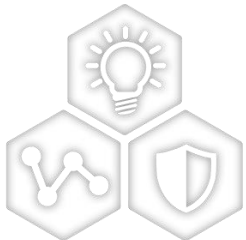


Microchip 802.15.4 based MiWi Products



A Leading Provider of Smart, Connected and Secure Embedded Control Solutions



SMART | CONNECTED | SECURE

2021

Microchip Wireless Top View



Technology	Standard	Freq.	Chip down	Module	Landing Page
Bluetooth®	Bluetooth Classic Bluetooth BLE Data & Audio	2.4GHz	✓	✓	www.microchip.com/ Bluetooth
Wi-Fi®	IEEE 802.11 b, g, n w/ or w/o BLE	2.4GHz	✓	✓	www.microchip.com/ Wifi
802.15.4®	IEEE 802.15.4	Sub-GHz & 2.4GHz	✓	✓	www.microchip.com/ Miwi
LoRa™	LoRa™	Sub-GHz	✓	✓	www.microchip.com/ Lora
Medical	MICS Bluetooth	Sub-GHz & 2.4GHz	✓	✓	www.microchip.com/ medical-wireless
Car Access	RKE - Remote Keyless Entry PEPS – Passive Entry Passive Start	Sub-GHz	✓	-	www.microchip.com/ car-access

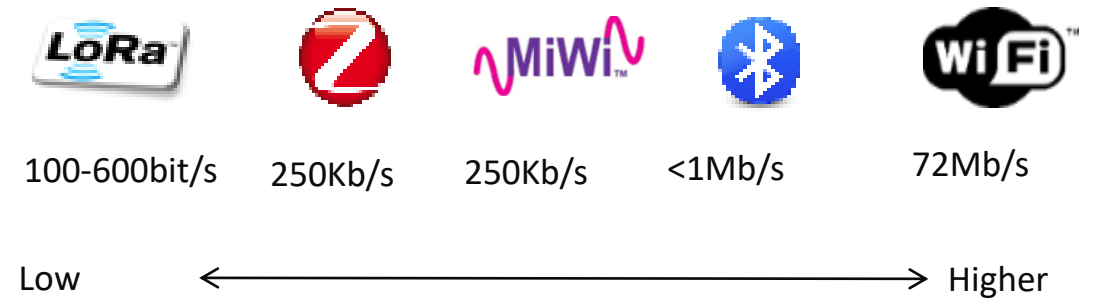


Wireless Selection Guide

Range



Data Rate



Battery Life



Direct Mobile



Direct Cloud/Internet



Gateway Needed for Internet/Cloud



802.15.4/LoRa Solutions

802.15.4

LoRa


Standalone

Network Controller

Link Controller


SAMR21
 MCU 256k-768k/32k
 2.4GHz
 O-QPSK
 IC

2.4 GHz



SAMR30
 MCU 256k/32k
 SubGHz
 BPSK / O-QPSK
 IC

Sub GHz




Chimera
 BT5 Dual mode +
 Zigbee
 Flash
 Module, IC

2.4 GHz

SAMR34/5
 ARM Cortex M0+
 LoRAWAN™ 1.0.2
 470/868/915 MHz
 IC (SiP)

