetes, the user-friendly device allows anyone's glucose levels to be consistently monitored, including the elderly and children as young as three.

"Its main end-users are diabetic patients," says Wayne Zhang, SiBionics' Supply Chain Director. "However, with the increasing global health awareness, many non-diabetic groups are also accepting and using this product. This includes individuals with prediabetes, individuals with weight management needs, health-conscious individuals who monitor their blood glucose levels, and sports enthusiasts who optimize their metabolism and athletic performance through continuous glucose monitoring. These non-diabetic groups are gradually becoming part of the product's user base."

> Many non-diabetics also use this CGM, including individuals with weight management needs and sports enthusiasts

The SIBIONICS GS1 CGM employs Nordic's nRF54L15 SoC and provides users flexibility and actionable insights on their blood sugar levels

Memory for the next generation

SiBionics' GS3 CGM was preceded by the GS1 CGM, also powered by a Nordic chip, the nRF52832 SoC. While the GS1 CGM already serves more than three million users globally with an annual production of approximately 10 million units, the company was keen to develop a next generation solution with enough memory to both store more user data, and upgrade the proprietary algorithm during ongoing development. With existing knowledge of working with Nordic, SiBionics selected the nRF54L15 SoC for the GS3 CGM, thanks in part to its generous 1.5 MB non-volatile memory (NVM) and 256 KB RAM.

The nRF54L15's NVM is used to store glucose readings, calibration data, and customized settings. It also preserves logs of historical measurements, firmware, and configuration data for accurately analyzing trends and ensuring safe restarts after updates or power cycles.

"If the NVM of the chip is too small, it will be unable to meet the requirements of the new product, unable to store more user data, and unable to upgrade the algorithm version through iteration," continues Zhang. "The nRF54L15 has sufficient NVM and RAM to meet our product's increasing memory requirements, while also preserving power consumption and a compact form factor."

More power, low power

With extended range, robust security and multiprotocol support, the nRF54L15 SoC gives engineers and developers a strong foundation for tackling complex medical IoT designs. It features an Arm Cortex-M33 processor, an ultra-low power 2.4 GHz radio, and is designed to support advanced application software and wireless protocol stacks on a single chip, reducing the need for external MCUs or additional memory.

"In selecting an SoC for the GS3 CGM we prioritized power consumption and efficiency, high performance and stability, small size and high integration, stable supply, and price advantage," says Zhang. "Combined with Nordic's support and cooperation over the years, the nRF54L15 SoC was an obvious choice."

The GS3 CGM received CE-MDR certification in 2025, and began large scale production this year, offering real-time metabolic insight to a broad spectrum of users—from those managing early metabolic dysregulation or weight management needs, to health-focused individuals and athletes seeking to fine-tune energy use and performance. By making glucose trends visible day-to-day, the GS3 CGM enables more informed decisions around diet, activity, and recovery, turning what was once a clinical tool into a practical guide for optimizing overall metabolic health.

Jerzy Bialousz
CEO, Inventia

Beyond the hype: the future of Industry 4.0

The shift to connected, data-driven automation is happening, but what you do with the data is what matters

Industry 4.0 adds connectivity, real time analytics and autonomy to industrial automation, optimizing production, maintenance and decision-making. But the biggest advantage is interoperability. It has previously been common practice for OEMs to develop products in a way that protects rather than opens systems to other vendors and solutions. Industry 4.0 requires a fundamentally different approach.

Barriers to adoption do still exist. Convincing a customer of the benefits must be based on explaining the details of the solution, focusing not on technical aspects but on economic ones.

In modern, asset-heavy industries uptime, cost of maintenance and safety are all in focus, but most companies care about cost optimization, which affects all aspects of everyday operations. Extra profit, short ROI, and low TCO are the major drivers that may help overcome customer reluctance and everyone's natural aversion to spending money.

> AI cannot solve problems that are not addressed properly. That requires people who understand what they are talking about

At Inventia we say to our customers, remember the IoT isn't solving a single major problem, it's helping solve many problems, or creating new income in many ways.

Beyond data collection

Most organizations can now collect data. If you have the right front-end device, collecting data is easy. The harder part is acting on it. Finding relationships between data and your operations—especially the economic part of the business—requires specialists.

AI is really helpful. Edge AI-computed decisions are received faster and generate less traffic, making them cheaper, but they are mostly related to nearby objects. In contrast, AI cloud-based systems gather information from many places and sources, which helps make decisions and take actions based on many more factors than in edge computing. Both are good, but we need to know what we need to accomplish the task, and AI cannot solve problems that are not addressed properly. That requires people who understand what they are talking about. In my opinion, the human factor is the most critical part of data analysis.

