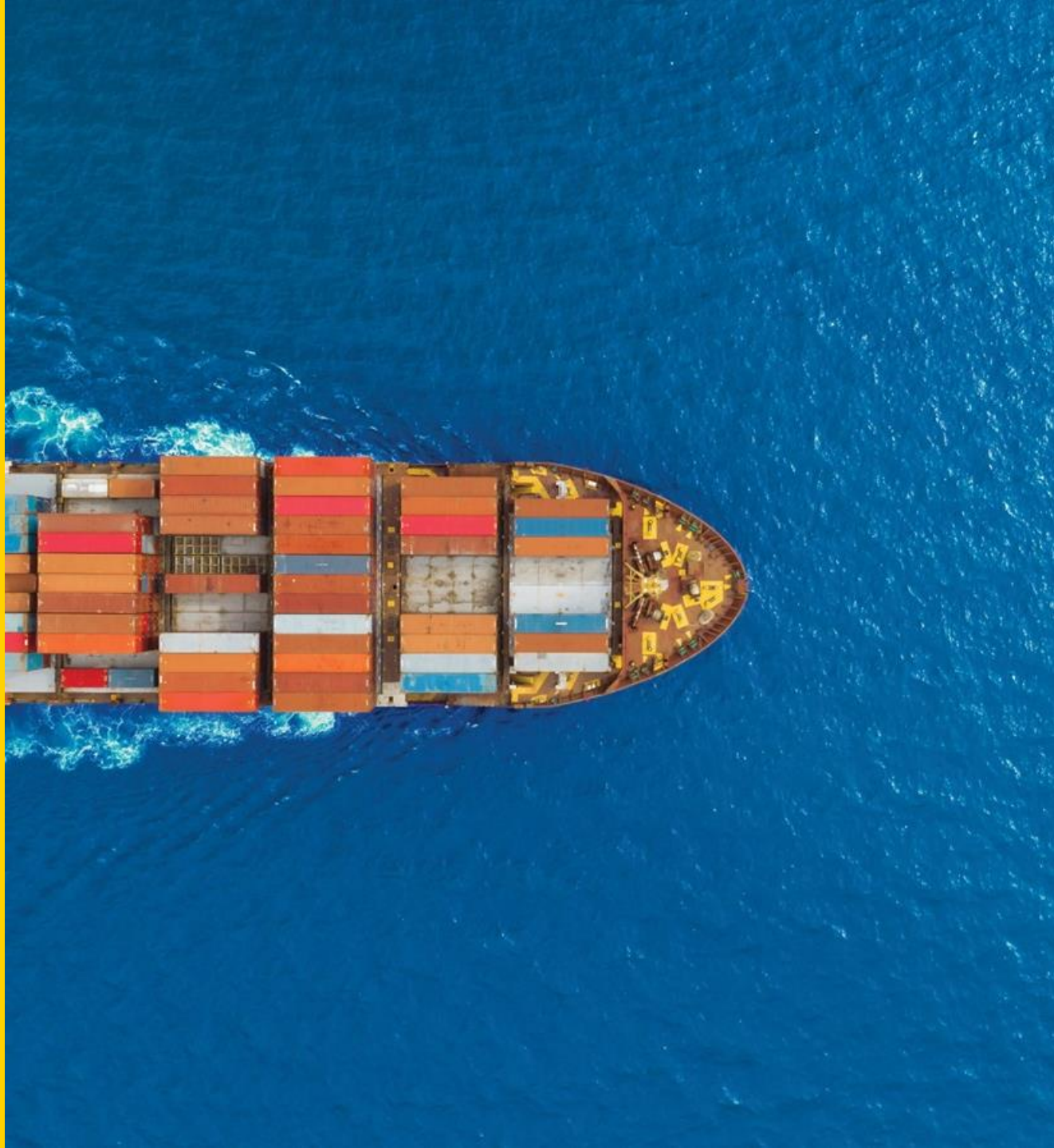




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Page EEPROM for asset tracking

About asset tracking

Monitoring and managing physical assets

Outdoor real-time monitoring		Containers 	Fleet management 	Livestock monitoring 	Tractors 	Mobility sharing 
Indoor localization & Warehouse logistics		RTLS* 	Mobile assets 	Pallets 	Smart parcels 	Employee Safety 
Goods guarantee		Cold chain 	Food tracing 	Medical 		
Disposable		Letters 	Packages 	Parcels 		

*RTLS = Real-Time Localization System

Monitoring an asset

The purpose of asset tracking is to provide **real-time visibility** into the **location** and the **status** of assets