Sub GHz




RN2483A-104
 LoRAWAN™ Stack
 433/868 MHz
 ASCII Interface
 Module

Sub GHz

RN2903A-103
 LoRAWAN™ Stack
 915 MHz
 ASCII Interface
 Module

Sub GHz

AT86RF233
 2.4GHz
 O-QPSK
 IC and Module

2.4 GHz

AT86RF212B
 SubGHz
 BPSK / O-QPSK
 IC and Module

Sub GHz

AT86RF215
 SubGHz / 2.4GHz
 MR-FSK, MR-OFDM, MR-O-
 QPSK, O-QPSK
 IC

Sub GHz
2.4 GHz

Production
 Development

802.15.4

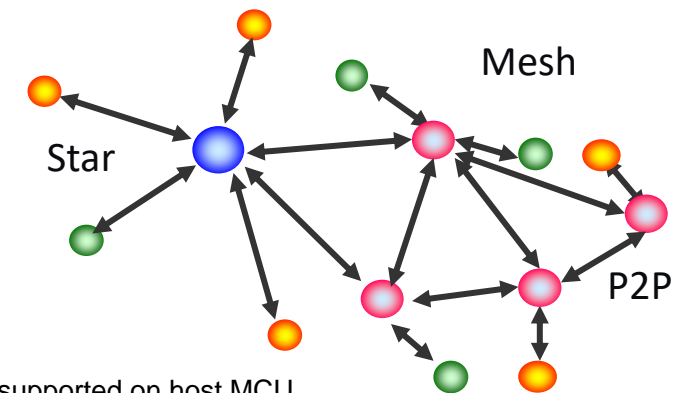
	P/N	Type	Module	Software**	Market
Transceivers	AT86RF212B	RFIC	✓	802.15.4 MAC, MiWi	Thermostats, Home Lighting, Smart Door Locks, Water Meters
	AT86RF233	RFIC	✓	802.15.4 MAC, zigbee*, MiWi	Light Sensors, Smart Home, Metering, Boiler Control, Solar Power Units
	MRF24J40	RFIC	✓	802.15.4 MAC, MiWi	Temp and Water Sensors, Garage door, SPA Control
	AT86RF215	RFIC	Not Planned	802.15.4 MAC	Smart Meters, Smart Home, Critical Apps – Flight Recorders, Avalanche Rescue devices
RF MCU's	ATSAMR30	SiP	✓	802.15.4 MAC, MiWi	Security, Irrigation Control, Wireless Switches and Plugs, Meters
	ATSAMR21	SiP	✓	802.15.4 MAC, zigbee*, MiWi	Zigbee Lighting, Smart Home, Smart Plugs, Thermostats, Outdoor Lighting
	ATMEGA256(4)RFR2	SoC	✓	802.15.4 MAC, zigbee*	Zigbee lighting, Outdoor Lighting, PIR Sensors, Operator Interfaces
	ATMEGA128(4)RFR2	SoC	✓	802.15.4 MAC, zigbee*	Access Control, Fume hoods, Healthcare patient tags, AC Control, Industrial Control
	ATMEGA64(4)RFR2	SoC	✓	802.15.4 MAC	Wireless race timer control, Water heater control

Sub-GHz	2.4GHz	Dual Band
---------	--------	-----------

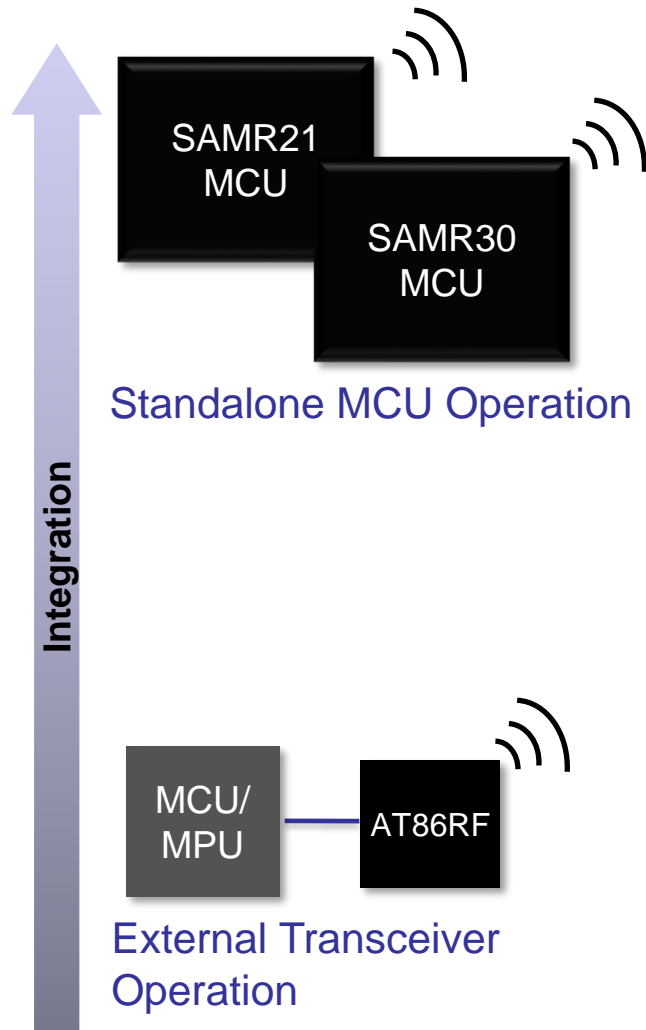
**For Transceivers, protocols are supported on host MCU