How this space will look five years from now is hard to predict, but everything will be different. The power of new technologies is undeniable, and by using them, humankind will gain the ability to invent and develop skills and products we cannot imagine today. I believe the combination of AI and edge computing will lead to more devices with local intelligence, supporting many everyday tasks.

If I was advising a company starting their IoT journey today, I would recommend focusing on factors that differentiate their products from the rest of the market, especially if they target a specific industry. Trying to be part of a hype called Industry 4.0 would probably lead to general problems of satisfying everybody while keeping costs minimal. That wouldn't work.

[Tech Zone]

An in-depth look at Nordic's wireless solutions

Power Management

Nordic introduces precise and adaptive battery health-monitoring

Nordic Semiconductor has announced Nordic Fuel Gauge v2.0, a major upgrade of its highly accurate software-based fuel gauge solution for the nPM1300, and nPM1304 Power Management ICs (PMICs). The release adds sophisticated State of Health estimation, adaptive battery modeling, and long term fleet analytics capabilities, extending advanced battery management to a wide range of power constrained IoT products.

Nordic Fuel Gauge v2.0 will empower manufacturers to build more reliable, sustainable, and longer-lasting products while also meeting emerging battery-replacement mandates. This includes the European Union Batteries Regulation 2023/1542, which dictates that portable batteries be "readily removable and replaceable by the end-user at any time during the lifetime of the product". The release enables manufacturers to determine when batteries need to be replaced, supports right to repair initiatives, improves product reliability, and reduces warranty costs.

"Battery behavior in the field rarely matches what you see in the lab," says Geir Kjosavik, Product Director PMICs at Nordic Semiconductor. "With Fuel Gauge v2.0, we're bringing adaptive, real world intelligence that was once exclusive to premium consumer electronics into the IoT space. It's a genuine game changer for billions of battery-powered devices."

Fuel Gauge v2.0 integrates seamlessly with Nordic's cloud lifecycle services – nRF Cloud. Devices can automatically report State-of-Health, State-of-Charge, and battery performance metrics without requiring custom cloud infrastructure. This enables engineering and operations teams to monitor fleet wide battery health, identify anomalies, optimize charging parameters, and improve future hardware designs using real world data.

Asset Tracking

Nordic and OQ Technology demonstrate direct NTN LEO satellite connectivity

Nordic Semiconductor has announced a new milestone for Non-Terrestrial Network (NTN) IoT – a successful end-to-end NB-IoT connectivity and data transmission from the low power nRF9151 cellular IoT module directly to OQ Technology's LEO satellite constellation.

The nRF9151 module runs Nordic's standard cellular IoT software stack, connected over OQ Technology's fully integrated 3GPP-compliant NTN NB-IoT RAN and 5G core network. This demonstrates that a compact, low-power, mass-market cellular IoT module can connect directly to NTN LEO satellite networks, making truly global coverage achievable without redesigning existing device hardware.

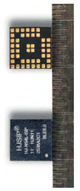
"Customers want a single solution that just works everywhere, also beyond terrestrial coverage," says Kristian Sæther, Senior Product Director, Long-Range BU at Nordic Semiconductor. "By having Nordic's nRF9151 connecting to OQ's LEO satellites, we're enabling developers to extend coverage without redesigning hardware—simplifying deployment and reducing cost."

Nordic's nRF9151 is a highly integrated, low-power cellular IoT module that also supports terrestrial LTE-M/NB-IoT with global band coverage in a compact form factor.

The nRF9151 cellular IoT module has now achieved certification with two leading GEO satellite network providers and successfully completed testing with multiple LEO satellite networks, including OQ Technology.

Modules

Design-optimized nRF54L15 modules

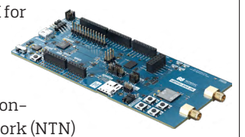


Tangshan Hongjia Electronic Technology Co., Ltd has launched a wireless module based on Nordic Semiconductor's next generation nRF54L15 SoC, featuring a high-performance antenna, dual crystal oscillators (32 MHz + 32.768 kHz), RF matching circuitry, and a DC-DC converter. Only a power supply is required for immediate operation.

The highly integrated HJ-N54L_SIP comes in a 4.5 by 4.5 by 1.1 mm form factor making it the smallest module in its class, according to the company. An HJ-N54L_SM variant is also provided, offering a larger footprint (10 by 10 by 2.5 mm) for end use cases where an ultra-compact design is not essential. Both modules are designed for a wide range of wireless IoT applications spanning smart home, consumer electronics, wearables, industrial monitoring, and intelligent transportation.

