



DATASHEET

Wirnet iBTS

Preliminary



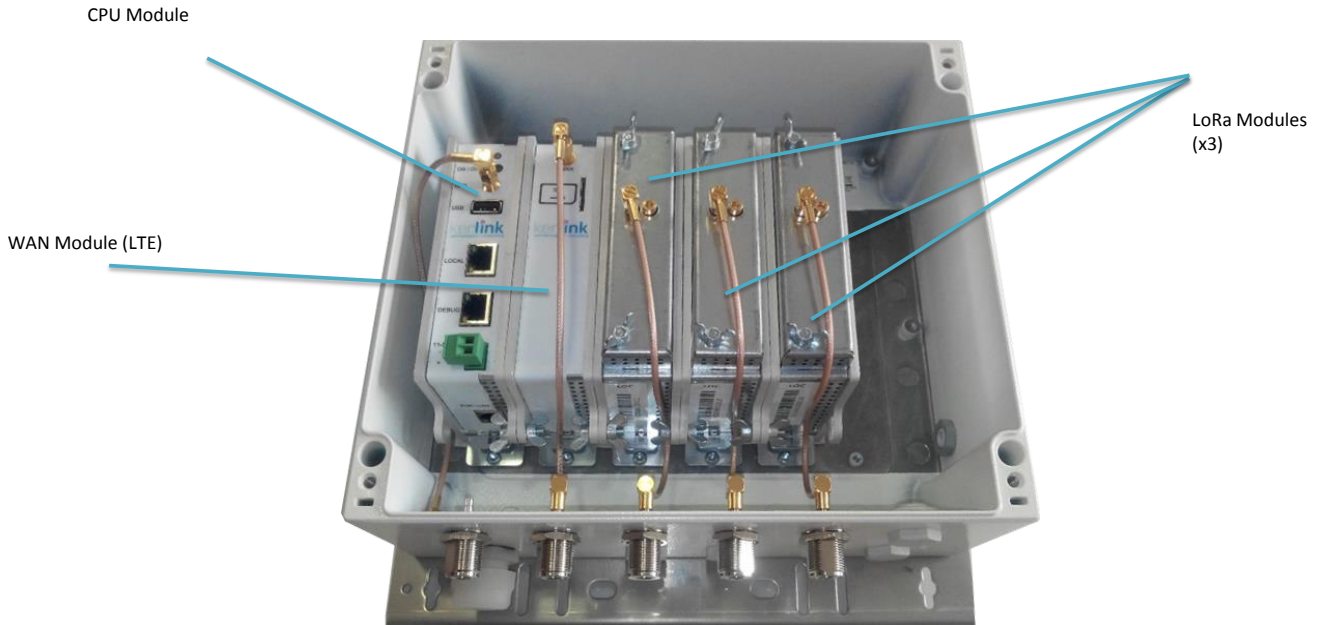
LoRa gateway for IoT chain

- Unlicensed band Long Range(Lora™) bidirectional communications capabilities
- One LoRa RF module (16 channels) extendable to four LoRa RF modules (64 channels)
 - Supported bands : 863-873MHz, 902-928MHz, 915-928MHz
- Configurable for single omnidirectional antenna, spatial diversity, dual polarization, tri-sectorization
 - LoRa geolocalization combining RSSI and Time Difference of Arrival (TDOA)
- Backhaul connectivity over GPRS/EDGE/HSPA/LTE(Europe/APAC or Americas bands) or Ethernet
 - Highly secured device relying on an hardware secure core
 - Carrier grade or compact casing