MiWi™ Your wireless connectivity made simple.



Enabling Embedded 15.4 Solutions



SAMR21 Series: 802.15.4 Microcontrollers

- ARM Cortex M0+ MCU w/integrated **2.4 GHz** transceiver
- Available SiP's and Certified Modules
- zigbee 3.0 support
- MiWi™ P2P/Star/Mesh now available in ASF

SAMR30 Series: 802.15.4 Microcontrollers

- ARM Cortex M0+ MCU w/integrated **Sub-GHz** transceiver
- Available SiP* today; Modules in Q4
- MiWi™ P2P/Star/Mesh now available in ASF

AT86RF2xx Series: 802.15.4 Transceivers

- **Sub-GHz** and **2.4 GHz** devices
- **Only Simultaneous dual band radio in the market**
- Serial Interface for MCU/MPU flexibility
- Regionally Certified “drop-in” Modules available

ATSAMR21 ARCHITECTURE

ATSAMR21x = SAMD21 + RF233

SAM D21 MCU:

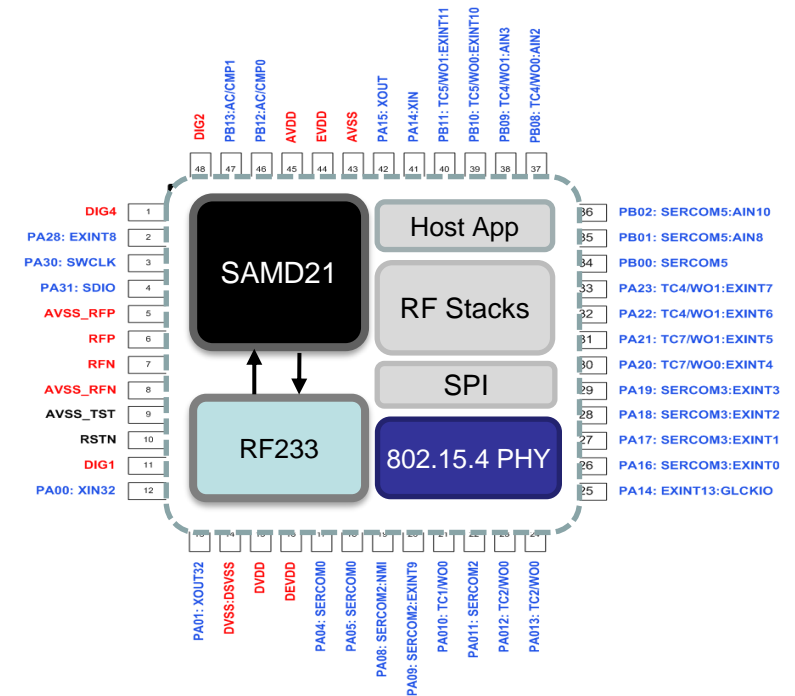
- Ultra-Low power 32-bit, 48 MHz general purpose Cortex-M0+: SAM D20 + enhancements:
- Up to 256KB Flash / 32KB RAM.
- USB, 28 GPIO, 5 SERCOMs (USART, SPI, I2C)
- Up to 8channels, 350Ksps, 12-bit ADC; 2 Analog Compares
- 12 channel DMA between peripherals and memory.
- 32bit RTCC and 16bit Timer/Counters