Long Range Development

DK combines NTN and cellular IoT connectivity

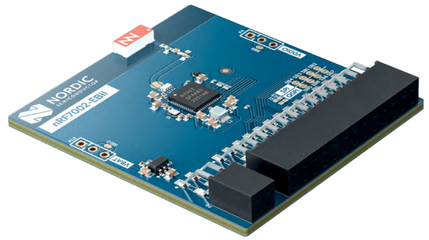


A specialized DK for RF engineers developing cellular IoT, DECT NR+, and Non-Terrestrial Network (NTN) applications has been announced by Nordic. Alongside the hardware release, the company has launched new modem firmware adding NTN (satellite) support to the nRF9151 module.

The nRF9151 SMA DK is designed for demanding RF evaluation. It replaces internal antennas with SMA connectors, allowing engineers to directly connect high-performance external antennas or lab equipment for precise characterization. This makes it the recommended tool for developing and evaluating cellular IoT, DECT NR+, and NTN designs where optimized RF performance is critical. Use cases are applications in remote locations with weak cellular signals, smart buildings with dense node counts, or industrial environments subject to RF shadowing.

Wi-Fi

nRF7002 EBII brings Wi-Fi 6 connectivity to nRF54L Series development options



Nordic Semiconductor has launched the nRF7002 Expansion Board II (nRF7002 EBII), adding Wi-Fi 6 capabilities to Nordic's nRF54L Series Development Kits (DKs). Based on Nordic's nRF7002 Wi-Fi Companion IC, the nRF7002 EBII allows product developers using Nordic's nRF54L Series multiprotocol SoCs to bring the benefits of Wi-Fi 6—including power efficiency gains for battery-powered Wi-Fi operation, and management of large IoT networks—to a wide range of IoT applications.

The nRF7002 EBII accelerates Wi-Fi 6 development by providing seamless hardware and software integration with the nRF54L15, and nRF54LM20 DKs, enabling developers to build advanced connected multiprotocol applications while leveraging Nordic's expertise in low power wireless technology.

The nRF7002 EBII supports dual-band Wi-Fi (2.4 GHz and 5 GHz) and advanced Wi-Fi 6 features such as Target Wake Time (TWT), OFDMA and BSS Coloring, enabling efficient, interference-free, battery-powered operation. It features a dual-band chip antenna ensuring robust connectivity across Wi-Fi bands.

The onboard nRF7002 companion IC offers Wi-Fi 6 compliance, as well as backward compatibility with 802.11a/b/g/n/ac Wi-Fi standards. It supports both STA and SoftAP operation modes for flexible network configuration.

The nRF7002 EBII is designed for easy integration with nRF54L Series Development Kits via a dedicated expansion header. Developers can also leverage SPI or QSPI interfaces for flexible host communication and use integrated headers for power profiling, making the board ideal for energy-constrained designs.

The nRF7002 EBII is fully supported in the nRF Connect SDK, Nordic's unified and flexible software development kit.

nRF54LM20B SoC

Nordic's nRF54LM20B is an ultra-low power, large memory wireless SoC integrating powerful intelligence directly on device to supercharge demanding edge AI workloads

With the launch of the industry-leading nRF54LM20B, Nordic sets a new standard for ultra-low-power edge AI, accelerating the arrival of a new generation of intelligent IoT solutions. The SoC combines energy efficiency with increased speed and efficiency of AI inference tasks.

The nRF54LM20B SoC pairs the Axon NPU with 2 MB NVM, 512 KB RAM, and a 128 MHz Arm Cortex-M33 processor, as well as a RISC-V coprocessor. Also included are a high-speed USB, up to 66 GPIOs, and Nordic's fourth-generation ultra-low-power 2.4 GHz radio supporting Bluetooth LE, Bluetooth Channel Sounding, Matter over Thread, and more. In addition, the Arm Cortex CPU can run a Wi-Fi stack for the nRF70 Series companion ICs

Security has been prioritized with the nRF54LM20B SoC, integrating features such as secure boot, secure firmware update, secure storage, trusted execution environment enabled by TrustZone, cryptographic accelerator with side-channel leakage protection, and tamper detectors to fulfil essential and advanced security requirements

The nRF54LM20B SoC is the first large-memory member of the nRF54L Series to integrate the Axon Neural Processing Unit (NPU), an ultra-efficient AI hardware accelerator. It accelerates TensorFlow Lite models with up to 15x faster inference than the CPU, and delivers up to 7x higher performance and up to 8x better efficiency than the closest competing wireless NPU