Localization

&



Condition



Benefits

Optimize asset utilization

Enhance customer service

Reduce cost



How to track an asset



GPS tracking system

- + Real-time monitoring
- Signal interference
- Investment



Barcode scanner

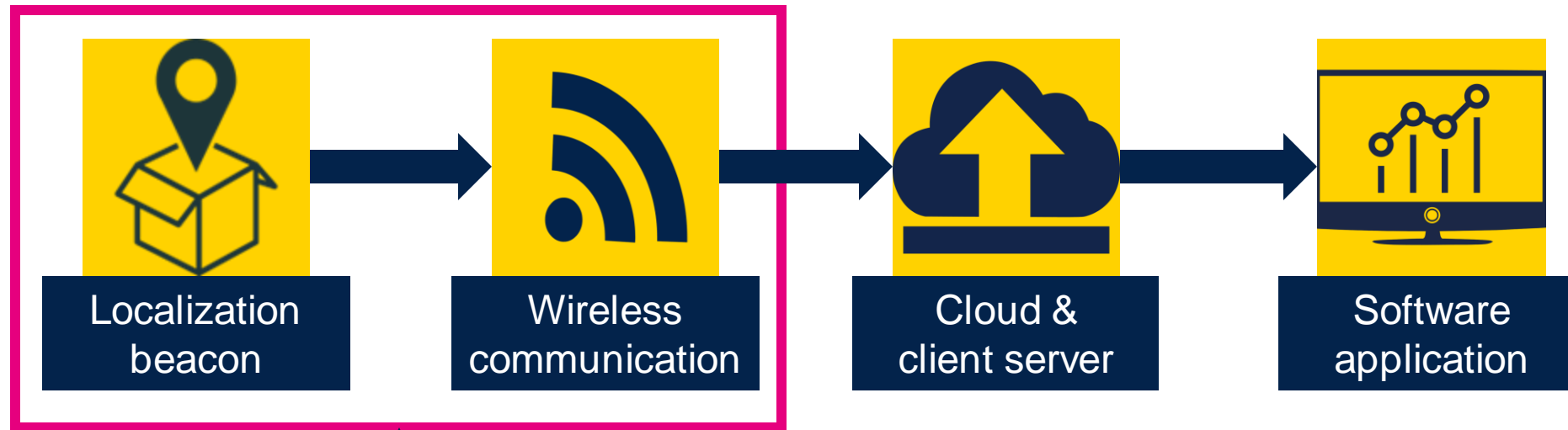
- + Cost-effective
- Errors if damaged
- Line-of-sight to the barcode



RFID

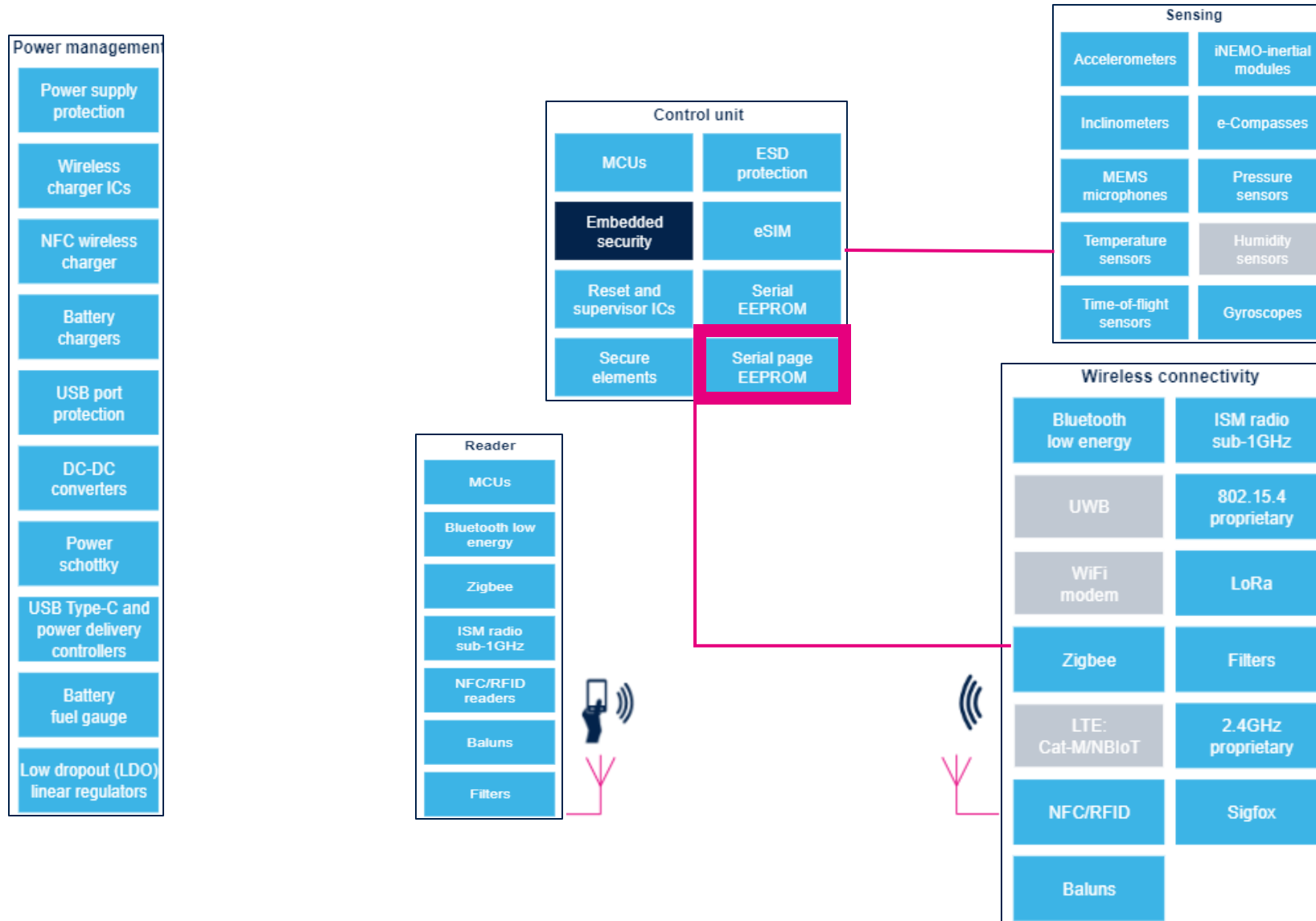
- + Non-line-of-sight environments
- Interference from other RFID tags
- Investment

