WF121: Wi-Fi Module

Product Presentation

Topics

- Key features
- Benefits
- WF121 overview
- The Wi-Fi software stack
- Evaluation tools
- Certifications
- Use cases

Key features

WF121: Key features

- **IEEE 802.11 b/g/n radio:**
  - Single 2.4 GHz band
  - Integrated antenna or U.FL connector
- **Excellent radio performance:**
  - TX power: +17 dBm
  - RX sensitivity: -91 dBm
- **Host interfaces:**
  - 20Mbps UART
- **Peripheral interfaces (***
  - GPIO, AIO and timers
  - I2C, SPI and UART
- **Embedded TCP/IP and 802.11 MAC stacks:**
  - IP, TCP, UDP, DHCP and DNS protocols
  - Bluegiga BGAPI™ protocol over UART for applications with MCU
  - Bluegiga BGscript™ scripting support for stand-alone applications
- **32-bit embedded microcontroller**
  - 80Mhz, 128kB RAM and 512kB Flash
  - MIPS architecture
- **Dimensions: 15.4 x 26.2 x 2.1 mm**
- **Temperature range: -40ºC - +85ºC**
- **Fully CE, FCC and IC qualified**

Benefits

WF121: Benefits

- Small, standalone 802.11 b/g/n module with radio, antenna and 32-bit MCU
- Long range provided by excellent radio performance
- Embedded TCP/IP and 802.11 MAC stacks
- On-board end user applications enabled by Bluegiga BGScript™
- Industrial specifications, long life time and future proof solution
- Regulatory qualifications reducing R&D risk, costs and time-to-market

WF121 overview

WF121: Radio

- **2.4GHz, 802.11 b/g/n Single spatial stream**
- **Operating freq. (ISM):**
  2402 – 2480 MHz
- **Symbol rates:**
  IEEE 802.11n : 72.2, 65, 58.5, 57.8, 52, 43.3, 39, 28.9, 26, 21.7, 19.5, 14.4, 13, 7.2, 6.5Mbps
  IEEE 802.11g : 54, 48, 36, 24, 18, 12, 9, 6Mbps
  IEEE 802.11b : 11, 5.5, 2, 1Mbps
- **Channels:**

North America:	11 channels
Rest of the world:	13 channels

WF121: Radio

- **TX power:** +17 dBm
- **RX sensitivity:** -91 dBm
- **Modulation methods:** CCK
  DSSS
  OFDM
  BPSK
  QPSK
  16-QAM
  64-QAM

WF121: Interfaces

Host interfaces

- 20 Mbps UART with flow contol
- Full-speed USB*

Radio co-existence interfaces

- 3-wire Unity 3
- 3-wire Unity 3e+ (recommended)
- 4-wire Unity 4

Programming & Debug

- 802.11 debug SPI
- MCU debug and programming

**) Check software support availability*

WF121: Interfaces

Ethernet

- 10/100Mbps RMII interface*

Peripheral interfaces

- Up to: 2 x I2C*
- Up to: 2x SPI*
- Up to: 4 x UART (2 with hardware flow control)*
- Up to:10 x AIO (10-bit ADC) 1MSps*