Neuton models are ultra-tiny, CPU-run edge AI models that are typically under 5 KB and up to 10 times smaller, faster, and more efficient than other CPU-run models. They are built from user data and as they run on the CPU, they can be run in parallel with a LiteRT model on the Axon NPU on the nRF54LM20B. Nordic Edge AI Lab (*see panel*) helps developers generate custom Neuton models for anomaly detection, activity and gesture recognition, biometric monitoring, and more

nRF CLOUD
powered by Memfault

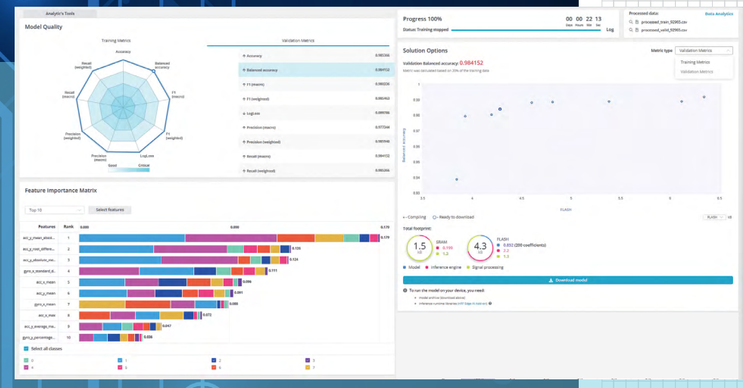
nRF Cloud offers a suite of services optimized for all Nordic's ultra-low power wireless devices, including the nRF54LM20B. nRF Cloud supports your IoT deployment throughout its entire lifecycle, allowing you to seamlessly scale from a few devices on a pilot run, to thousands of devices on a production deployment. By providing hardware, software, and cloud services, Nordic offers a complete solution that helps you accelerate time-to-market and reduce the development and maintenance costs of your IoT applications

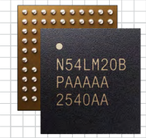
The nRF54LM20B is designed to deliver a strong balance of processing performance and energy efficiency, achieving up to 503 CoreMark (or 193 CoreMark/mA at 3 V) which translates into high computational capability per unit of power consumed. The device draws just 3.4 mA in receive mode and 4.8 mA in transmit mode at 0 dBm (both at 3 V), while sleep modes are highly optimized, ranging from as low as 0.7 µA to 4.0 µA. These characteristics make it well suited to battery-powered and energy-constrained applications that require long operational lifetimes

Building intelligent applications

Implementing AI in your embedded application offers massive benefits, and Nordic Edge AI Lab is your gateway to ultra-efficient edge intelligence. In the Edge AI Lab, you can create high-performance AI models ready to deploy on Nordic's ultra-low-power SoCs, for both CPU-run and NPU-accelerated edge AI.

Nordic Edge AI Lab is an automated no-code online model generation tool allowing you to build highly compact models and embed them across all Nordic SoCs, including the nRF54LM20B. The platform uses Nordic's patented neural network framework, Neuton. The Nordic Edge AI Lab is easy to use, and automates the entire process of creating models for edge AI, transforming raw sensor streams into high-quality training data using built-in preprocessing tools designed for edge AI. You can implement common TinyML tasks such as gesture recognition, wake word detection, human activity recognition, machine fault classification or any sensor-based time series task. Additional Edge AI Lab features include a LiteRT model builder for the Axon NPU, as well as text-to-wake-word and text-to-keyword spotting (KWS) model generation.





Tech Spec

Processing
128 MHz Arm Cortex-M33 processor, 128 MHz RISC-V Coprocessor, 128 MHz Axon NPU

Memory
2 MB NVM and 512 KB RAM

Supported protocols
Bluetooth LE, Bluetooth Mesh, Bluetooth Channel Sounding, Matter, Thread, Zigbee, Amazon Sidewalk, 2.4 GHz proprietary

Digital interfaces
High-speed SPI/UART, 6x SPI/UART/TWI, High-speed USB, ADC, TDM, PDM, NFC, PWM, QDEC

Development tools
nRF54LM20 DK

Mastering low power cellular IoT for multi-year battery life

Navigating the trade-offs between latency, data throughput and energy efficiency ensures cellular IoT developers can create a cost-effective and sustainable device that will stand the test of time

Cellular IoT has emerged as a cornerstone technology for the broader IoT because it combines ubiquitous coverage, strong security, and carrier-grade reliability with the ability to connect vast numbers of low-power devices.

However cellular design can be complex for developers, not least balancing performance, power, and cost. In terms of power, every microampere counts for a battery-operated device, and achieving a multi-year operational lifetime is the ultimate goal and a key market differentiator. The good news is that it's achievable with smart, informed engineering decisions at every stage of development.

Integrated hardware architecture

The physical foundation of your device is the first and most critical area for power optimization. Traditional cellular IoT designs, which rely on a separate host microcontroller (MCU), a cellular modem, and external memory, are inherently inefficient. The communication between these discrete components over interfaces like UART or SPI consumes constant power and introduces latency.