AT86RF233 2.4GHz ISM transceiver:

- 2Mbps data rate, -99dBm RX Sensitivity
- TX Output Power up to +4dBm
- 128 Byte TX/RX Frame Buffer
- Integrated 16MHz Crystal Oscillator supporting external Crystal
- PLL synthesizer with 5 MHz and 500 kHz channel spacing for 2.4GHz ISM

ATSAMR21E19

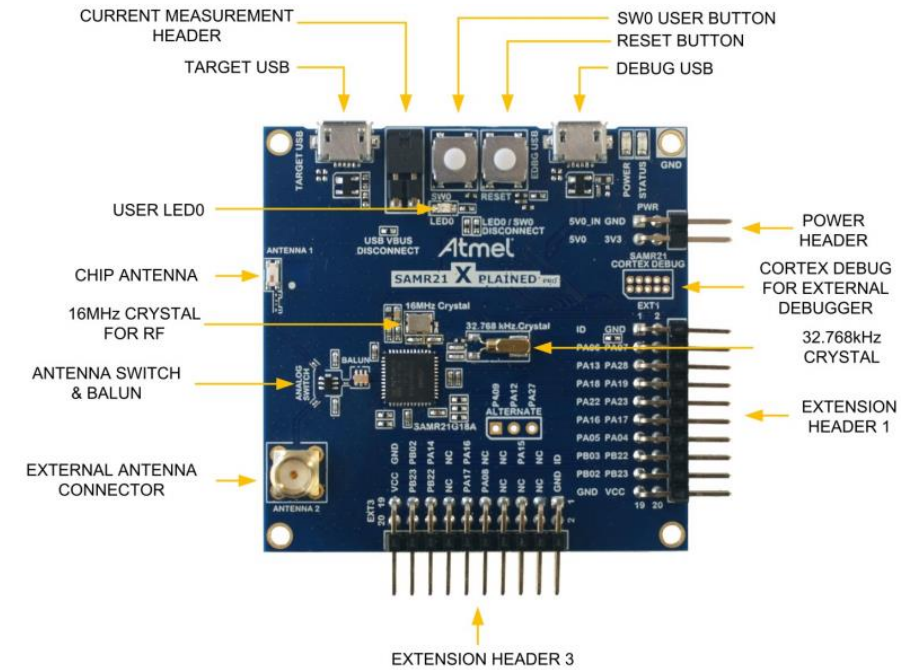
- Adds 512KB Serial Flash supporting Over-the-Air Updates



SAMR21 Xplained PRO Evaluation Kit

■ ATSAMR21G18A MCU

- 256K Flash /32K RAM
- 48-pin package
- Chip antenna plus SMA connector
- On board EDBG debug