Configurable GPIO ports

- Configurable IO ports (wake-up, sleep etc.)
- 5V tolerant pads available

Other

- JTAG and ICSP
- USB On-The-Go, both Host and Device modes

**) Check software support availability*

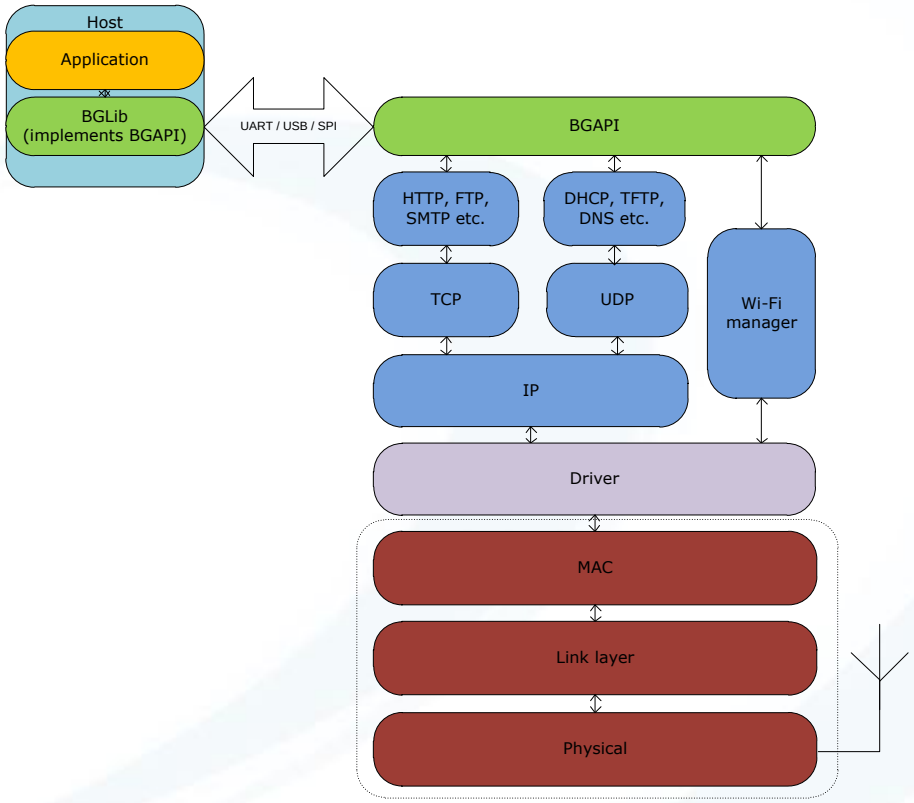
WF121: Microcontroller

- **Architecture:** MIPS
  80MHz
  1.56 DMIPS/MHz
- **SRAM:** 128kB
- **Flash:** 512kB

Bluegiga Wi-Fi® Software

Bluegiga Wi-Fi software

- **Implements the following layers**
  - 802.11 interface driver
  - IPv4 compatible TCP/IP stack
  - TCP and UDP
  - DHCP
- **Implements the following clients and servers**
  - TCP client/server
  - UDP client/server
  - DHCP client
  - DNS
- **Security**
  - WPA/WPA2-PSK
- **Flexible host software interface**
  - BGAPI™: Binary protocol over UART
  - BGLib™: ANSI C library for host processors
- **On-module applications**
  - BGScript™ : simple scripting language
  - **No host needed**



Bluegiga Wi-Fi software

BGAPI
- A binary API between the host and the stack

DHCP, DNS
- UDP based application protocols

Wi-Fi manager
- Connections, settings, security, scanning

UDP
- User Datagram Protocol
- A connection less data transmission protocol

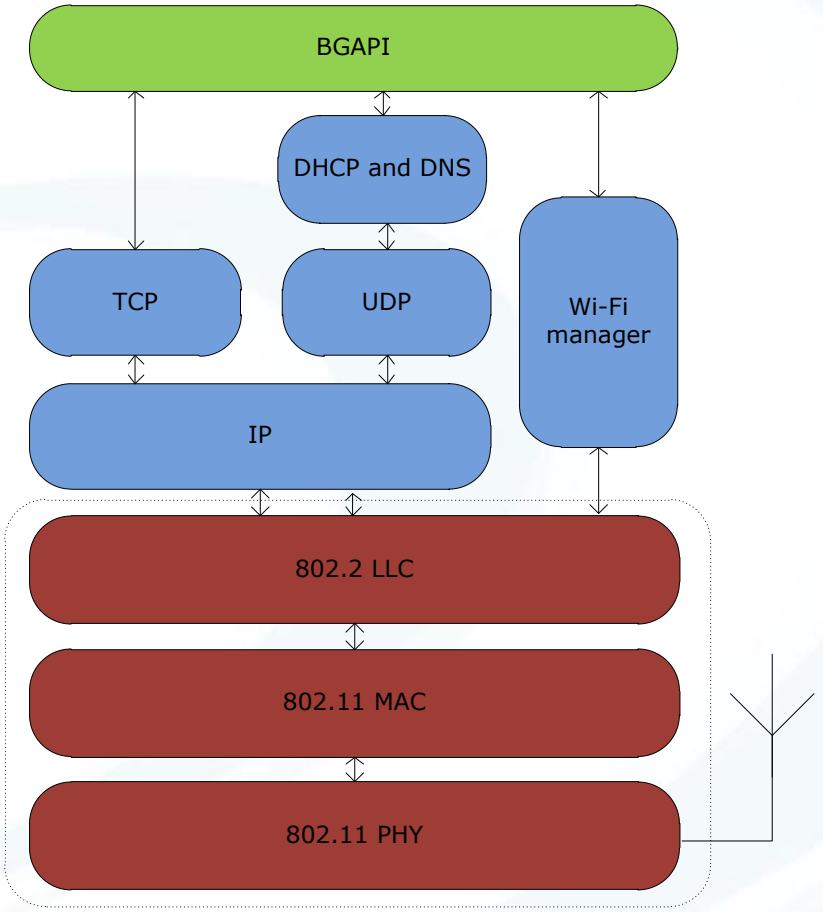
TCP
- Transmission Control Protocol
- Connection oriented data trasfer