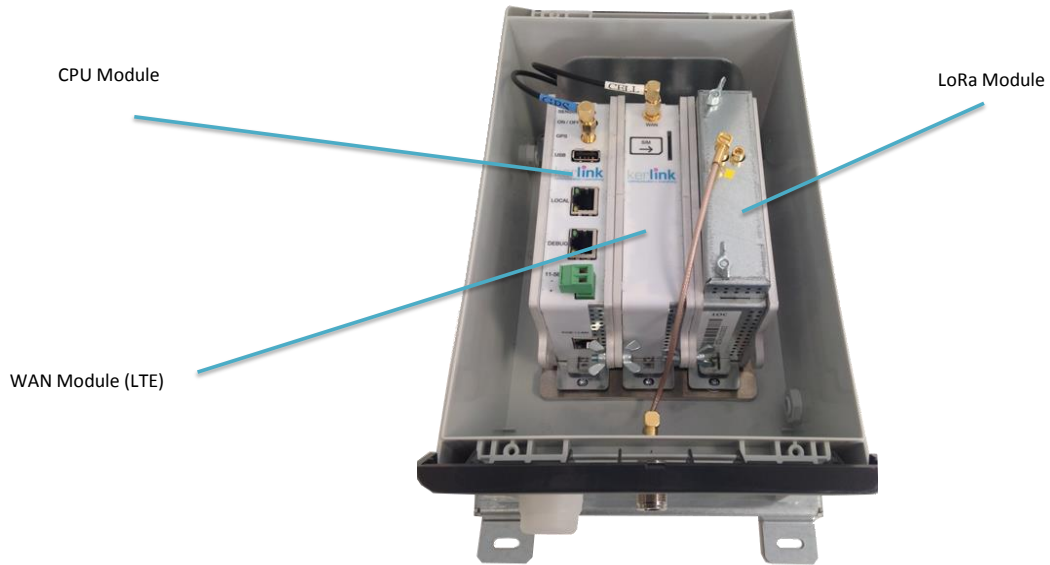
1. Hardware Key Features

1.2 Hardware modularity

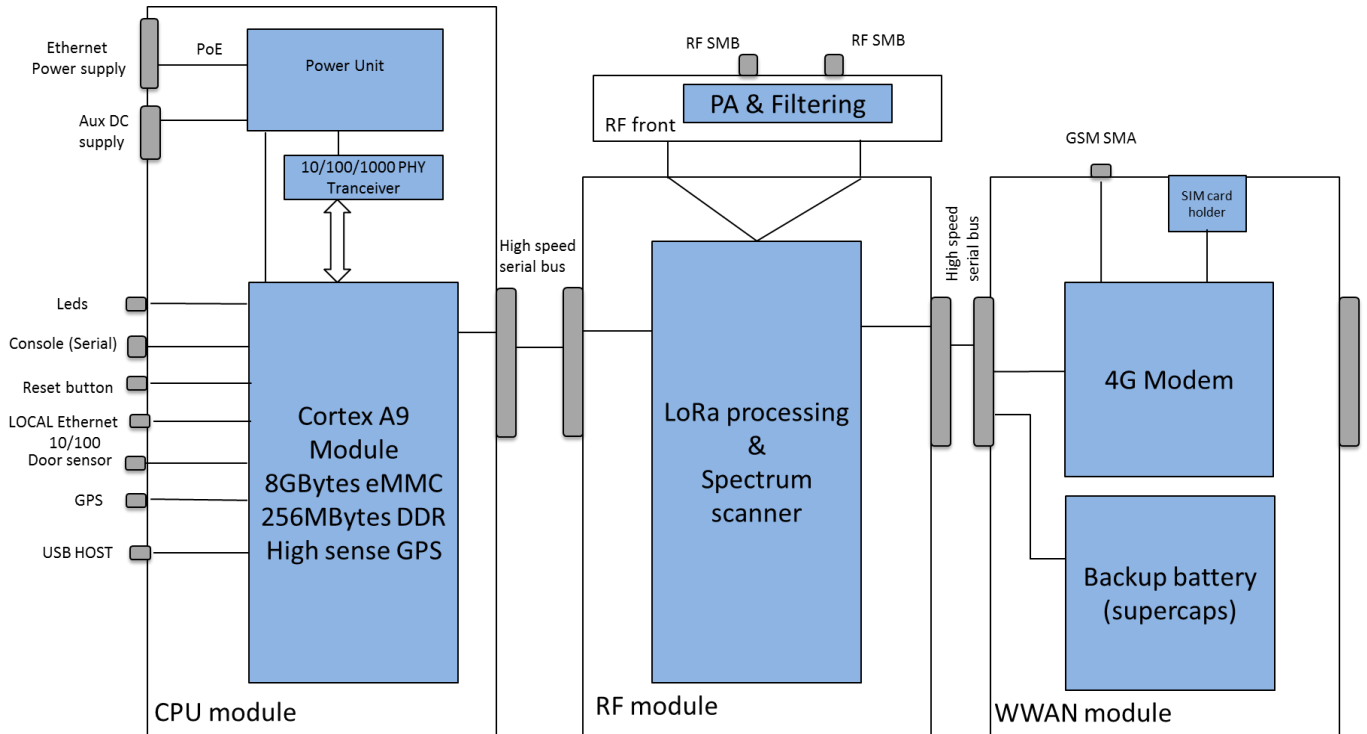
Standard Casing



Compact Casing



1.2 Hardware block diagram



1.2 CPU module

1.2.1 System

- CPU:**
- Based on ARM cortex A9 core processor (Up to 800 MHz)
 - Real-time clock saved by battery
 - Hardware watchdog
 - Optimised power consumption management
 - Embedded hardware secure core

