LoRaWAN® MODULE FOR

Not to be shared without prior consent by the LoRa Alliance®
Agenda

• Embit, Who We Are
• IoT Everywhere
• IoT Everywhere Next Step: Massive Integration
• Massive IoT
• Develop your own LoRaWAN® IoMe solution
  ● First Prototype
  ● Design your LoRaWAN Solution
• Conclusion
• Q&A session!
Embit, Who We Are

- Embit was born in Modena (Italy) in 2004
- Development of innovative ideas and Wireless Solutions
- Embedded Wireless Module
- Strong RF Know-How
- Microchip Partner
- LoRa Alliance™ Member since 2016
IoT Everywhere

Everything surround us will be smart and connected!

The Fridge will remember us to buy the dinner

Our Plants will suggest us the best moment to water them

Lights will know when staying On or Off

Creating Valuable IoT Connections | lora-alliance.org
IoT Everywhere Next Step: Massive Integration

• IoT is going to be part of our lives
• IoT is going to be part of us!
• Massive Integration: from Internet of Things bringing people into Internet of Me
IoT Everywhere Next Step: Massive Integration

- Massive Integration: **Internet of Me**[1]
- **People**-centered
- Changing **life**-style
- Improvement of the **Quality-of-Life** (QoL)
- Wearable Devices
  - Wrist-Fitness Tracker
  - Health-Care Monitoring
  - Wellness and Fashion

---

[1]: article-information
IoT Everywhere Next Step: Massive Integration

- Wearable IoT devices’ technical challenges:
  - Small form factor, size matters!
  - Wireless Connectivity
  - Low power
  - Security
Massive IoT: Small Form Factor

- **Embit’s purpose is to create the smallest LoRaWAN® module on the market**
- **Size today**: 11.5x11.5 mm, smaller than 1 cent
- Minimize size and routing while improving connectivity: U.FL
- Antenna tuning at 50 Ω
- 17 digital I/O

EMB-LR1276S
**Massive IoT: Wireless Connectivity**

- **The smallest LoRaWAN® module!**
- Full LoRaWAN Class A and Class C end-device protocols
- Full compatibility with TTI secure system
- Interoperability tested with:
  - A2A Smart City
  - Loriot
  - LoRaServer
  - The Things Network
Massive IoT: Low-power

• The smallest LoRaWAN® module!
• LDO supplier mode or switching mode to save power
• Extreme low power mode: 1 μA
Massive IoT: Security

- The smallest LoRaWAN® module!
- Crypto Unit to protect communication (ATECC608A)
- The secure element can contain a secure identity, root keys compatible with LoRaWAN 1.0.x and 1.1
- Possibility to use open-software crypto, libraries integrated
- Authentication
- Provisioning

Creating Valuable IoT Connections | lora-alliance.org
Massive IoT with EMB-LR1276S: Use Case
Massive IoT with EMB-LR1276S: Use Case

To be shared without prior consent by the LoRa Alliance®

Creating Valuable IoT Connections | lora-alliance.org
Massive IoT with EMB-LR1276S: Use Case
Massive IoT with EMB-LR1276S: Use Case
Develop your own LoRaWAN® IoMe solution

- EMB-LR1276S is small, LoRaWAN® ready, low-power and secure and can be adopted for a plethora of solutions.

- It reduces drastically time-to-market in IoMe projects: where small size is a requirement

- It is reliable for applications directly involving the person

- Creating a wide area network of micro LoRaWAN nodes, people-centered and life-style-changing
Develop your own LoRaWAN® IoMe solution

• Create a prototype using EMB-LR1276S
  • Dev Board 1276S
  • Nano LoRa Click
• Design your LoRaWAN® IoMe Node
  • Speed-up your RF design
  • Software Integration
First Prototype: EMB-LR1276S Dev Board

- External Vin
- External Battery
- User Button
- Reset Button
- Programming Connector
- Light and Temperature sensors
- Antenna Connector
- LED
- Power Jumpers
- Micro USB B connectors
- USB Bus
- Sercom Busses
First Prototype: Nano Click

- Nano Click Board in collaboration with Mikroe
- Board compatible with mikroBUS™
- MikroBUS™ supplies LoRaWAN® board and enables data exchange through UART
- Host sends EBI commands to Nano Click to make it join the LoRaWAN network for sending and receiving data
- Sensors can be plugged-in seamlessly
Design your LoRaWAN® IoMe Solution

Optional MCU or Host Board

32-pin SMD connector (USB, UART, I2C, SPI, GPIO, ADC, SWD,...)

SAM R34

RF Matching and LP Filter

Crypto

EMB-LR1276S

32-pin SMD connector (USB, UART, I2C, SPI, GPIO, ADC, SWD,...)

Sensors

Battery

RF Antenna

U.FL Connector or SMD Pads

LoRaWAN® NODE
Design your LoRaWAN® IoMe Solution

RF PROBLEMS!

RF Antenna
U.FL Connector or SMD Pads

32-pin SMD connector (USB, UART, I2C, SPI, GPIO, ADC, SWD,...)

SAM R34
RF Matching and LP Filter

Crypto

32-pin SMD connector (USB, UART, I2C, SPI, GPIO, ADC, SWD,...)

Sensors

Optional MCU or Host Board

Battery

LoRaWAN® NODE
Speed-Up your RF Design

- Antenna size: Integrated Antenna or External Antenna
- Integrated Antenna available through Coplanar Waveguide with Lower Ground Plane (CPWG) design
- Integrated Antenna: PCB Antenna
  - Cheap, but
  - It needs ground plane
- Integrated Antenna: Chip Antenna
  - Small Size
  - Customizable, but
  - Easily to be detuned

LoRa Alliance®
Speed-Up your RF Design

• Optional External Antenna Connection: 50 Ω single-ended U.FL connector

• Electro-Magnetic modelling
  • Challenge for small devices: Enclosure and Tuning

• Antenna Fabrication and Characterization
Software Integration

- Microchip SAMR34 System-In-Package
- Microchip LoRaWAN® Software Stack
- Integrated MCU + sub-GHz radio
- 256 KB Flash and 32 KB RAM
Software Integration

- Libraries to deal with LoRaWAN® functionality
- Implementing software state machines to manage all LoRaWAN chain, to send Join Packet, to send Data etc.
- USB, UART, I2C, SPI, ADC interfaces to connect your sensors
- Uploading sensors' driver in your code to fetch data
- Save space and energy embedding your application directly inside the module
- Atmel Studio 7 IDE
- Or use commands to control the transceiver (EBI Commands) with another MCU
To sum up...

- Find your IoMe use cases
- Choose the right sensor
- Make a prototype
- Layout and Antenna Design
- Software Integration
- Your LoRaWAN® IoMe Solution is ready!
Conclusion

• IoT Everywhere > The Internet of Me\textsuperscript{[1]}

• LoRaWAN® Network penetration

• Massive Integration > small form factor devices/ specific tech challenges

• Develop your micro IoMe LoRaWAN Solution according to your use case
References