IP
- Internet Protocol
- Transmission and reception of IP packets

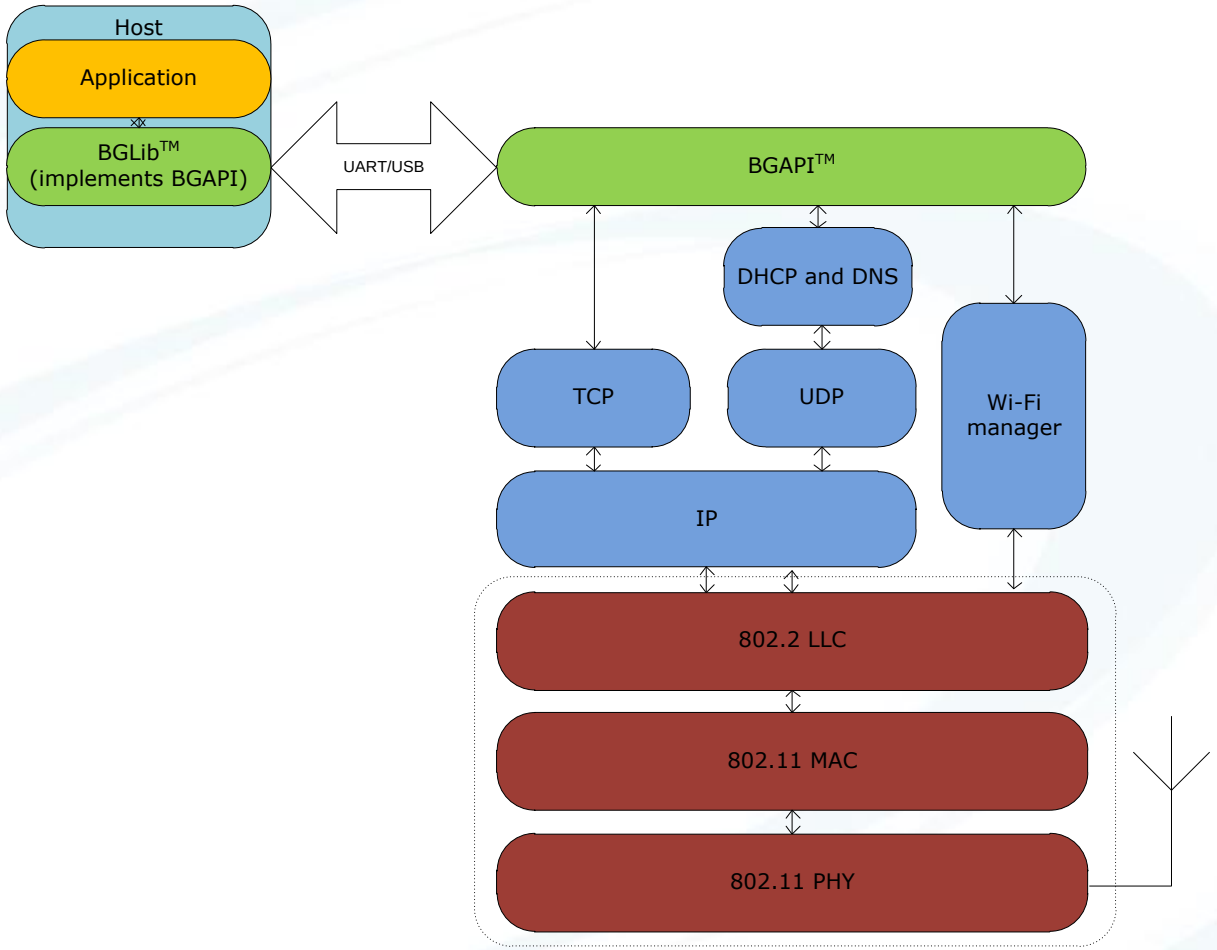
MAC
- 802.11 Media Access Control

Link layer
- Packets and radio control

Physical layer
- Transmission/reception of bits



Bluegiga BGAPI™ protocol



Bluegiga BGAPI™ protocol

- A binary command, response and event protocol between the host (MCU) and the stack
- Small size requirement and low implementation overhead
- Good for application with a separate host
- A portable ANSI C host library (BGLib) available

