

EASIER SMART METERING, SMART STREET LIGHTING, SMART CITY & IoT APPLICATIONS

Tinymesh

THE INTELLIGENT WIRELESS INFRASTRUCTURE

Roll out new products and services quickly

In a world where the Internet-of-Things is already part of everyday life, and the Internet-of-Everything is the next step, Tinymesh™ offers a complete infrastructure specifically designed to make it easy and uncomplicated for all kinds of companies to create new business models or revenue generating / cost-saving products and services or that can be rolled out quickly and cost effectively.

Complete with everything you need

Tinymesh™ is uncomplicated and gives you, out-of-the-box, everything you need to set up and manage robust and reliable wireless device networks with secure two-way communication for remote monitoring, data collection and control. Uses include:

- Smart Metering
- Smart Street Lighting
- Smart City Applications
- Smart Neighborhood Applications
- Smart Building Applications
- Internet-of-Things Applications
- Industrial M2M Applications
- All kinds of wireless sensor networks and many other applications

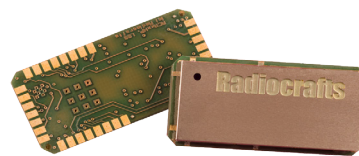
Reduce development time and costs

You build your Tinymesh™ Device Networks using Tinymesh™ RF transceiver modules. You simply incorporate one module in each device you want to control in your network. Each module is very sophisticated and contains a fully embedded Tinymesh™ multi-hop protocol stack that enables your Device Networks to be automatically self-forming and self-healing for problem free operation and maintenance. In addition the modules are made to facilitate easy connection to, and communication with sensors or your devices in a wide variety of ways - out-of-the-box!

Operate worldwide in any license free RF band

Tinymesh™ RF transceiver modules are manufactured and distributed world-wide by Radiocrafts of Norway. The modules are completely shielded and pre-certified for operation worldwide in license free bands. Radiocrafts test the modules 100% before shipping to customers. The benefits are:

- Little or no variance on delivered product
- Avoidance of yield problems and costs
- Regulatory compliance for every module
- No extensive testing needed at later stage
- Only functional tests need to be done to ensure your application is working properly



Small size:
Tinymesh™ Modules measure
only 12.7 x 25.4 x 3.3 mm

Designed for maximum flexibility

Each Tinymesh™ Module is user-configurable for Gateway, Router or low-power End Node operation.

GPRS access points, readily available as an integrated unit with a slot-in card and Tinymesh™ Module in Gateway mode, facilitate easy connection over the Internet between your Tinymesh™ Device Network and your API / Tinymesh™ Cloud Services.