The modern approach, embodied by devices such as Nordic Semiconductor's nRF9151 module, revolutionizes this design by integrating a dedicated application processor, a multi-mode LTE modem supporting 3GPP release 17 NTN, GNSS, and memory into a single, compact package. This unified architecture with integrated power and clock management is the first step toward optimization, as it minimizes power drain, reduces latency, and simplifies hardware while reducing the BoM.

The next important decision is choosing the right radio technology for your application. While both LTE-M and NB-IoT are designed for LPWANs, each offers distinct advantages, and which flavor you opt for will depend heavily on your target end application. While LTE-M provides superior throughput, latency and roaming support, NB-IoT offers better deep indoor/underground penetration as well as a slight edge on power consumption for applications requiring infrequent transmissions.

The core principle is that higher data rates mean less time on-air. The radio is the most power-hungry component, so minimizing its active time is paramount. LTE-M is often the preferred technology for its balance of throughput and mobility, especially for FOTA updates where its speed dramatically cuts down on power-intensive radio time. However if your use case also requires NB-IoT connectivity, the most robust solution is a device like the nRF9151 that supports both, allowing the application to switch dynamically for maximum efficiency.

> With the nRF9151, Nordic has integrated everything into a single 12 by 11 mm module – all fully designed by Nordic

Optimize the data pipeline

How data travels from your device to the cloud directly impacts power consumption and data costs. Every byte matters, and therefore so does selecting the most efficient protocol. For most cellular IoT applications UDP (User Datagram Protocol) is the better choice over TCP (Transmission Control Protocol) as the transport protocol. It sends packets without setting up a connection and without guaranteeing delivery, order, or duplication. There's no retransmission or built-in error correction – data is just sent as-is. It avoids the multi-step, power-hungry connection 'handshake' and has minimal header overhead.

At the application layer, UDP-based protocols like CoAP and LwM2M were designed for constrained devices and are therefore far more power-efficient than TCP-based options like MQTT and HTTPS in most use cases.

The format for your data is also crucial. A binary format like CBOR (Concise Binary Object Representation) can represent the same data as human-readable JSON (JavaScript Object Notation) in a fraction of a size, directly reducing on-air time and power. In constrained IoT, this decision is often the difference between a viable product and a failed one.

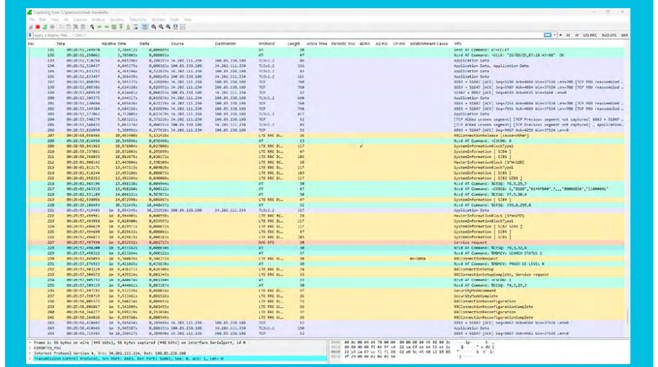
Capturing and analyzing modem traces

Nordic's Cellular Monitor app is a cross-platform tool for nRF91 Series devices. It is used for capturing and analyzing modem traces to evaluate communication and view network parameters, and is an indispensable tool during development for achieving multi-year battery life enabling you to:

Demystify Network Behavior:
See exactly why a connection is taking longer than expected or if the network rejects your device's requests for low-power modes like PSM.

Pinpoint Inefficiencies:
Identify unexpected network-initiated traffic, diagnose packet retransmissions that are killing your power budget, and optimize protocol overhead at the byte level.

Debug Faster:
Stop guessing and start seeing. What would generally be a black box of radio communication becomes a transparent, dissectible log, dramatically accelerating the debugging of connectivity and power consumption issues.



Wireshark integration for modem tracing

Give your device the edge

The single most effective strategy for achieving multi-year battery life is to minimize the use of the radio. Instead of being a simple data pipe, your device should be a smart edge computer. Select a module, such as the nRF9151, that has a powerful integrated application processor to perform as much work as possible on the device itself. You can then collect sensor readings over hours or days and send them in a single, efficient bulk transmission. For example, run a simple AI model on the device to detect a specific event and transmit only a tiny, high-value alert message. This transforms a constant, high-power data stream into an infrequent, low-power event.

