Wireless Embedded Modules

Making **DEVICE NETWORKING** *easy*

Product Overview

Product Summary

- Embedded 802.11b wireless modules
- Ultra-compact, single component solutions
- Pin-compatible and interchangeable with wired Connect ME and Connect EM family models

Problem Being Solved

- Environment, mobility and/or frequent relocation of product makes physical wiring costly, difficult, and a recurring issue
- Wireless networking is difficult for many of our customers

Product Purpose

- Make Wireless as easy to design, install and use as Ethernet
- Make it easy to bring secure, cost-effective Wi-Fi to low-end devices everywhere

Connect Wi-ME Product Overview

- **Wireless Embedded module**
  - Field-upgradeable 3.3V single component solution
  - 55 MHz NS7250 processor with ARM7TDMI core
  - 2MB Flash, 8MB RAM

- **Integrated 802.11b wireless Ethernet**
  - 2.4GHz dipole antenna included

- **High-speed TTL serial interface**
  - Throughput up to 230 kbps
  - Full hardware and software flow control
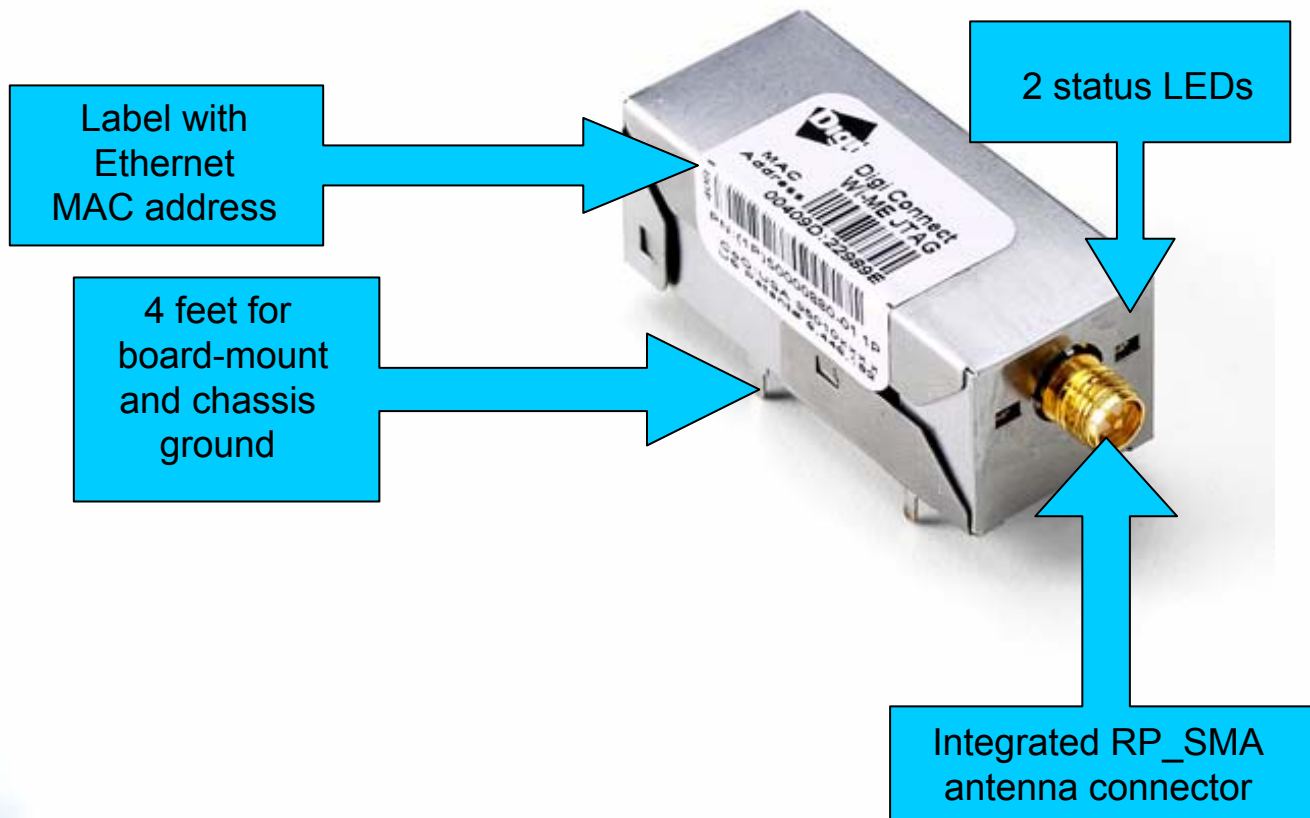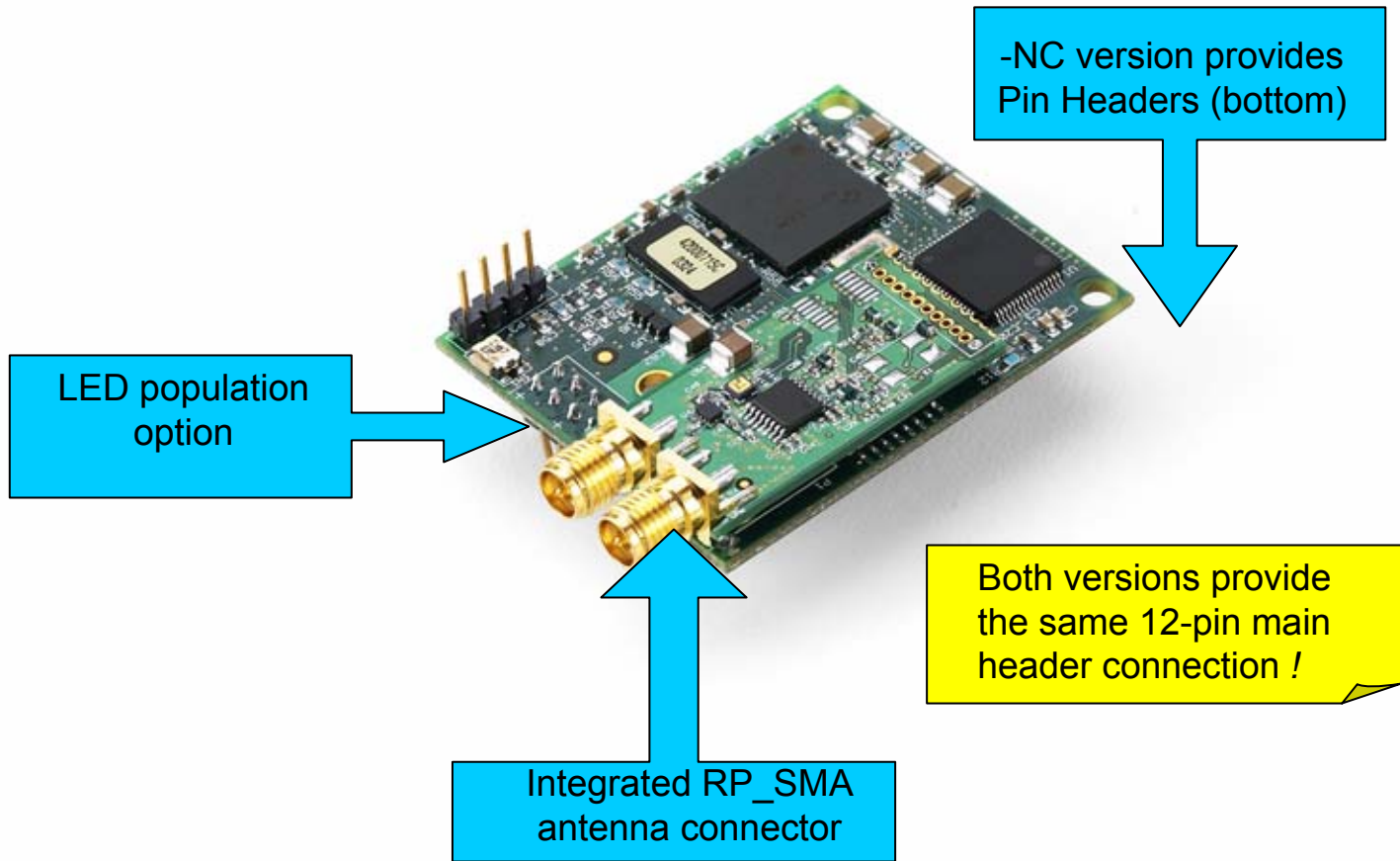
- **Operating temperature range –40°C to +85°C**