Cloud Based Services included

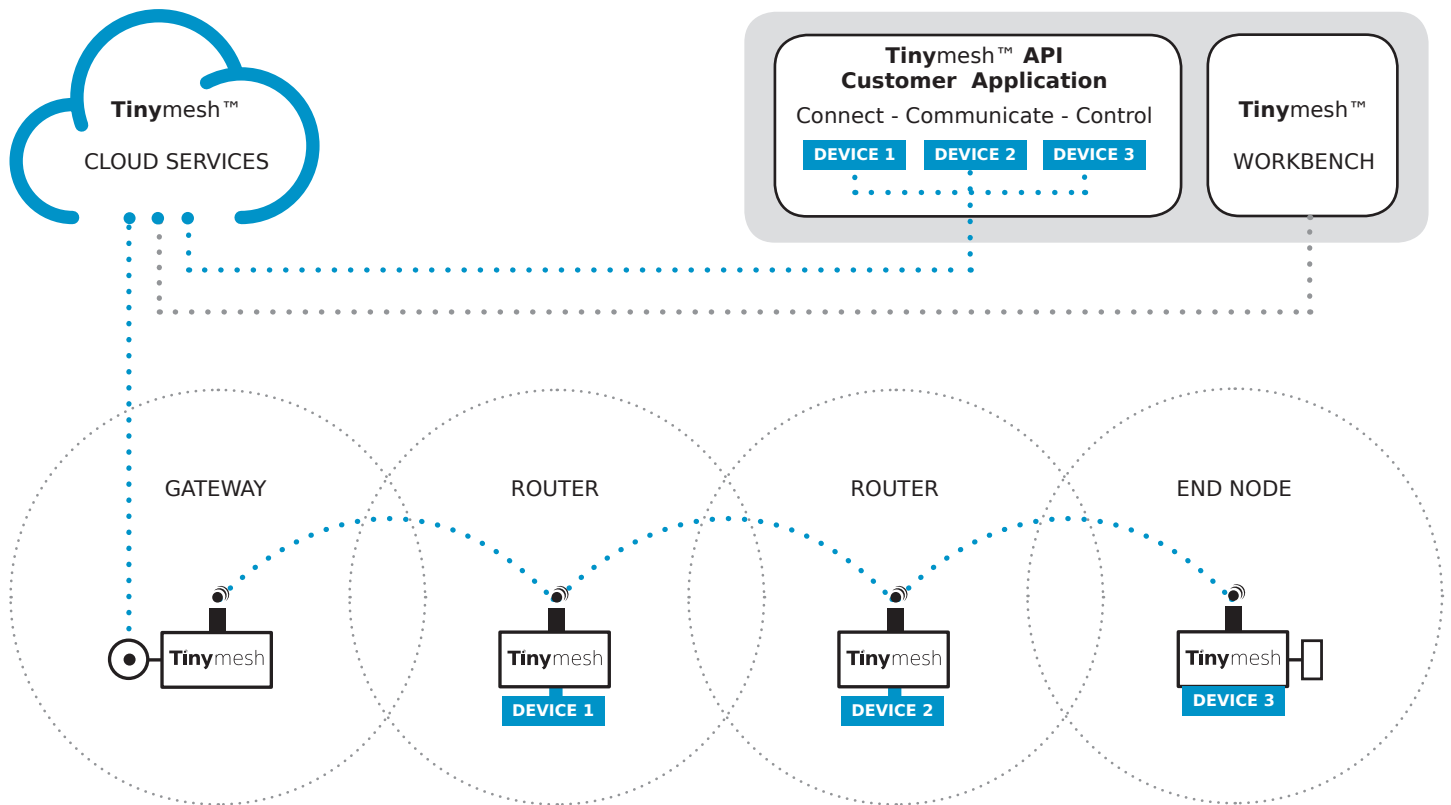
Your Tinymesh™ Device Networks are supported by Tinymesh™ Cloud Services, a suite of Internet tools that make it easy to integrate your Tinymesh™ Networks with your applications. Tinymesh™ Cloud Services let you manage all your Tinymesh™ Networks in one place with one common interface. Tinymesh™ Cloud Services provide a REST API for interfacing to your applications; a versatile Workbench for remote configuration and network support; End-to-End encrypted data transport; over-the-air Tinymesh™ firmware upgrades; and a multi-tenant database for Big Data storage.

The World's Most Complete & Flexible Solution

Easier Smart Metering, Smart Street Lighting, Smart City & IoT Applications

Out in the field, Tinymesh™ makes it easy and uncomplicated for you to connect to all your devices using Tinymesh™ Modules that do not need additional micro-controllers. Back in your office or control center Tinymesh™ makes it easy and uncomplicated for you to connect your business application to all your devices deployed out in the field so you can monitor them, control them and harvest data

from them by using Tinymesh™ Cloud Services. Tinymesh™ makes it easy and uncomplicated for you and all your devices to communicate using the built-in powerful multi-hop wireless mesh network capabilities of the Tinymesh™ Protocol Stack that is embedded in every Tinymesh™ Module and is designed to operate anywhere in the world using license-free ISM bands.