Bluegiga BGLib™ host library

BGLib implements a parser for the BGAPI binary protocol

BGLib available for several host systems:

- Windows
- Linux
- Fully embedded implementation

Uses function and call back arhitecture

Benefits:

- Fast application development
- Proven / tested code
- Ready made example applications

Bluegiga BGScript™ Scripting language

Basic style scripting API

- Fast development of simple applications
- Examples: Scanning, authentication, connecting, email

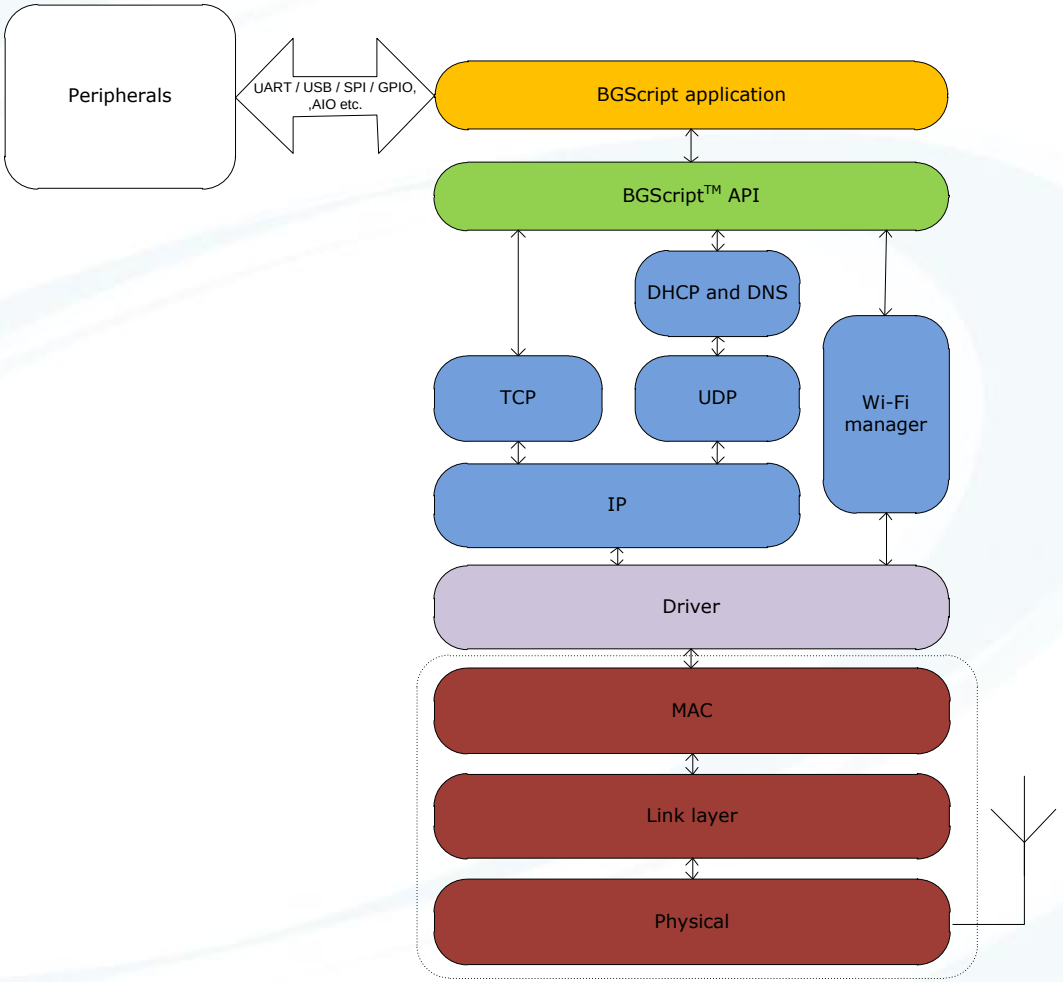
Software tools

- Code developed with any text or source code editor
- Code compiled with Bluegiga's compiler
- Binary application flashed to the hardware