Asset tracking - process




Page EEPROM can bring benefits

Asset tracking - block diagram



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Wireless connectivity	
Bluetooth low energy	ISM radio sub-1GHz
UWB	802.15.4 proprietary
WiFi modem	LoRa
Zigbee	Filters
LTE: Cat-M/NB IoT	2.4GHz proprietary
NFC/RFID	Sigfox
Baluns	

- MCU needs to manage many standard
 - BLE
 - LoRa
 - Zigbee
 - NFC
 - Sigfox
 - ...
- 
- Need high memory size

Firmware can be stored in a Page EEPROM

- **320 Mbit/s** for downloading the firmware in the MCU
- **2.5 s** for updating (erase + program) 8 Mbit of firmware
- **ECC** for high code reliability

Page EEPROM for asset tracking

Sensing	
Accelerometers	iNEMO-inertial modules
Inclinometers	e-Compasses
MEMS microphones	Pressure sensors
Temperature sensors	Humidity sensors
Time-of-flight sensors	Gyroscopes

- Lot of sensing to get the asset status
 - Localization
 - Temperature
 - Humidity
 - Speed
 - ...



Need datalogging



Serial Flash limitation*



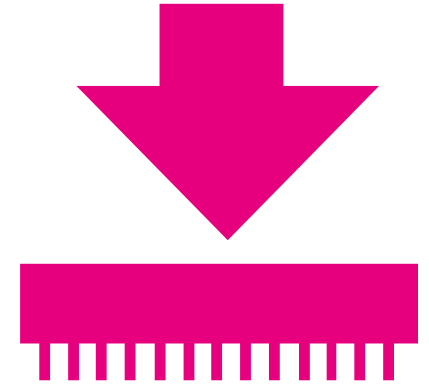
Datalogging with Page EEPROM

- Write (auto erase + prog) with **byte access level**
- **2 ms** to write 512 bytes
- Endurance **500k cycles/page** (x5 vs. Flash)**
- **Current** peak control **below 3 mA** to conserve battery life

Page EEPROM for asset tracking

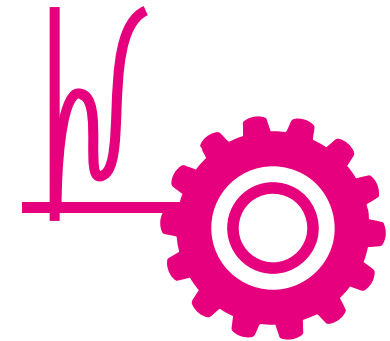
Benefits for firmware management

- MCU manages more wireless protocol
- MCU can have a firmware back-up in the Page EEPROM
- Downtime reduced with Page EEPROM high speed performances



Benefits for asset status monitoring

- Simplifying firmware with no need to emulate EEPROM
- High monitoring rate (x5) compared to a Serial Flash
- Ultra low power datalogging to increase battery lifetime



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