Beyond RFID: How BLE completes asset tracking and monitoring

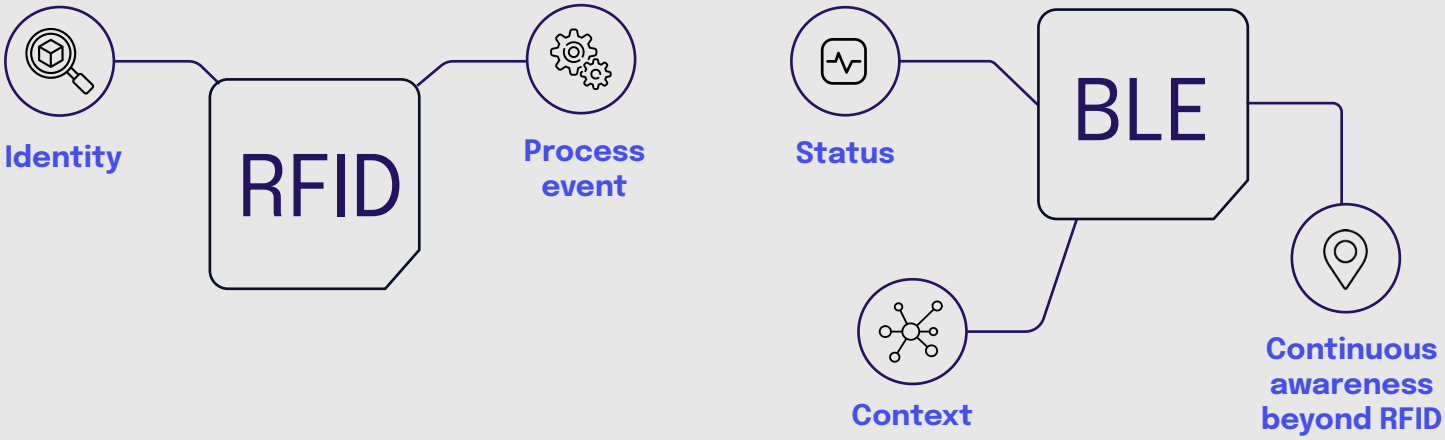
Identification, condition monitoring and extended coverage

Summary

RFID is a well-established and widely adopted technology for asset identification and tracking. Across industries, it has proven its value by enabling fast, reliable, and cost-effective visibility at key process checkpoints.

However, as companies move toward real-time operations, condition monitoring, and digitalized supply chains, **new requirements are emerging**. Assets are no longer confined to fixed locations or controlled environments. They move across facilities, outdoors, and through areas without RFID infrastructure. In these scenarios, Bluetooth Low Energy (BLE) is increasingly recognized as a powerful complement to RFID.

Together, they form a unified, end-to-end visibility layer: RFID captures the 'what' and 'where' at checkpoints, BLE fills in the 'how' and 'what's happening now' in between.



0. The Visibility Gap: Where Assets Disappear

Consider a pharmaceutical cold chain:

Loading dock: RFID read confirms pallet departure

In transit (4 hours): No visibility

Distribution center: RFID read confirms arrival

Cold storage (2 days): No visibility

Retail delivery: RFID read confirms shipment

What happened during the gaps?

- *Did the temperature exceed safe limits?*
- *Was the shipment exposed to shock or improper handling?*
- *How long was the door open during unloading?*
- *The shipment arrived late: where was it delayed?*
- *The shipment didn't arrive: where was it last seen?*

Without continuous monitoring, these questions go unanswered until product failure or compliance audit. BLE sensors broadcast temperature, humidity, shock, and other conditions every 10-60 seconds throughout the entire journey. Issues are detected in real-time, not discovered weeks later. And, in case the RFID loop breaks, BLE can provide the last seen location and timestamp.

This whitepaper aims to explain how BLE extends the value of existing RFID systems, when to use each technology and how a hybrid approach delivers the strongest performance.

1. From Asset Identification to Continuous Visibility

Today, the market view is often segmented:

Asset identification and inventory are commonly handled with RFID.

Condition monitoring and proximity-based use cases are often addressed with BLE.

While this separation has worked in the past, many organizations now want more. They are looking to:

- extend asset tracking beyond RFID read points,
- monitor asset condition in real time,
- integrate asset data with mobile devices and IoT platforms.