- **Five selectable GPIO ports for application specific use**

- **Available with Digi plug-n-play firmware option or NET+Works development kit for custom applications**

Connect Wi-ME Product Overview

➡ Standard unit provides integrated antenna connector, antenna, Status LEDs, TTL/power connector, and <u>no</u> JTAG interface

Label with Ethernet MAC address

2 status LEDs

4 feet for board-mount and chassis ground

Integrated RP_SMA antenna connector

Connect Wi-EM™ Product Overview

☑ Pin-compatible family of board-level modules

☑ Connect Wi-EM is 0.3 inches (0.762cm) wider

☑ All other dimensions identical including mounting holes

☑ Ultra-compact form factor

Connect Wi-EM Product Overview

- **Wireless Embedded module**
  - Field-upgradeable 3.3V single component solution
  - Compact PCB module design with population options
  - 55 MHz NS7250 processor with ARM7TDMI core
  - 4MB Flash, 8MB RAM
- **Integrated 802.11b wireless Ethernet**
  - Support for dual diversity antenna configurations
- **High-speed TTL serial interface**
  - Two on-board serial ports with throughput rates of up to 230 kbps
  - Full hardware and software flow control
  - Serial Peripheral Interface (SPI) with up to 11Mbps data rate
- **Operating temperature range –40°C to +85°C**
- **Nine selectable GPIO ports for application specific use**
- **Available with Digi plug-n-play firmware option or NET+Works development kit for custom applications**

Digi

Connect Wi-EM Product Overview

➡ Two versions available: Fully populated with LED array, or pin headers only

-NC version provides Pin Headers (bottom)

LED population option

Both versions provide the same 12-pin main header connection *!*
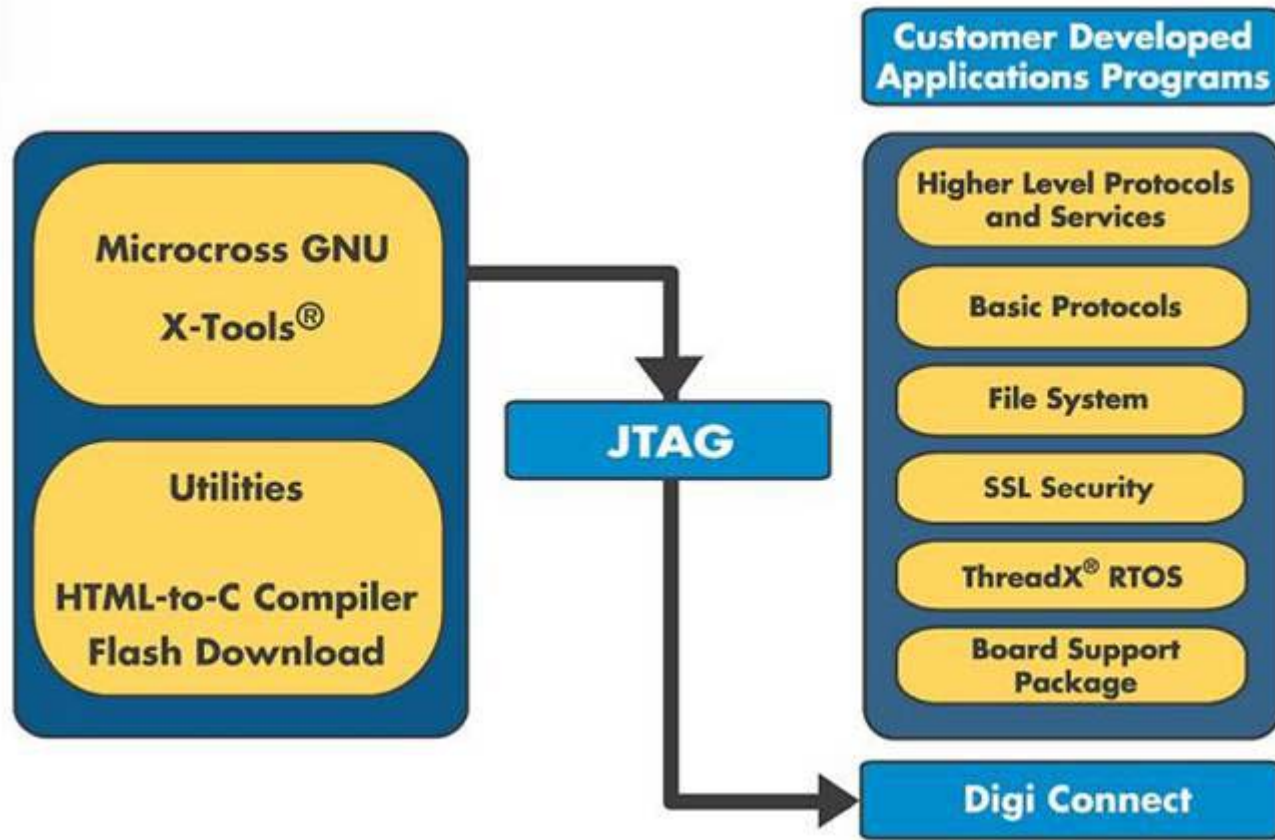
Integrated RP_SMA antenna connector