You should also leverage manufacturer power saving features where possible. For example, the nRF9151 supports roaming PSM (Power Saving Mode), eDRX (Extended Discontinuous Reception) and AS-RAI (Application Sub-layer Release Assistance Indication). PSM allows the device to enter a deep sleep state for long periods while remaining registered with the network. This is perfect for applications that only need to report data periodically. eDRX meanwhile provides a balance between power savings and reachability, allowing the device to wake up briefly during defined 'listening windows' to check for incoming data. AS-RAI allows the device to signal to the network that it has no more data to send, enabling a faster transition to an idle state.

Antenna design is crucial

Antenna performance is not a luxury; it is a fundamental requirement for a low-power device. A poor or mismatched antenna is a power killer, forcing the modem to transmit at a higher power level and leading to data retransmissions, both of which drain the battery. Engage with antenna design partners early in your hardware design process.

Also important is to select a power-efficient cloud platform. Nordic's nRF Cloud is designed for ultra-low power operation with IoT devices, supporting efficient protocols like CoAP over UDP to extend battery life further and reduce data costs. It also provides a lightweight, on-device agent to capture crash data, monitor fleet health, and proactively identify issues. This remote debugging and fleet management capability is invaluable, saving the cost and logistical headache of physically servicing devices.

Profile, measure, fine-tune

Last but not least, you can't optimize what you can't measure. Achieving multi-year battery life is not a one-time task but an iterative process of testing and refinement. A theoretical power budget is a great starting point, but only real-world measurement and deep-dive analysis will reveal the hidden inefficiencies that can drain a battery over time. To truly master low-power design, you must adopt a multi-layered approach to profiling and debugging.

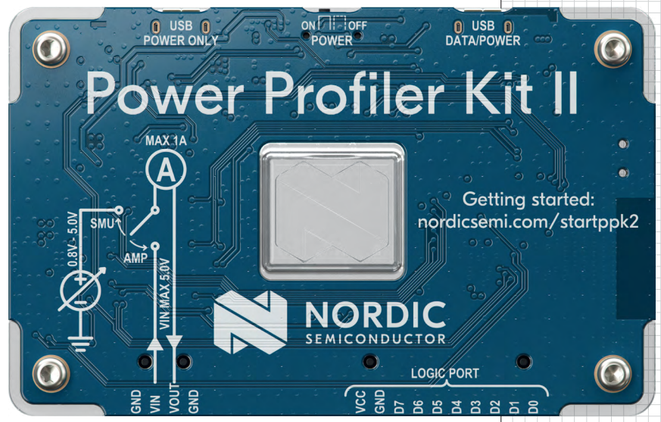
Begin your design process with Nordic's Online Power Profiler that lets you get early, high-level estimates of your application's power consumption. You can make crucial initial decisions about battery size and overall data strategy by inputting variables like your expected data payload, transmission frequency, and chosen network parameters.

Once you have hardware ready, Nordic's Power Profiler Kit II (PPK2) is essential for getting precise, real-world current measurements of your device. It allows you to see the power cost of every single operation, from waking the processor to transmitting a packet, revealing the power spikes and idle currents that define your device's battery life. If it reveals a power spike you can't explain, an unexpectedly long connection time, or a higher-than-calculated idle current, this is where deep debugging becomes critical.

To solve these complex issues, Nordic provides a unique Cellular Monitor tool with full Wireshark integration. This powerful combination allows you to capture extensive logging and detailed modem traces, giving you extreme insights into the conversation happening between your device and the cellular network. You gain unmatched visibility by exporting these traces directly into Wireshark, the industry-standard network protocol analyzer.

Armed with insights from the Online Power Profiler, PPK2, and Cellular Monitor app, you can now complete the optimization loop and fine-tune your application. Adjust your PSM and eDRX timers based on live network behavior, modify your data reporting intervals to find the perfect balance between latency and power, and refine your application logic to eliminate every unnecessary microampere of consumption. This iterative cycle of estimating, measuring, debugging, and fine-tuning is the key to moving from a good design to a truly world-class, ultra-low power product.

A Nordic whitepaper entitled *Mastering Low-Power Cellular IoT for Multi-Year Battery Life* is available from https://tinyurl.com/bdzm6778



Nordic's Power Profiler Kit II (PPK2) is essential for getting precise, real-world current measurements of your device. It allows you to see the power cost of every single operation, from waking the processor to transmitting a packet

Tech Check

The nRF9151 comprises an Arm Cortex-M33 programmable application processor combined with 1MB Flash and 256 KB RAM, a multimode LTE-M/NB-IoT modem with NR+ support and GNSS, power management, RF Front End, passives and crystals. The module supports 3GPP release 14 LTE-M/NB-IoT and the integrated modem ensures global connectivity without regional limitations