- Volatile memory:**
- DDRAM 256 MB

- Non-volatile memory:**
- 8 GB eMMC

1.2.2 User interfaces

Internal LEDs:

- Operational status : power, software activity

USB host interface allowing :

- Local secured software upgrade with simple USB key

Web local interface allowing :

- Configuration
- Diagnostic
- Maintenance

Internal push buttons :

- Manual station power on/off
-

1.2.3 Communication

Backaul Ethernet :

- PowerOverEthernet IEEE 802.3af /at
10/100/1000 Base T compliant

Local Ethernet interface :

- Used during installation and maintenance operations
 - IEEE 802.3 10/100 Base T compliant
-

1.2.4 Positionning/Timing

GPS :

- Integrated high sensitivity GNSS module
 - GPS L1C/A, GLONASS L1OF, BeiDou B1, QZSS L1C/A, SBAS L1C/A and Galileo E1B/C-ready
 - Time pulse accuracy < 20ns
 - NMEA 0183, version 4.0
 - External GNSS active antenna with 5m coaxial cable (integrated antenna for compact version)
-

1.2.5 Sensors

- Embedded temperature sensor
 - Door opening detection system
 - Pressure sensor
-

1.2.6 Power

- PowerOverEthernet supply : 48V class 4
 - 30W PoE required compact casing version
 - 60W PoE required standard casing version
 - DC power supply (ex : solar panel use) : 11 to 56V DC
 - Power control : ignition detection, software OFF switching, ON/OFF button
-

1.3 LoRa modules

LongRange modem :

- SDR evolutive architecture including two dual core SoC DSP and ARM processor per LoRa RF modem
- One LoRa RF modem extendable to three LoRa RF modems with standard casing
- Incorporate LoRa (TM) bidirectional communications technology
- Modular "LoRa RF Modem" architecture :
 - 96 LoRa demodulators over 16 channels per LoRa RF Module (1x16 or 2x8 channels)
 - Extend the channels number adding modules :
 - 1 LoRa RF Module : 1x16 or 2x8 channels (single or spatial diversity or dual polarization)
 - 2 LoRa RF Modules : 2x16 channels or 2x2x8 channels (spatial diversity and/or dual polarization)
 - 3 LoRa RF Modules : 3x16 channels or 3x2x8 channels (tri-sectorization w/ or w/o dual polarization)
 - 4 LoRa RF Modules block (915 and 923 versions) : 1x64 or 2x32 channels (single or spatial diversity or dual polarization)
- More than 15km range in sub-urban situation
- More than 2km range in urban situation

Geolocalization :

- Outdoor and indoor environments
 - Synchronization with GPS
 - Combines RSSI and TDOA measurements
 - Accuracy < 100m (70% confidence, high density coverage)
-

1.3.1 868 MHz module version

Capabilities:

- LoRa channels : 1x16 or 2x8 channels (single or spatial diversity or dual polarization)
- RX range: 863- 873MHz,
- TX range : 863-873MHz
- Sensitivity : up to -141 dBm
- Tx conducted power from 0dBm to +30dBm

1.3.2 923 MHz module version

Capabilities:

- LoRa channels : 1x16 or 2x8 channels (single or spatial diversity or dual polarization)
- RX range: 915- 928MHz,
- TX range : 920-928MHz
- Sensitivity : up to -141 dBm
- Tx conducted power from 0dBm to +30dBm

1.3.3 915 MHz module version

Capabilities:

- LoRa channels : 1x16 or 2x8 channels (single or spatial diversity or dual polarization), FCC Hybrid Mode
- RX range: 902- 928MHz,
- TX range : 902-928MHz
- Sensitivity : up to -141 dBm
- Tx conducted power from 0dBm to +30dBm

1.3.3 Four modules block 915 MHz version

Capabilities:

- 4 LoRa RF modules : 1x64 or 2x32 channels (single or spatial diversity or dual polarization)
- RX range: 902- 928MHz,
- TX range : 902-928MHz
- Sensitivity : up to -141 dBm
- Tx conducted power from 0dBm to +30dBm

1.3.3 Four modules block 923 MHz version

Capabilities:

- 4 LoRa RF modules : 1x64 or 2x32 channels (single or spatial diversity or dual polarization)
- RX range: 915- 928MHz,
- TX range : 920-928MHz
- Sensitivity : up to -141 dBm
- Tx conducted power from 0dBm to +30dBm

1.4 WWAN module

1.4.1 Europe/APAC bands

- PCI Express Mini Card modem
- LTE (800/900/1800/2100/2600) : cat3, DL up to 100Mbps, UL up to 50Mbps
- HSPA/UMTS (850/900/1900/2100MHz) : DL up to 42Mbps (cat 24) , UL up to 5,76Mbps (cat 6)
- EDGE (850/900/1800/1900MHz) : UL/DL up to 236.8Kbps
- GPRS (850/900/1800/1900MHz) : UL/DL up to 85.6Kbps
- IMEI inside
- External LTE (700-2700MHz) antenna with 5m coaxial cable (integrated antenna for compact version)
- Back-up battery : up to about 1 minute allowing safe powerdown of the product

1.4.1 Americas bands

- PCI Express Mini Card modem
- LTE (700/850/1700/1900/2100) : cat3, DL up to 100Mbps, UL up to 50Mbps
- CDMA (800/1900) : up to 3.1Mbps
- HSPA/UMTS (850/900/1700/1900/2100MHz) : DL up to 42Mbps (cat 24) , UL up to 5,76Mbps (cat 6)
- EDGE (850/900/1800/1900MHz) : UL/DL up to 236.8Kbps
- GPRS (850/900/1800/1900MHz) : UL/DL up to 85.6Kbps
- IMEI inside
- External LTE (700-2700MHz) antenna with 5m coaxial cable (integrated antenna for compact version)
- Back-up battery : up to about 1 minute allowing safe powerdown of the product

2. Mechanical

2.1 Standard casing

- Aluminium enclosure
- Dimensions : 295 x 317 x 125 mm (including mounting kit)
- Weight :
 - with one LoRa RF modem : about 6,2Kg (including mounting kit)
 - with three LoRa RF modems: about 7,2Kg (including mounting kit)
- Connectors :
 - One PoE cable gland
 - RF connectors : one for GPS (GNSS), one for WWAN (LTE/HSPA/GSM) - N type
 - LoRa RF connectors : from one up to six, depending on the configuration - N type
 - Three spares

External connectors:**2.2 Compact casing**

- Polycarbonate enclosure
- Dimensions : 357 x 189 x 150 mm (including mounting kit)
- Weight : about 3Kg (including mounting kit)
- Connectors :
 - One PoE cable gland
 - LoRa RF connectors : one (single antenna configuration) or two (diversity configuration) - N type

External connectors:**2.3 Mounting**

The provided mounting kit allows three different mounting options :

- Wall mounting by screwing
- Pole mounting by U-bolt (max diameter : 76mm for standard version and 60mm for compact version)
- Metallic strapping mounting (tube, pipe, flue...)

Specific mounting kits are provided with antennas :

- LoRa antenna bracket (wall mount, pole mount, metallic strapping)
- GNSS and WWAN antenna bracket for standard casing (wall mount, pole mount with U-bolt, metallic strapping)

2.4 Environmental

- Full operating range : -20°C to +55°C
- Humidity : 95%, non condensing (protective vent)
- Ingress protection : IP66
- Impact resistance : IK08
- UV resistance : UL508
- Flammability rating : UL94-V0

3. Software key features

3.1 Operating system

- Based on Yocto/Poky 2.1
- Standard Long Term Support Linux version 3.14
- File system : EXT4, Squashfs
- Support of all GNU/Linux tools (cross-compiled for ARM)
- TCP/IP BSD4.4 socket on network bearer

3.2 Software packages included (non-exhaustive)

- | | |
|--|--|
| <ul style="list-style-type: none"> • Embedded Base Station Controller (BSC) • LoRa packet Forwarder • LoRa test tools • Python • Busybox • Ntp | Networking : <ul style="list-style-type: none"> • DHCP client • SSH server • Firewalling (iptables) and IP routing (layer 3) • OpenVPN • IPSEC (Strongswan) • Connman |
|--|--|