Digi Connect Family Integration Kits
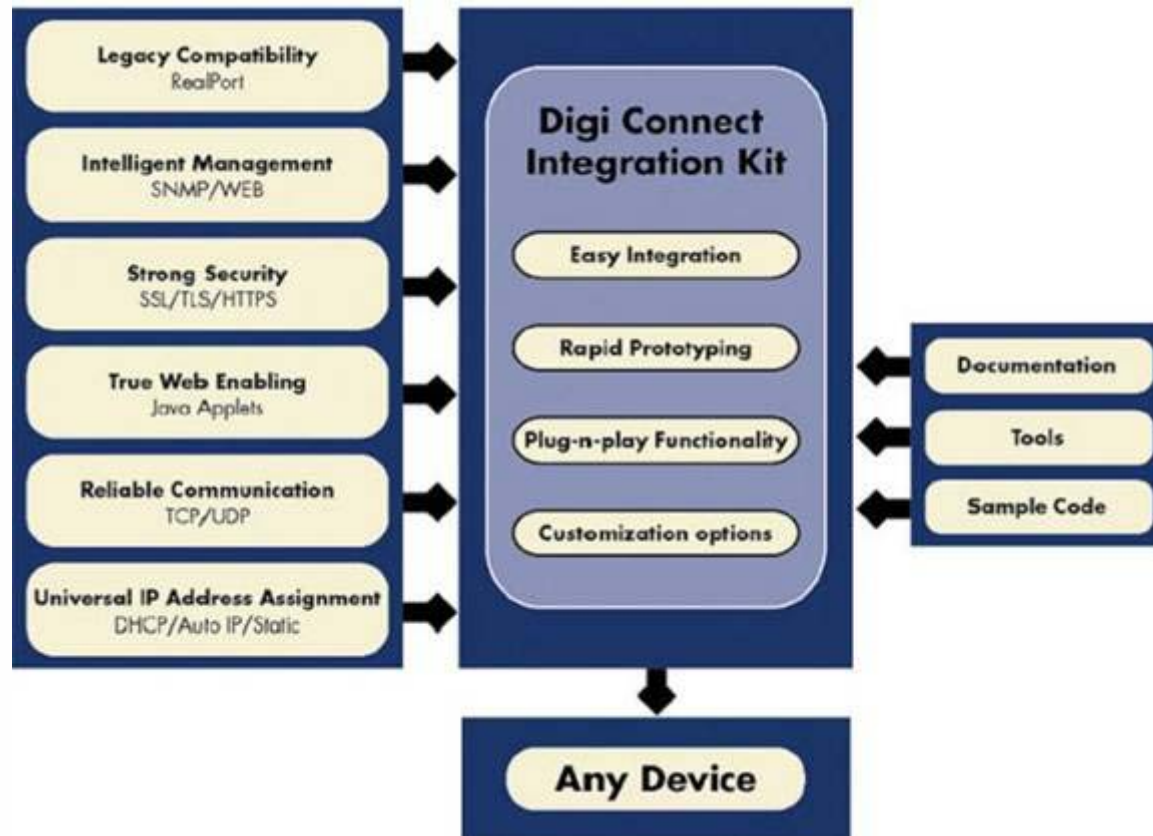
Design-in of Digi Connect products without any embedded software development. Allows development and use of custom Java applets.

