Adding WiFi to Your Embedded System

WPG Americas & Gainspan
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Your partners for Embedded Wi-Fi

Multi Market Leader 32 bit ARM MCU

Leader Ultra low power embedded Wi-Fi

NXP’s & Gainspan’s largest distribution partner
GainSpan: Low Power Embedded Wi-Fi for IoT

- **SOC’s**
  - Low Power 802.11b, 802.11 b/g/n SoC’s
  - Pin compatible, size and cost optimized modules
  - Evaluation kits and boards

- **Modules & SDK’s**
  - MCU based hosts
  - Serial to Wi-Fi commands
  - Application development kits

- **ADK/Mobile Apps**

Connecting People to Things…
Connecting Things to the Internet…
Some Typical Applications

Healthcare and Fitness

Audio and Video

Smart Energy

(Industrial)

(Commercial)

(Home)

Control and Monitoring
GainSpan Low Power Serial to Wi-Fi Solution
(as easy as 1,2,3…)

1. Select NXP MCU Host
   • 32-bit ARM Cortex MCU
   • Small (6KB) driver/reference code
   • Application code
   • Serial to Wi-Fi with AT commands
   • No new tools
   “Application” “Wireless” “Application”
   “Wakeup” “Wakeup” “Wakeup”

2. Select Embedded Wi-Fi Module
   • GS1011MI – 802.11b low power - (Default module located on NXP Demo)
   • GS1011ME – 802.11b extended range
   • GS1500M – 802.11b/g/n
   • GS1550M – 802.11a/b/g/n

   UART/SPI
   “Wireless” “Wireless”
   “Wakeup” “Wakeup”

(Optional)
Customize Module Networking Features
SDK-Builder™

3. Develop Mobile & Web Apps
   • Use HTTP methods with XML
   • GainSpan ADK with GSLink™
   • Provisioning, setup
   • Firmware updates
   • Applications – web servers or clients

Connect to the Cloud (Optional)
Serial to Wi-Fi Demo Overview

- The NXP/GainSpan demo kit will provide customers the means to evaluate capabilities of the GainSpan GS1011 ultra-low power wireless module and the Serial-to-WiFi embedded software for Wi-Fi 802.11b networks.

- The GainSpan Serial-to-Wi-Fi embedded software allows device and appliance manufacturers to easily add Wi-Fi capabilities to their products with minimal impact on the NXP microcontroller firmware.

- Enables customers to develop software on their existing NXP microcontrollers to support the “AT” command set, and connect it to either the UART or SPI interface onboard the NXP/GainSpan evaluation board.
NXP/GainSpan Demo

Functions on board:

- TFT LCD Panel
- Accelerometer
- Temperature sensor
- Light sensor
- LED dimming
NXP/GainSpan Demo Benefits & Features

- Easy integration of Wi-Fi and web connectivity to devices with existing NXP microcontroller and UART or SPI interface.
- Offloads Wi-Fi and TCP/IP networking from smaller host NXP microcontrollers.
- Simple AT commands for configuration and data communication.
- Support for over the air firmware updates using external flash.
- Supports Infrastructure, Limited AP and Adhoc networking, Direct connect.
- Two UART and SPI ports. Clock Data rates are
  - UART: up to 921 Kbps
  - SPI: up to 3 Mbps
- Full Wi-Fi and networking stack services including TCP/UDP/IP, DNS, DHCP, HTTP and SSL.
- Wi-Fi Security
  - WEP, WPA/WPA2 Personal
  - WPA/WAP2 Enterprise
  - Wi-Fi Protected Setup (WPS 2.0)
- Power Save Modes – PS-Poll, Sleep, Deep Sleep, Standby
GainSpan GS1101 SoC Summary

**GS1011 Wireless SoC**

- **WLAN ARM 7**
  - Wi-Fi Radio, PHY, MAC, 128KB Flash
- **Networking Services ARM7**
  - 256KB Flash
- **Peripherals**
- **RTC and Power Management**