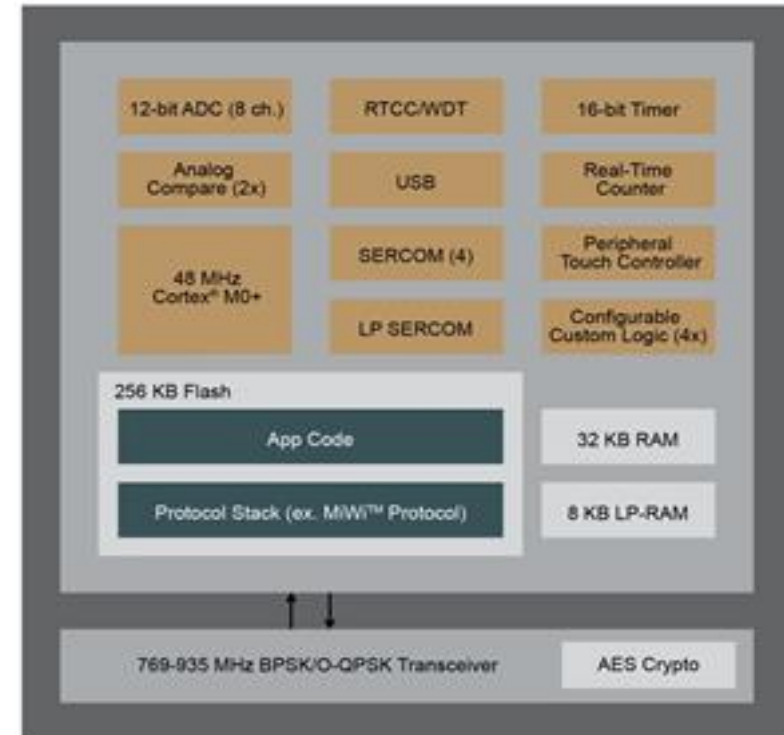


PN# ATSAMR21-XPRO

<http://www.microchip.com/DevelopmentTools/ProductDetails.aspx?PartNO=ATSAMR21-XPRO>

SAMR30 Single-chip MCU with Sub

- A Cortex M0+ MCU + Sub-GHz Transceiver in a single package!
 - ATSAML21 + AT86RF212B
- 256 KB flash / 32KB RAM
- 8KB Low Power Mode Retained RAM
- USB Host and Device
- **Ultra Low Power Consumption**
 - **700nA Typical with RTC**
- Hardware AES crypto accelerator
- High performance ADC and analog peripherals for sensor nodes
- IEEE® 802.15.4-2003/2006/2011 compliant
- 769-935MHz band support



- 5x5 32QFN or 7x7mm 48QFN Pkgs
- MiWi P2P and Mesh in development
- Complimentary module family with certifications in development

SAMR30 Module XPro

On-board **chip antenna** and **SMA connector** for an external antenna

USB-UART interface for observing SAM R30M data

On-board Digital **Temperature Sensor** with Non-Volatile Registers and 8 Kb Serial EEPROM

On-board **4 Mb SPI Flash**

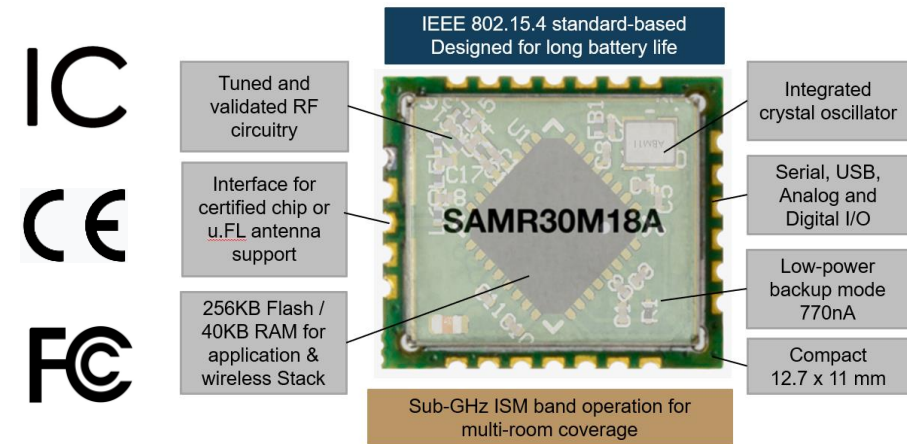
Footprint provision for evaluating Microchip CryptoAuthentication™ **ATECCx08A** devices