Digi Connect Family Development Kits

Customer Developed Applications Programs

- Microcross GNU X-Tools®
- Utilities
- HTML-to-C Compiler Flash Download

JTAG

- Higher Level Protocols and Services
- Basic Protocols
- File System
- SSL Security
- ThreadX® RTOS
- Board Support Package

Digi Connect

Offers highest level of flexibility. Requires embedded software development of firmware residing on Digi Connect products.

Digi International

Development & Integration Kits

- **Shared Development board between kits**

- **Illustrates "one-design" for wireless and wired modules**

Development & Integration Kits

- **Shared Development board between kits**

- **Illustrates "one-design" for wireless and wired modules**
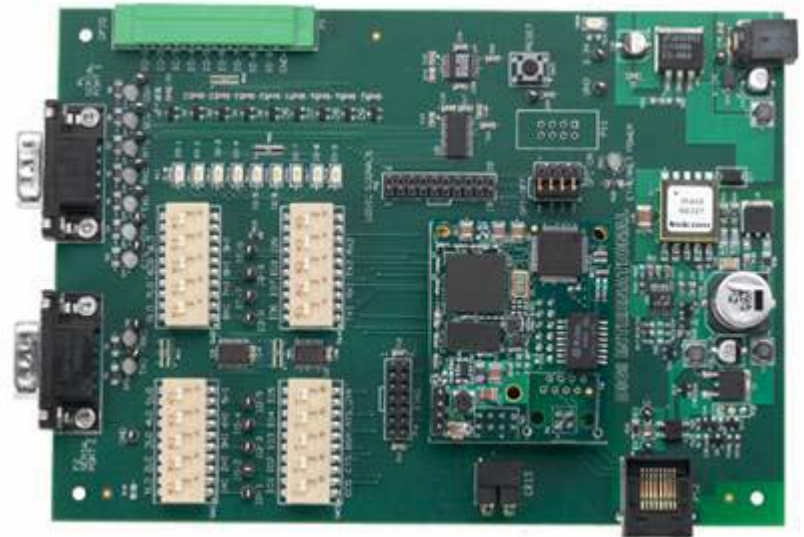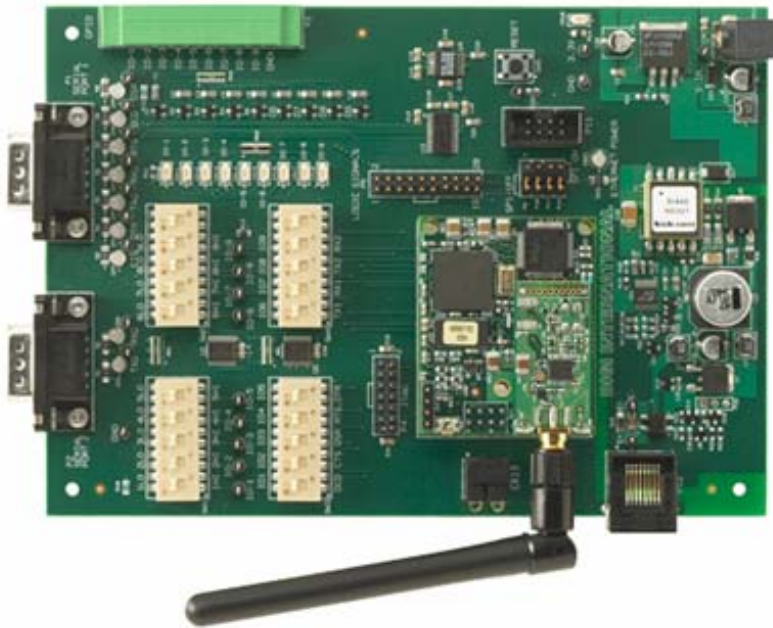
Product Comparison

Feature	Connect Wi-ME	Connect Wi-EM
Physical	Connector style	Board Mount
Population Options	No	Yes
Antenna	2.4Ghz dipole included	Dual diversity capable
Flash	2MB	4MB
GPIO	5	9
Ports	1	2
SPI	No	Yes