Each Tinymesh™ Device Network can control just a few or several thousand devices with multiple gateway support, indoors or outdoors.

Tinymesh™ Cloud Services

Manage all your Tinymesh™ Devices & Networks in one place with one common interface.

Tinymesh™ API

Connects your business application to your Tinymesh™ Devices & Networks.

Tinymesh™ Workbench

For development, testing, configuration and support of your Tinymesh™ Devices & Networks.

Tinymesh™ Device Networks

Self-forming and self-healing multi-hop device networks built with Tinymesh™ RF Transceiver Modules.

Multi-hop Mesh Protocol Stack and much more

Each Tinymesh™ Module's firmware includes the Tinymesh™ multi-hop protocol stack embedded. This is a full-function, secure and robust multi-hop wireless mesh protocol stack, for remote data collection and two-way control. It also includes features that eliminate the need for an additional micro-controller. With Tinymesh™ you get:

- Bi-directional wireless communication
- Self-forming and self-healing
- Flexible input/output control
- Analog, digital, PWM, pulse counter and serial ports
- Individual, Group or Broadcast addressing
- Transparent serial or packet mode communication
- AES 128 encryption
- Configurable sleep mode and End Device operation

Ultra Narrow Band option for extra power

Open up the full potential of your Device Networks by using powerful Tinymesh™ Ultra Narrow Band Modules, just one of many options available in the complete range of Modules (see last page).

Designed for the shortest in-design time

Required electrical connections are reduced to a minimum for easiest in-design and shortest time to market. For the minimum configuration all you need are:

1. VCC and GND
2. Single-pin antenna interface

A Tinymesh™ demo kit with USB connectivity and PC Tools for configuration and communication is available for evaluation and development work. The kit provides out-of-the-box operation, enabling rapid evaluation and shortest in-design time.

Tinymesh™ RF Transceiver Modules with Powerful Standard Features

I/O features

- Configurable digital input and output and analog inputs
- Dimming control (0-100% PWM)
- Transparent Wire Replacement or packet communication
- Serial Port with bit rates to 230,400 bps, full software and hardware handshake
- Pulse counter with configurable de-bounce timing, sampling intervals, trigger hysteresis and detection feedback output
- Time generated, input level triggered and event triggered status messages
- Serial Data Streaming support with block counter function
- Locater Function for asset tracking applications
- Polled or triggered alerts
- Input and Output configurations settable through network commands

HW features

- Selectable Gateway, Router or low power End Node configuration
- Signal Strength LED and Network connection LED outputs for simplified field installation
- 256 byte serial data input buffer for MODBUS RTU compatibility
- Two-wire UART interface for easy RS 232/422/485 wire replacement
- Small size (12.7 x 25.4 x 3.3mm), shielded and optimized for SMD mounting
- No external components
- Wide supply voltage range, 2.0 - 3.9V
- Connects to existing or new hardware without external MCU or additional firmware
- Built in temperature and voltage sensors

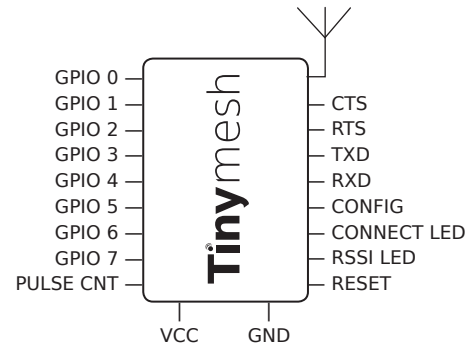
RF/Stack features

- Embedded Tinymesh™ networking protocol with bi-directional RF data transfer
- Self-forming, self-healing and self-optimizing mesh network
- AES 128 encryption
- "Walk-by" mode for low power data logging and metering applications
- Group, Broadcast or Individual addressing modes
- Clustered Node Detection and Network Congestion Avoidance (CND/NCA™)
- RF Jamming Detection and Alarm, with alarm output and network alarm messaging
- Network Busy Detection for ad hoc networks with multiple, roaming Gateway Devices

No additional micro-controller needed

Tinymesh™ enabled devices can be directly connected and controlled by the Tinymesh™ Module with no additional micro-controller or firmware needed.