Get Started in 3 Easy Steps

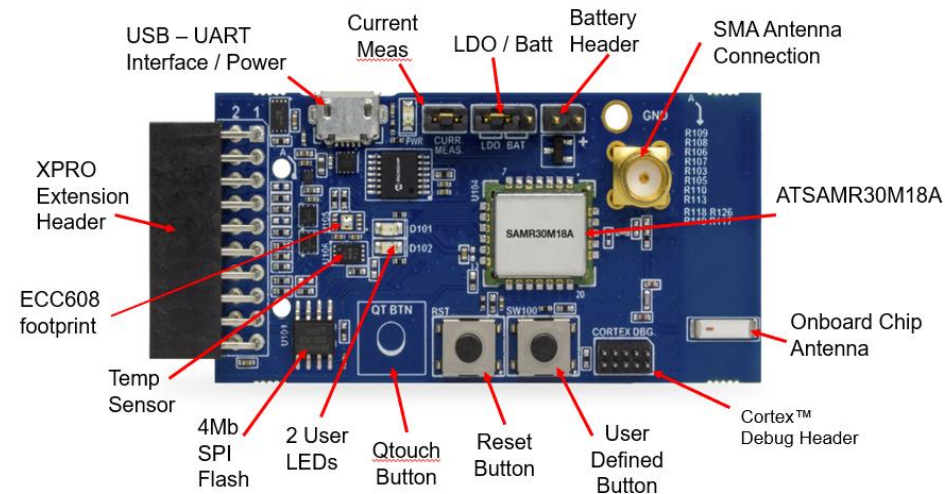
Download and Launch Atmel Studio

Connect Xpro via Atmel ICE

Select and work with demos from ASF



SAM R30 Module



SAM R30 Module XPro (AC164159)

Integrated Development Environment

- Write, compile and debug C/C++ on the SAM R30 Module
- Configure / test wireless design performance with Wireless Composer
- Display and capture runtime power data with Data Visualizer plug-in*
- Extensive software libraries including MiWi wireless protocol on the SAM R30 module and over 1,600 project examples
- Full chip simulation for an accurate model of CPU, interrupts, peripherals and external stimuli



700,000+

Studio downloads since 2012

93%

Users ratings excellent, very good, good

- Free at [Atmel Studio 7](https://www.atmel.com/Atmel-Studio-7)

*Requires Power Debugger board

Development Wireless Composer

- Studio 7 Extension to quickly validate your RF design performance
 - RF Channel Energy Scan
 - Packet Error Rate (PER) testing
 - Throughput Analysis
 - Link Quality Indicator (LQI)
 - Receive Signal Strength Indicator (RSSI)
- Brings together the tools required to edit the code in Studio 7
 - Control GUI / Evaluate / Test RF
 - Register Configuration
 - Radio operational state control
 - Continuous Wave test modes
 - Transmit power adjust

The screenshot displays the Development Wireless Composer interface, which is a Studio 7 extension for testing RF designs. The main window is titled 'Performance Analyzer' and shows a 'Connected Kits' list with 'COMBS' selected. The 'Test Parameters' section includes 'Test in Progress...' and 'Save results to file: C:\Users\javad\Documents\WirelessComposer\'. The 'Test Results' table shows the following data:

Node	LQI	ED (in dbm)
Local (Results of messages as received by the host node)	255	-57
Remote (Results of messages as received by the remote node)	255	-54

Below the table, there is a 'Test Results' section with a table of test results. The table has columns for Time, Type, Message (Hex), Node, LQI (Received), ED (Received in dbm), EDI (Local in dbm), and EDI (Remote in dbm). The results show a series of successful transmissions with LQI values of 255 and ED values around -57 to -54 dBm.

The interface also includes several configuration panels on the left, such as 'Kit/Transceiver Properties', 'Transceiver Registers', 'PER Test Configuration', and 'Transceiver State Selection'. The 'PER Test Configuration' panel shows settings for 'Antenna Diversity on Peer' (Disable), 'Channel Page' (0), and 'Transceiver State Selection' (RPC). The 'Transceiver State Selection' panel shows 'Receiver Demodulation' (Enable) and 'To State' (TO_STATE).