Wireless Technology Overview

- **WLAN**
  - Generic term meaning most any Wireless LAN network
  - Commonly associated with 802.11 family of IEEE standards

- **Wi-Fi**
  - Term used for WLAN Connectivity based on the 802.11 family of Standards
  - Supported by the Wi-Fi Alliance (formerly WECA)
  - To get a Wi-Fi label (ensuring interoperability) you must past conformance testing

- **802.11x**
  - Family of IEEE standards on Wireless LAN technology
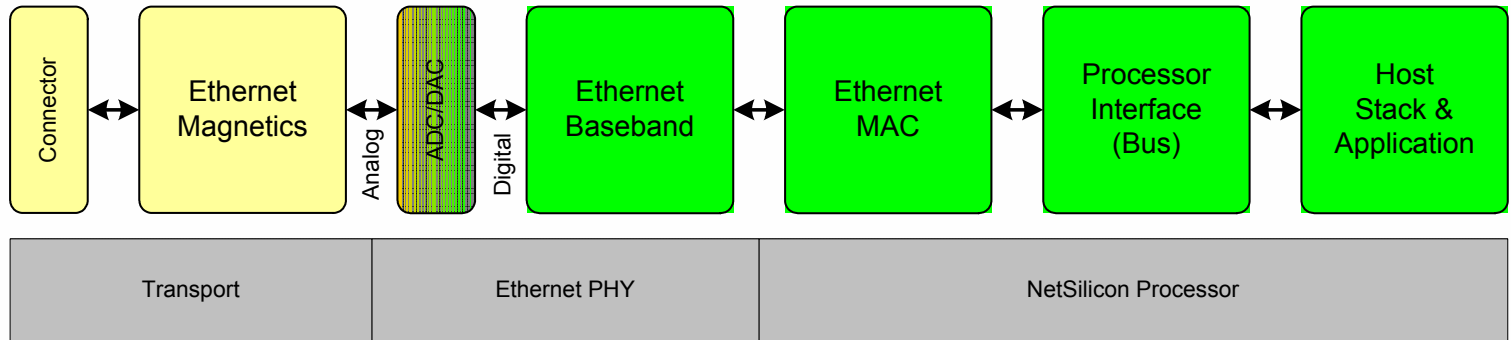 - Compare to 802.3 family – also known as Ethernet

Why Choose? A vs B vs G
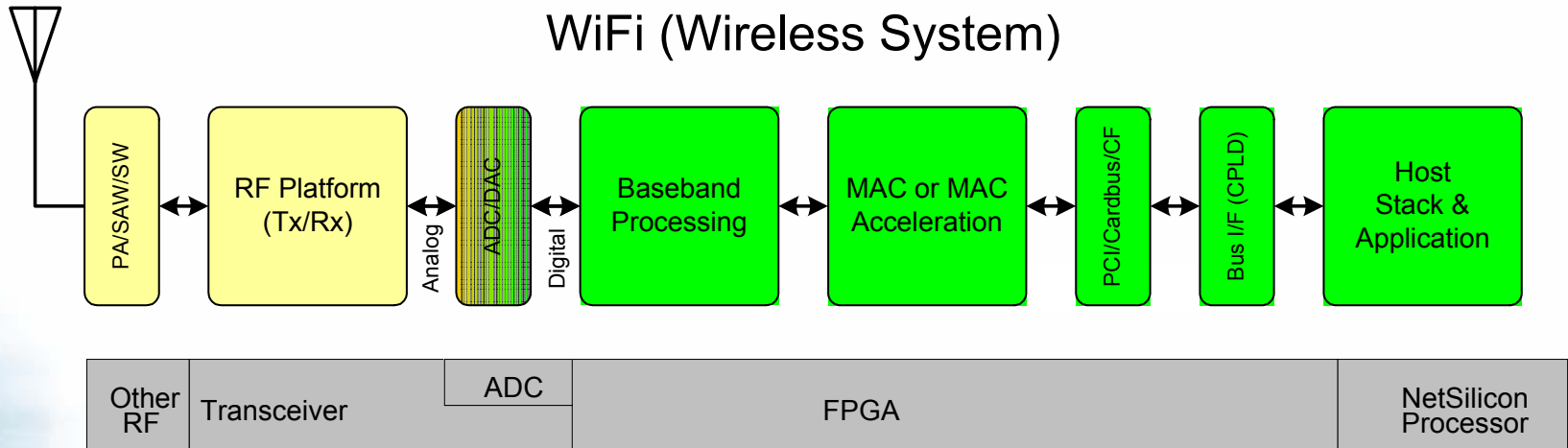## Wireless Technology Comparison Chart