Cuts out the need for external MCU:

- Reduced product cost
- Smaller footprint
- Faster time-to-market

Bluegiga BGScript™ scripting language



BGScript : Scan, connect and create TCP server

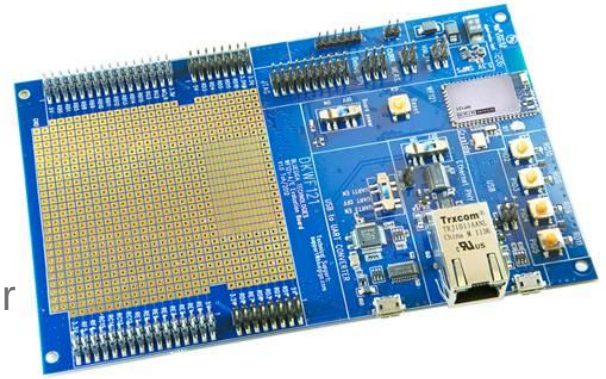
```
/* System boot event listener */
sub system_started(status)
    system_set_passphrase(”mylittlesecret")              //Set pass word
    system_connect_ssid(1,”TestAP")                      //Connect to SSID ”TestAP”
    endpoint_send(0,"Connecting\n")                      //Send staus to UART
end


/* Disconnect event listener */
sub system_disconnected(reason)
    system_connect_ssid(1,”TestAP")                      //Connect to SSID ”TestAP”
end


/* Connection status listener */
sub system_link_status(status)                           //If status is connected
    if status=1 then system_tcp_start_server(1234,0)     //Start TCP server to port 1234
end

/* Connection status listener */                         //Route TCP stream to UART
sub endpoint_status(handle,type,streaming,destination,connected)
    if type=4 and connected=1 then endpoint_set_default_streaming_destination(0,handle)
end
```

Evaluation tools

WF121: Evaluation kit

WF121 evaluation kit:

- WF121-A module
- Serial host inteface, with onboard serial-to-usb converter
- USB host
- Current measurement point
- Ethernet
- Programming and debug cables
- Prototyping area



Certifications

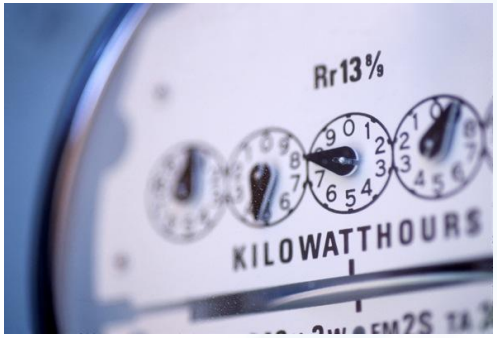
Certifications

- **CE**
  - EN300328
  - EMC330489
- **FCC**
  - Modular approval - 15.21,15.105(b)
- **Industry Canada (IC)**

Use cases

Embedded Wi-Fi

- Point of sale terminals
- Portable scanners
- Metering
- M2M connectivity



Consumer electronics

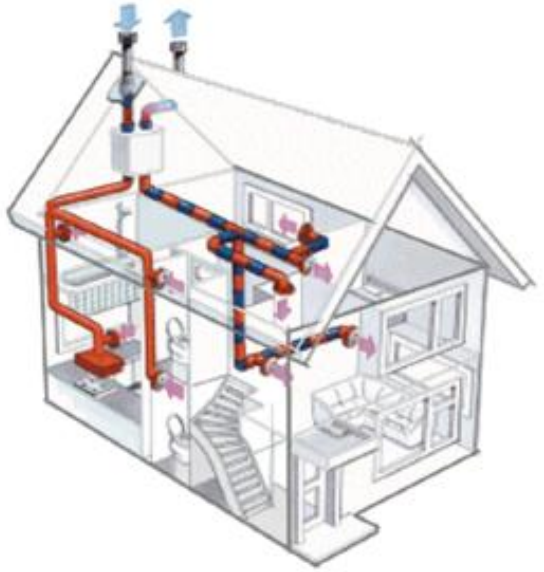
- Internet radios

- Digital picture frames

- Medical devices

HVAC & Smart Energy

- Heating
- Ventilation
- Air-conditioning
- Thermostats
- Remote displays



Medical

- Medical sensors

- Hospital sensors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Thank you
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