3.2 Software security

- Secure boot (software authentication and integrity control) relying on an hardware secure core
- Critical information storage (private keys, certificates...) inside an hardware secure core
- Critical software execution protection (encryption, decryption,) relying on a Trust zone embedded inside an hardware secure core
- Firewall
- Read Only file system preventing unexpected file system corruption
- Software auto-recovery mechanism to protect against software update failure
- Secured firmware upgrade (usb key or over the air)

3.3 BSC services

BSC (Base Station Controller) interfaces are relying on standard SNMP (v2c) protocol and provide the following services :

- Alarm notifications
- Firmware upgrade
- File transfer
- Remote shell control
- Configuration
- Monitoring (platform statistics, RF statistics, RF spectrum analyzer...)

The BSC interface is securized through an SSL tunnel (openVPN)

3.4 Software development tools

- C/C++ Linux cross compilation toolchain based on GNU tools (GCC 5.3.0, Glibc 2.23)
- On-line wiki

Optional

- Debug probe

4. Certifications (according to Radio module frequency)

- R&TTE 1999/5/EC Directive until June 15th 2016 and the RED 2014/53/EU directive from June 16th 2016
- Electromagnetic compatibility (article 3.1-b of the directive)

EN 301 489-1	issue 1.9.2
EN 301 489-3	issue 1.4.1
EN 301 489-7	issue 1.3.1
EN 301 489-19	issue 1.2.1

- Efficient use of the radio frequency spectrum (article 3.2 of the directive)

EN 301 511	issue 9.0.2
EN 301 908	issue 6.2.1
EN 300 440-1	issue 1.5.1
EN 300 440-2	issue 1.3.1
EN 300 220-1	issue 2.4.1
EN 300 220-2	issue 2.4.1

Category 2 receiver according to the EN 300 220-1

- Safety (article 3.1-a of the directive)

EN/IEC 60 950-1	(ed. 2006 /A11: 2009/A1: 2010/A12:2011)
EN/IEC 60 950-22	
CENELEC EN 60 950-1	(Ed. 2006/A11 : 2009/A1 : 2010/A12:2011)
AS/NZS 60950.1	: 2003

- Magnetic field exposure
 - EN 50385 (ed. 2002)
 - EN 62479 (ed. 2010)

- Radio / FCC :
 - CFR 47 FCC Part 15 :
 - FCC 47 CFR Part 15 : 2014 - Part 15- Radio frequency devices
 - FCC PART 15.247 - Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz. (frequency hopping and digitally modulated)
 - FCC Part 15.207 conducted emissions on AC mains in the band 150kHz – 30MHz
 - FCC Part 15.247 intentional radiated emissions
 - FCC Part 15.215 Additional provisions to the general radiated emissions limitations

 - RSS 247 :
 - RSS-Gen – Issue 4, November 2014- General requirements and Information for the Certification of radio Apparatus
 - RSS-247 Issue 1, May 2015 - Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and Licence-Exempt Local Area Network (LE-LAN) Devices
- AS/NZS 4268 2012 + A1 : 2013 : Radio equipment and systems – Short range devices – Limits and methods of measurement
- ARIB STD-T108 - 920MHz-Band Telemeter, Telecontrol and Data Transmission Radio Equipment
- Clause 2, Article 58-2 of Radio Waves Act (Republic of Korea)
- IDA Technical Specifications for Short Range Devices (IDA TS SRD) – Issue 1 Rev 7, April 2013

5. Optional accessories

- **Antennas** : various LoRa antennas can be proposed to adapt to environment and the gateway configurations :
 - Omnidirectionnal, 868MHz 3dBi
 - Omnidirectionnal, 915MHz 3dBi
 - Omnidirectionnal, 915MHz 6dBi
- **Antennas mounting kit**
- **Surge Protection** : RF coaxial and indoor or outdoor PoE protections
- **PoE injector** (indoor or outdoor) : 30W/60W depending on the gateway casing (compact/standard)

6. Contacts : For more information please contact:



1 Rue Jacqueline Auriol
35235 THORIGNÉ-FOUILLARD

Tel : +33 2 99 12 29 00

E-mail : contact@kerlink.com

Web : www.kerlink.com