Wireless Standard	802.11b		802.11a		802.11g	
Popularity		Widely adopted. Readily available everywhere.		New technology.		New technology with rapid growth expected.
Speed	11 Mbps	Up to 11Mbps (note: cable modem service typically averages no more than 4 to 5Mbps).	54 Mbps	Up to 54Mbps (5X greater than 802.11b).	54 Mbps	Up to 54Mbps (5X greater than 802.11b).
Relative Cost	$	Inexpensive.	$$$	Relatively more expensive.	$$	Relatively inexpensive.
Frequency	2.4 GHz	More crowded 2.4GHz band. Some conflict may occur with other 2.4GHz devices like cordless phones, microwave ovens, etc.	5 GHz	Uncrowded 5GHz band can coexist with 2.4 GHz networks without interference.	2.4 GHz	More crowded 2.4GHz band. Some conflict may occur with other 2.4GHz devices like cordless phones, microwave ovens, etc.
Range	100-150	Good Range. Typically up to 100-150 feet indoors, depending on construction, building materials, room layout.	25-75	Shorter range than 802.11b & 802.11g. Typically 25 to 75 feet indoors.	100-150	Good Range. Typically up to 100-150 feet indoors, depending on construction, building materials, room layout.
Public Access		The number of public "hotspots" is growing rapidly, allowing wireless connectivity in many airports, hotels, college campuses, public areas, and restaurants.	X	None at this time.		Compatible with current 802.11b hotspots (at 11Mbps). Also, it is expected that most 802.11b hotspots will quickly convert to 802.11g.
Compatibility	OK 802.11b	Widest adoption.	OK 802.11a	Incompatible with 802.11b or 802.11g.	OK 802.11b 802.11g	Interoperates with 802.11b networks (at 11Mpbs). Incompatible with 802.11a.

Digi WiFi & Ethernet Components

Ethernet (Wired System)

Connector	Ethernet Magnetics	Analog — ADC/DAC — Digital	Ethernet Baseband	Ethernet MAC	Processor Interface (Bus)	Host Stack & Application

Transport	Ethernet PHY	NetSilicon Processor

WiFi (Wireless System)

PA/SAW/SW	RF Platform (Tx/Rx)	Analog — ADC/DAC — Digital	Baseband Processing	MAC or MAC Acceleration	PCI/Cardbus/CF	Bus I/F (CPLD)	Host Stack & Application

Other RF	Transceiver	ADC	FPGA	NetSilicon Processor

Digi

Wired Equivalent Privacy (WEP)

What is WEP?

- WEP was designed to secure the radio link

- Wired Equivalent Privacy (WEP) provides 64/128Bit encryption

- WEP uses 64-bit shared keys

- Minimum level of wireless security

- Not completely secure - weaknesses can be exploited by malicious users

Wi-Fi Protected Access (WPA)

What is WPA?
- Wi-Fi Protected Access (WPA) is a response by the WLAN industry to offer an immediate, strong security solution

WPA is intended to be:

- A software/firmware upgrade to existing access points/NICs

- Inexpensive in terms of time and cost to implement

- Cross-vendor compatible

- Suitable for enterprise, small sites, home networks

- Runs in enterprise mode or pre-shared key (PSK) mode

- WPA is a subset of the 802.11i draft standard and is expected to maintain forward compatibility with the standard

Wi-Fi Protected Access (WPA)

WPA Summary

- Fixes all known WEP privacy vulnerabilities

- Designed and scrutinized by well-known cryptographers

- Pragmatic sacrifice of best possible security to minimize performance degradation on existing hardware

- Will work in home, small business, and enterprise environments

Digi Wireless Security Settings (I)

Digi Wireless Security Settings (II)

Digi Wireless Security Settings (III)

Digi Wireless Security Settings (IV)

Questions?