Nordic Product Guide

This handy summary describes all of Nordic's IoT solutions

NORDIC SEMICONDUCTOR

Full product details at:
www.nordicsemi.com/products/

RF SoCs and modules

		nRF93 Series	nRF91 Series	nRF70 Series	nRF54L Series	nRF53 Series	nRF52 Series
IC TYPE		Wireless Module	Wireless Module	Wi-Fi Companion IC	Wireless SoC	Wireless SoC	Wireless SoC
ICs		nRF93M1	nRF9160 nRF9151	nRF7002 nRF7001 nRF7000	nRF54LM20B nRF54LM20A nRF54L15 nRF54L10 nRF54L05 nRF54LV10A nRF54LS05B nRF54LS05A	nRF5340	nRF52840 nRF52833 nRF52832 nRF52820 nRF52811 nRF52810 nRF52805
WIRELESS	LTE-M, NB-IoT, GNSS		Yes				
	LTE Cat 1 bis	Yes					
	NON-TERRESTRIAL NETWORKS (NTN), DECT NR+		Yes (nRF9151 only)				
	DUAL-BAND Wi-Fi 6			Yes (with host)	Yes (with nRF70 Series)	Yes (with nRF70 Series)	Yes (with nRF70 Series)
	Wi-Fi LOCATIONING	Yes	Yes (with nRF70 Series)	Yes (with host)	Yes (with nRF70 Series)	Yes (with nRF70 Series)	Yes (with nRF70 Series)
	BLUETOOTH LE				Yes	Yes	Yes
	BLUETOOTH CHANNEL SOUNDING				Yes		
	BLUETOOTH LE AUDIO					Yes	
	BLUETOOTH MESH, ZIGBEE, THREAD, MATTER, AMAZON SIDEWALK, NFC				Yes	Yes	Yes
	ESB AND 2.4 GHz PROPRIETARY PROTOCOLS				Yes up to 4 Mbps	Yes up to 2 Mbps	Yes up to 2 Mbps
MCU FUNCTIONALITY	PROCESSOR		64 MHz Arm Cortex-M33		128 MHz Arm Cortex-M33	2x Arm Cortex-M33, up to 128 MHz	64 MHz Arm Cortex-M4
	AI ACCELERATOR				128 MHz NPU		
	COPROCESSOR				RISC-V, 128 MHz		
	NVM		1 MB		Up to 2 MB	1 MB + 256 KB	Up to 1 MB
	RAM		256 KB		Up to 512 KB	512 KB + 64 KB	Up to 256 KB
	STANDARD PERIPHERALS AND INTERFACES	UART/USB	Yes	High-speed SPI/QSPI	Yes	Yes	Yes
	HIGHLIGHTED DIGITAL INTERFACES				High-speed USB	Full-speed USB	Full-speed USB
SECURITY	ISOLATION		TrustZone		TrustZone	TrustZone	
	CRYPTOGRAPHIC ACCELERATOR		Yes		Yes (with side-channel leakage protection)	Yes	Yes
	TAMPER DETECTORS				Yes		
GPIOs		4	32		Up to 66	48	Up to 48
PACKAGE TYPES		LGA	LGA	QFN, CSP	QFN, CSP	aQFN, CSP	aQFN, QFN, CSP
MINIMUM PACKAGE SIZE		17.7x15.8x2.4 mm	12x11x1.2 mm	3.8x3.4 mm	1.9x2.3 mm	3.5x3.6 mm	2.5x2.5 mm
Neuton EDGE AI MODELS			Yes	Yes	Yes	Yes	Yes
COMPATIBLE PMICs			nPM1300, nPM6001	nPM6001	nPM1300, nPM1304, nPM2100, nPM1100, nPM6001	nPM1300, nPM1304, nPM2100, nPM1100, nPM6001	nPM1300, nPM1304, nPM2100, nPM1100, nPM6001
nRF Cloud SERVICES		Yes	Yes	Yes (with host)	Yes	Yes	Yes