Tinymesh™ Modules have built-in network configurable I/O capabilities that include analog, digital, serial port, pulse counting and dimming functions.



Cost leader with lowest Total Cost of Ownership

The Tinymesh™ Stack embedded in every Tinymesh™ Module is a set of general purpose low power RF protocols for intelligent applications that require easy installation and reliable data collection and control.

- Fully embedded
- Self-forming
- Self-healing
- Acknowledge
- Retransmission
- Out-of-the-box operation
- RF frequency selection
- Internet Cloud Support

Tinymesh™ RF modules are designed for operation in the license-free ISM bands at 169-2450 MHz's.

The compact Tinymesh™ Modules are easy to integrate and use, for shortest possible time-to-market and lowest total cost of ownership (TCO) for the end product.

Innovative technology for a greener planet

Tiny Mesh AS was awarded the prestigious "Innovator of the Year" award in 2014, and previously nominated for the Rosing Smart IT Prize awarded by The Norwegian Computer Society. In the Smart IT category the jury emphasizes work where technology is an import prerequisite for energy efficiency or optimization of energy consumption, enabling improvement of existing processes or creating new or more sustainable businesses and processes.

Focus on your core business and profitability

The powerful Tinymesh™ Device Network command structure and the versatile connection options allows Tinymesh™ users to focus on their core business, while relying on Tinymesh™ for secure and reliable connectivity in real-life environments.

Tinymesh™ - a new paradigm making it easy to connect the unconnected

Tinymesh™ products and services are designed and developed by Tiny Mesh AS of Norway. Tinymesh™ solutions are unique and designed to be complete and better and do more with less, with the end-user and the real-world always in mind. Tinymesh™ solutions are uncomplicated "out-of-the-box" solutions, with low total cost of ownership, that make it easy and uncomplicated for all kinds of companies to create new products, services and business models by making it easier than ever before to connect, communicate with and control all kinds of meters, sensors, actuators, assets, devices, tags and other things - anywhere in the world.

Tinymesh™ RF Module Selector - Quick Reference Chart

Module ▶ Parameter	LP HP UNB-HP	RC1701HP-TM	RC114x-TM RC1740HP-TM	RC1760HP-TM	RC117x-TM RC117xHP-TM	RC1180-TM RC1180HP-TM RC1780HP-TM	RC1181TM	RC119x-TM RC119xHP-TM	RC2500-TM RC2500HP-TM	Unit
Frequency	LP HP UNB-HP	169	433 - 434 424 - 447	458-468	865 - 867 865 - 867	868 - 870 868 - 870 865 - 870	865 - 927	902 - 927 902 - 927	2400 - 2483 2400 - 2483	MHz
Channels	LP HP UNB-HP	13	17 173	239	15 15	18 18 94	83	50 50	83 83	
Data Rate	LP HP UNB-HP	0.3 - 100	1.2 - 100 0.3 - 100	0.3 - 100	1.2 - 100 1.2 - 100	1.2 - 100 1.2 - 100 0.3 - 100	1.2 - 100	1.2 - 250 1.2 - 250	1.2 - 100 1.2 - 100	Kbit/s
Max TX power	LP HP UNB-HP	27	11 14 / 27	14 / 27	11 27	11 27 14 / 27	11	11 27	1 18	dBm
Sensitivity 1.2 / 100 Kbit/s	LP HP UNB-HP	-118 / -102	-110 / -97 -118 / -102	-118 / -102	-110 / -97 -109 / -96	-110 / -97 -109 / -96 -118 / -102	-110 / -97	-110 / -97 -109 / -96	-105 / -89 -108 / -91	dBm
Supply voltage	LP HP UNB-HP	2.8 - 3.6	2.0 - 3.6 2.8 - 3.6	2.8 - 3.6	2.0 - 3.6 2.7 - 3.3	2.0 - 3.6 2.7 - 3.3 2.8 - 3.6	2.0 - 3.6	2.0 - 3.6 2.7 - 3.3	2.0 - 3.6 2.0 - 3.6	Volt
RX/TX Current	LP HP UNB-HP	31 / 407	24 / 35 31 / 318+63	31/297+72	24 / 37 24 / 560	24 / 37 24 / 560 31 / 297+72	24 / 37	24 / 37 24 / 560	25 / 27 30 / 155	mA
SLEEP Current	LP HP UNB-HP	0.6	0.3 0.6	0.6	0.3 3.4	0.3 3.4 0.6	0.3	0.3 3.4	0.4 1.3	uA
Temp. Range	LP HP UNB-HP	-30 to +85	-40 to +85 -30 to +85	-30 to +85	-40 to +85 -40 to +85	-40 to +85 -40 to +85 -30 to +85	-40 to +85	-40 to +85 -40 to +85	-40 to +85 -20 to +85	°C