RFID excels at identifying what an asset is and when it passes a checkpoint.
But between those checkpoints, assets may disappear from view.
This is where BLE plays a complementary role.

2. **RFID Overview:** Efficient Identification at Scale

RAIN RFID is optimized for:

- **fast bulk reading,**
- **low tag cost,**
- **battery-free operation.**

Typical RFID systems operate at fixed locations (gates, doors, conveyors, storage areas) where readers energize passive tags and capture asset IDs.

This model delivers strong ROI in:
- **logistics and warehousing,**
- **manufacturing processes,**
- **retail inventory management**.

However, RFID visibility is inherently event-based. **If an asset is not near a reader, no data is generated.**

3. **BLE Overview:** Awareness Beyond Infrastructure

Bluetooth Low Energy (BLE), part of the Bluetooth 4.0+ standard, is designed for low-power, continuous communication. BLE devices can run for years on a coin cell battery while transmitting small packets of data such as temperature, vibration, or battery voltage. BLE devices (beacons or sensor tags) are battery-powered and can:

- **broadcast asset presence,**
- **transmit sensor data (temperature, humidity, shock, motion),**
- **interact with smartphones and mobile applications.**

Data can be collected through:

- **fixed infrastructure (BLE gateways, Wi-Fi access points with BLE support),**
- **or mobile infrastructure (smartphones used by operators, drivers, or field staff).**

Key Advantages

- **Low energy use:**
  Multi-year battery life for beacons or sensors.
- **Longer range:**
  30–100 meters typical indoors, depending on setup.
- **Universal compatibility:**
  Works with smartphones, tablets, or dedicated gateways.
- **Rich data capability:**
  Unlike passive RFID, BLE can broadcast sensor values or status updates.
- **Simple infrastructure:**
  Many existing Wi-Fi access points already include BLE radios.
- **Robust design:**
  BLE beacons are engineered to withstand harsh environments, ensuring reliable performance in demanding conditions.

Real-World Uses

- **Cold chain logistics:**
  Continuous temperature and humidity data.
- **Healthcare:**
  Tracking of mobile medical equipment, condition alerts, and maintenance planning.
- **Manufacturing:**
  Real-time visibility of tools, components, and environmental conditions.
- **Smart buildings:**
  Occupancy and environmental monitoring for energy optimization.
- **Asset tracking**
  outside and in between RFID checkpoints' and Real-Time-Location

4. RFID and BLE: Complementary Strengths

FEATURE	RFID (PASSIVE UHF)	BLE
Read range	Up to ~20 m	200 m
Reading interval	Event / checkpoint-based	Continuous broadcasting
Battery	No	Yes
Unit cost	Low	High
Ideal environments	Warehouses, dock doors, conveyors	Yards, customer sites, mobile flows
Data capacity	Limited (ID only)	Extended (sensor data)
Best for	Bulk identification	Real-time condition and proximity

Hybrid systems leverage both:

- RFID for efficient mass identification,
- BLE for awareness, context, and extended coverage.

Organizations such as **Posti**, a leading Nordic postal and logistics operator, have demonstrated how combining these technologies can improve visibility without replacing existing RFID investments.

5. Two Ways to Combine RFID and BLE

Organizations looking to combine RFID and BLE typically have two implementation options. Both enable hybrid asset visibility, but they differ significantly in complexity, scalability, and long-term efficiency.

Hybrid systems combine the strengths of both: RFID delivers mass data efficiently, while BLE provides live condition monitoring. Together they provide richer insights, turning item identification into actionable intelligence.

5.1 Separate RFID and BLE Devices

The most straightforward approach is to deploy:
- passive RFID tags for identification at fixed checkpoints,
- separate BLE beacons or sensors for condition monitoring or extended tracking.

In this model, each technology operates independently and data is merged at software level by correlating:
- RFID identifiers (e.g. EPC),
- and BLE device IDs (e.g. MAC address).

This approach can work well for pilots or limited deployments, especially when BLE is used for tracking selected, high-value assets or processes.
However, it also introduces challenges:
- two physical devices per asset,
- two identifiers to manage and synchronize,
- higher installation effort,
- increased risk of data inconsistency over time.

5.2 A Single Hybrid Device: RFID and BLE in One Beacon

A more efficient and scalable option is to use a single device that integrates both RFID and BLE, such as the Beontag Viking Hybrid.
In this model:

- one physical beacon carries both technologies,
- RFID and BLE share a unified asset identity,
- and the same asset can be identified at RFID checkpoints and tracked continuously via BLE.