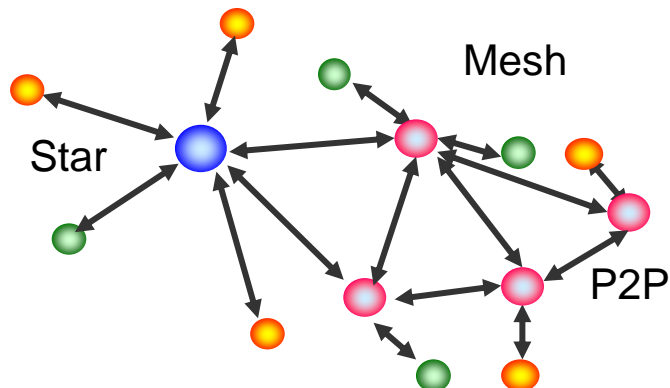
At the bottom, there is a 'Performance Analyzer' window showing a 'Channel vs Received Input Power' graph. The graph plots 'Received Input Power (dBm)' on the y-axis (ranging from -90 to -10) against 'Channels' on the x-axis (ranging from 11 to 26). The graph shows a series of bars representing the received input power for each channel, with values ranging from approximately -65 dBm to -75 dBm.

Zigbee and MiWi Stacks



Microchip's own zigbee stack (Limited Distribution)

- zigbee 3.0 (zigbee Pro + Green Power)
- 1st Platform certified by the Alliance
- Lighting and Zigbee Green Power Switch and Sensor support
- SAMR21 (2.4GHz) platform developed
- 250+ Node test network
- IAR Toolchain



Microchip's Compact, Royalty-Free Wireless protocol designed for 802.15.4 Networks

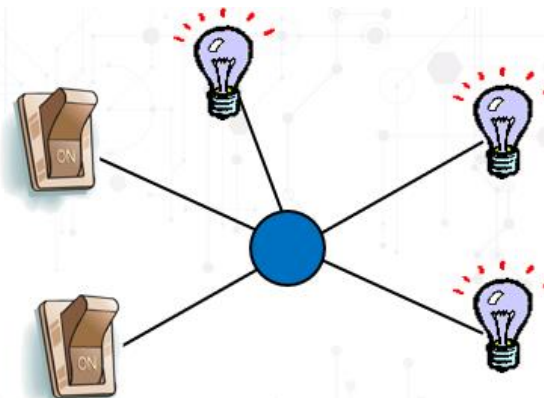
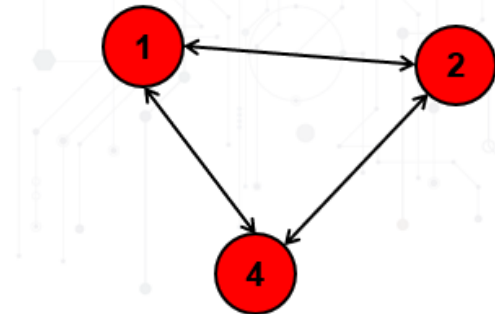
- **Only 20 to 32KB code!**
- *True* Routing Mesh (not a flood mesh)
- Single chip **SAMR21 (2.4GHz)** and **SAMR30 (Sub-GHz)** SiP support!
- Legacy version for support of PICs and Xcvrs

Same Stack 2.4GHz or Sub-GHz

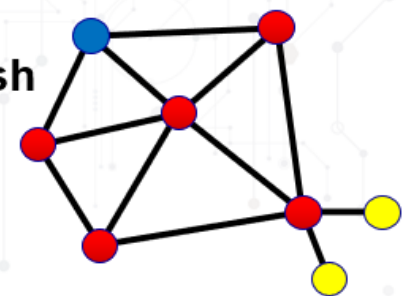
Overview of MiWi™ P2P, Star, Mesh Network

	MiWi™ P2P	MiWi™ Star	MiWi™ Mesh
Standard	Proprietary	Proprietary	Proprietary
Code Size	~ 14KB	~ 16KB	~ 27KB
Network Size	Direct Connection 2 nodes 1 Hop	Small Networks 128 End Nodes 1 Coordinator 2 hops	Large Networks 200 Nodes 100+ Coordinators 100+ hops
Application	P2P communication, Thermostat, Interphone...	Industrial Gateway, Monitoring system ...	Extends the range, IoT sensor(>100 nodes) ...