The use of RF frequencies, data rates, maximum allowed RF power and duty-cycles are limited by national regulations.

License Free Band Selector / Requirements:	Use module:
Conformity with EU R&TTE directive (EN 300 220, EN 301 489, EN 60950)	RC1140/80(HP)-TM
Conformity with regulations for operation under FCC CFR 47 part 15	RC1190-TM
Compliance with G.S.R.564(E) (G.S.R.168(E))	RC1170(HP)-TM
Compliance with EN 300 328 (Europe), FCC CFR 47 part 15 (US) and ARIB STD-T66 (Japan)	RC2500(HP)-TM
Compliance to IEEE 802.15.4.g PHY mode 0 encoding when configured for RF Data Rate 8	RC117x-TM & RC117xHP-TM
For Narrow Band applications meeting EN 300 220-2 requirements	RC17XXHP-TM

Perfect for Smart Metering

A Tinymesh™ Module can interface directly to the serial port of existing energy meters, allowing meters to go online with minimal effort. Transparent mode operation allows direct transition from wired MODBUS to wireless mesh without rewriting a single line of code.

Perfect as an AMI Backbone

Tinymesh™ may be used as a wireless MODBUS replacement or as a multi-hop backbone for point-to-point wireless devices such as Wireless M-bus. Specialized Tinymesh™ Modules allow you to piggy back Wireless M-bus and a Tinymesh™ self-forming and self-healing Device Network with two-way communication, thus giving you the best of both worlds with the minimum of development time and costs. Used in conjunction with Tinymesh™ Cloud Services it provides a very potent solution.



Perfect for Smart Street Lighting

Tinymesh™ is ideal for street lighting applications when large numbers of message hops, connection redundancy and multi-Gateway support is required for reliable operation. Together with the built-in configurable I/O and PWM dimming, Tinymesh™ provides a fully embedded control and monitoring solution. Set light dimming as a percentage value to the PWM output. Control on and off switching with a digital output. Monitor power level and tamper attempts directly with alarm-triggered inputs. Observe temperature and operational voltage with the integration ready Tinymesh™ Module.

Perfect for simple surveillance

A rule of thumb states 50% of hotel mini-bars are not used, so a simple door switch connected to the triggered input of a Tinymesh™ Module allows hotels to save valuable time when checking mini-bars. No more wasted time to check unused mini-bars; no more lost revenue due to undetected pilferage or non-reported usage.

Perfect for sophisticated monitoring

Intelligent building management requires real-time data about indoor and outdoor environmental conditions. Using a specially developed Room Sensor, room temperature, air humidity, carbon dioxide concentrations, noise level, light intensity and proximity movement can be continuously monitored. All signals are handled directly by a single Tinymesh™ Module.