This simplifies deployment and operations:

- faster installation and onboarding,
- fewer components to manage,
- no manual ID mapping between systems,
- cleaner, more reliable data integration.

From a business perspective, hybrid devices reduce operational complexity while maximizing the value of existing RFID infrastructure–making BLE a true extension of RFID, not a parallel system.
In some cases, a hybrid tag can be the most straightforward way to get started.
If the device meets the RFID requirements of the customer's use case, it can be seamlessly integrated into existing operations, enabling BLE data collection–often using already available infrastructure, such as Wi-Fi access points.
No additional devices, ID mapping, or infrastructure are required.

Choosing the Right Approach

Using RFID and BLE as separate devices can be a valid starting point.
However, for organizations planning to scale hybrid asset tracking, a single hybrid beacon offers a clearer path to efficiency, consistency, and long-term ROI.

6. Getting Started: Practical Implementation Options

Option 1: **Incremental Hybrid Deployment**

Assessment

Identify visibility gaps and condition-sensitive assets.

Pilot

Combine a small number of BLE devices with existing RFID tracked assets.

Integration

Link RFID and BLE data using a shared identifier (EPC ↔ BLE ID) via middleware.

Option 2: **Hybrid Tags for Faster Adoption**

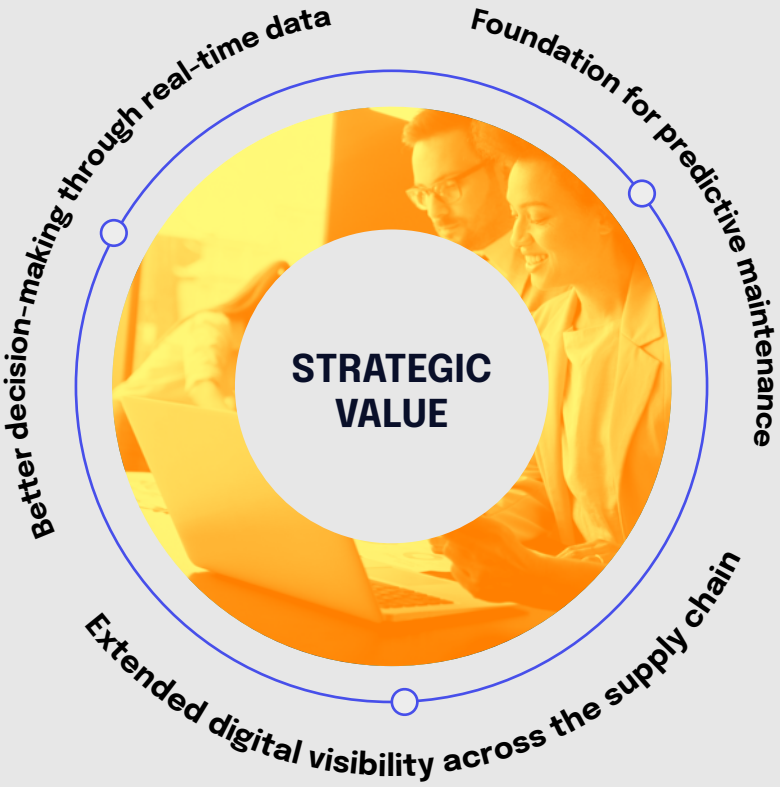
One device

Unified ID

Faster pilots and easier scaling

This approach is particularly effective for asset tracking use cases where simplicity and speed are critical.

7. Business Impact



8. Conclusions

RFID remains the most efficient and scalable technology for large-scale asset identification. Bluetooth Low Energy adds the missing layer of awareness–extending asset tracking beyond fixed infrastructure and enriching identification data with real-time context.

Combined in a hybrid approach, RFID and BLE allow organizations to move beyond isolated checkpoints and achieve continuous asset intelligence across facilities, transport flows, and operational environments.

Leveraging Beontag's RFID, BLE, and hybrid tag portfolio, organizations can select the solution that best fits their operational reality today, while remaining flexible for future expansion.

The result is a future-ready asset tracking strategy, built on reliable identification, extended coverage, and actionable insight.

Download the BLE + RFID implementation guide and learn how to extend existing RFID structures with BLE and understand how hybrid architectures work in practice.