PMICs nPM FAMILY

		nPM6001	nPM2100	nPM1304	nPM1300	nPM1100
TYPE	PMIC	●	●	●	●	●
FEATURES	BUCK REGULATOR	4		2	2	1
	BOOST REGULATOR		1			
	BATTERY CHARGER			●	●	●
	LDO		1	2	2	2
	LOAD SWITCH		1	2	2	
CHARGER/BATTERY	TERMINATION VOLTAGE			3.5 to 4.65 V	3.5 to 4.45 V	4.1 to 4.2 V or 4.25 to 4.35 V
	MAX CHARGING CURRENT			100 mA	800 mA	400 mA
	POWER PATH MANAGEMENT			●	●	●
	THERMAL PROTECTION	●	●	●	●	●
	BATTERY COMPATIBILITY		LiMnO$_2$, AA/AAA 1S or 2S, Silver Oxide	LiFePO$_4$, Li-Ion, LiPo	LiFePO$_4$, Li-Ion, LiPo	Li-Ion, LiPo
	INPUT VOLTAGE	3 to 5.5 V	0.7 to 3.4 V	4 to 5.5 V	4 to 5.5 V	4.1 to 6.7 V
	USB COMPLIANCE			Type-C	Type-C	
POWER RAILS	REGULATED OUTPUT VOLTAGE	0.5 to 3.3 V	1.8 to 3.3 V	1 to 3.3 V	1 to 3.3 V	1.8 to 3 V
	MAX CURRENT PER DC/DC	550 mA, 200 mA, 150 mA, 150 mA	150 mA	200 mA, 200 mA	200 mA, 200 mA	150 mA
SYSTEM MANAGEMENT	SYSTEM MONITORING		Battery-voltage and -temp (derived from die temp)	System-, input bus- and battery-voltage; battery-current and -temp; die temp	System-, input bus- and battery-voltage; battery-current and -temp; die temp	
	FUEL GAUGE		●	●	●	
	HARD SYSTEM RESET		●	●	●	
	TIMED WAKE-UP (HIBERNATE)		●	●	●	
	WATCHDOG TIMER	●	●	●	●	
	SHIP MODE	●	●	●	●	●
	BROWN-OUT DETECTOR	●	●	●	●	●
	LED DRIVERS, GPIOs	0, 3	0, 2	3, 5	3, 5	2, 0
	CONTROL INTERFACE	TWI	TWI	TWI	TWI	Pin-configurable
REGULATORY COMPLIANCE		CE, RoHS	CE, RoHS	CE, JEITA, RoHS	CE, JEITA, RoHS	CE, JEITA, RoHS
OPERATING TEMPERATURE		-40 to 85°C	-40 to 85°C	-40 to 85°C	-40 to 85°C	-40 to 85°C
EVALUATION KITS		nPM6001 EK	nPM2100 EK	nPM1304 EK	nPM1300 EK	nPM1100 EK
PACKAGE OPTIONS		2.2x3.6 mm CSP	4x4 mm QFN16, 1.9x1.9 mm CSP	5.5 mm QFN32, 3.1x2.4 mm CSP	5x5 mm QFN32, 3.1x2.4 mm CSP	4x4 mm QFN24, 2.1x2.1 mm CSP

Cloud lifecycle services

nRF Cloud

nRF CLOUD powered by Memfault

Description:
Nordic Semiconductor's nRF Cloud provides device management, embedded observability and location services, optimized for all Nordic's low power IoT devices. Both device-to-cloud and cloud-to cloud implementations are supported as are CoAP and MQTT protocols.

Services:
nRF Cloud provides critical cloud operational infrastructure and modern embedded development tools pre-integrated and power-optimized for Nordic devices. With nRF Cloud teams can accelerate development, launch with more confidence and operate in production more efficiently.

nRF Cloud device management includes general fleet management services, message routing and storage, and a firmware-over-the-air (FOTA) update function, whereby modem and/or application firmware can be updated automatically and remotely. Device management simplifies management of IoT fleets in the field and ensures they remain secure and reliable across their lifecycle.

nRF Cloud embedded observability automates the collection of coredumps, crash logs, and performance metrics from devices in the field and makes it available for analysis and investigation. With observability, engineering teams can identify and resolve faults in the field much faster, monitor performance easily, and identify improvements based on real world data. This helps teams accelerate field testing, improve reliability in production, and ship software updates with more confidence.

nRF Cloud location services include Assisted GPS, Predictive GPS, Wi-Fi, single-cell and multi-cell, and supply accurate and power-efficient location data for IoT devices employing nRF91 Series products. The Wi-Fi feature requires a Wi-Fi scanning IC, such as one of the nRF70 Series Companion ICs. Each location feature has accuracy and power efficiency benefits, so switching between different location services during operation can be useful.

All nRF Cloud services are available to try for free for Nordic customers on up to 10 non-production devices, can be integrated in minutes, and scale at very low cost.

Tech Spec

Supported products
All wireless products

Location services
A-GPS, P-GPS, Wi-Fi, Single-Cell, Multi-Cell

Additional features
Device-to-cloud and cloud-to-cloud use cases. CoAP, MQTT and REST API support

Applications
Consumer electronics, Industrial, smart appliances, access control, asset tracking, RTLS

Energy-efficient edge AI

For small battery-powered devices

Add edge AI without adding extra hardware.

Choose between a fully integrated NPU or ultra-efficient CPU-run models.

Increase battery life with up to 15× faster execution of AI inference.

LEARN MORE

www.nordicsemi.com/edge-ai

NORDIC® SEMICONDUCTOR