- PAN Coordinator (FFD)
- Coordinator (FFD)
- End Device (RFD)



Mesh



Summary

● What's product

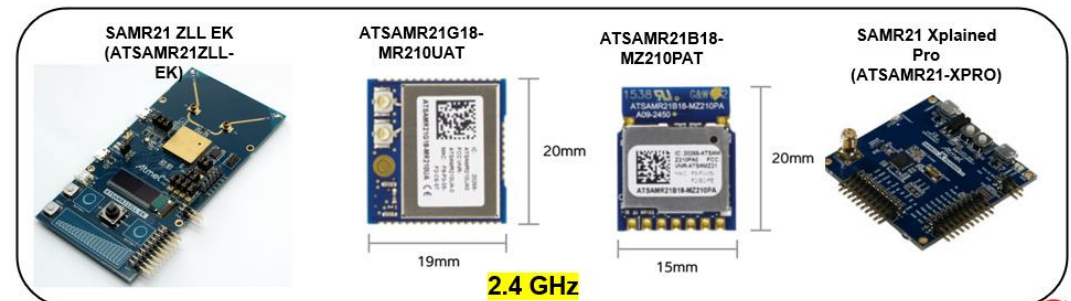
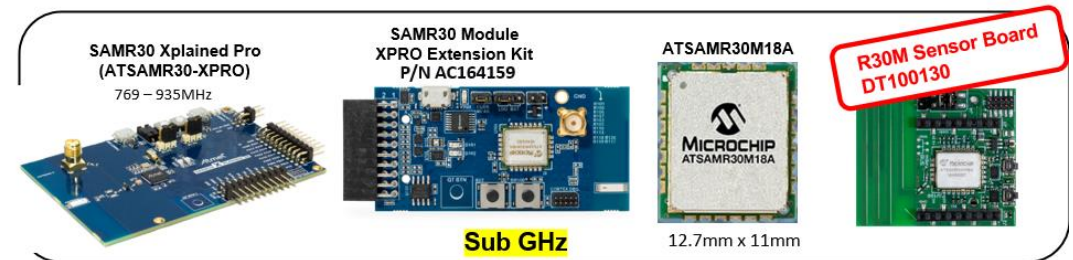
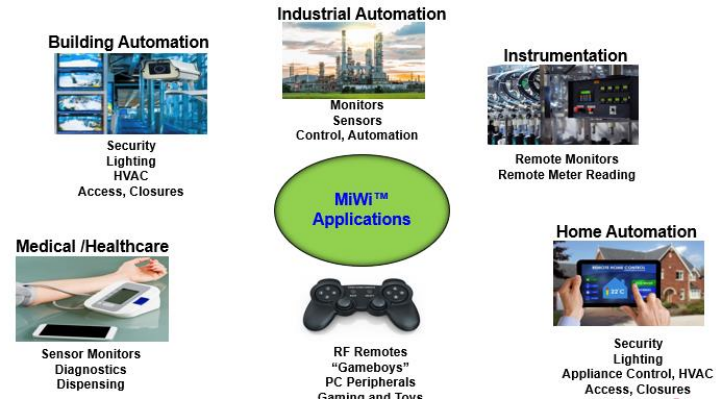
- SAMR30 (Sub GHz) or SAMR21(2.4GHz)

● Why(Advantages)

- Low power(700nA),Long range(150M+@Sub GHz),Low latency (ms level)
- Mi-Wi protocol Support P2P, STAR,MESH(**Royalty-Free**)
- TSS: Turnkey solution with Gateway including HMI

● Target Market

- Industrial Automation
 - Sensor Monitors
 - RF Remotes
 - Remote Monitors
- Building/Home Automation
 - Lighting
 - Appliance Control



Thank you!