**Main Components**

- **Power Amplifier**
  - WLAN Transceiver 802.11b
  - WLAN MAC ARM7 CPU
- **Networking Services**
  - ARM7 CPU
- **Rom**
  - 80KB
- **SRAM**
  - 128KB
- **Flash**
  - 384KB
- **RTC/PWR Mgmt**
- **SPI**
- **UART**
- **ADC**
- **I2C**
- **PWM**
- **GPIO**
- **JTAG**
- **Antenna**
- **Optional Ext Power Amp.**
- **PA/DAC**
- **RF Switch**
- **44MHz XTAL**
- **Power Control**
  - 1.8V
- **Wake Up**
- **32/131kHz XTAL**
- **Battery (3.6V – 1.2V)**
NXP LPC1788 Features

- The LPC1788FBD208 was chosen for its flexible and scalable interfaces with key features such as an External memory bus, Ethernet, USB, and optional LCD.

- The LPC1788FBD208 is an ARM Cortex-M3 based microcontroller for embedded applications requiring a high level of integration and low power dissipation.

<table>
<thead>
<tr>
<th>Type Number</th>
<th>Flash (KB)</th>
<th>CPU SRAM (KB)</th>
<th>Peripheral SRAM (KB)</th>
<th>Total SRAM (KB)</th>
<th>EEPROM (KB)</th>
<th>Ethernet</th>
<th>USB</th>
<th>UART</th>
<th>EMC (1)</th>
<th>LCD</th>
<th>QEI</th>
<th>SD/MMC</th>
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<td>LPC178x</td>
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<td>LPC1788FBD208/LPC1788FET208</td>
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<td>64</td>
<td>16 x 2</td>
<td>96</td>
<td>4</td>
<td>Y</td>
<td>Y/H/O/D</td>
<td>5</td>
<td>32-bit</td>
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NXP LPC178x Block Diagram

- Low power
- High integration
- Cortex M3, 120 MHz
- 512 kB flash
- External memory controller
- Ethernet, USB 2.0
- 5 UART & 3 I2C
NXP/GainSpan Demo ADKs
(Application Development Kit)

GainSpan-NXP Wi-Fi Sensor ADK
- This ADK demonstrates the GSLink feature for communication between the NXP/GainSpan demo and an iOS or Android smart device or web application
- Works with Gainspan Wi-Fi Adapter board connected to the NXP demo board, which supports Temperature, Light and Accelerometer sensors
- Mobile Application Features
  - LEDs on the demo board can be turned on/off using an iOS or Android-based smartphone
  - Displays the temperature, light and spatial orientation sensors on the NXP Demo board
- Web Server application
- Future cloud connectivity, web client
NXP/GainSpan Demo ADKs (Application Development Kit)

- **Provisioning ADK**
  - Complete solution that enables provisioning and configuration of GainSpan Wi-Fi modules
    - Provision an embedded device (client) onto a secure network (WPA/2 Personal or Enterprise security) using web browser or smart device
    - Configure node in Limited AP mode
  - Allows users to quickly configure their wireless security and network options using either smartphones (iOS or Android based) or PC (web browser)
  - Web and mobile (iOS, Android native) applications
NXP/GainSpan Demo ADKs (Application Development Kit)

- **Over-the-Air Firmware Update ADK**
  - Enables wireless upgrades of the embedded firmware on GainSpan Wi-Fi modules using either a web browser or a mobile application
  - Update of embedded firmware can be done in Limited AP and Client modes
  - Includes Backup and factory restore options
  - Initiate from a Android mobile device or Web application
Connecting to the GainSpan module is as easy as using simple AT Commands

- Using AT commands, you can configure the bridge so data can be sent.
- Using a terminal app, issuing the command AT+NDHCP=1 allows the Evaluation Board to employ DHCP to obtain or renew its IP address.
- The command AT+NSTAT=? will show us the current network configuration of the Evaluation Board including the IP address. Example screen 1 shown below.

![Example screen 1: AT+NSTAT Output](image-url)
Availability

- This demo board allows customers to quickly begin using GainSpan embedded Wi-Fi product via the NXP MCU

- Boards will be available starting May 6. Please contact WPG directly.
Contacts and resources

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Thank You for Attending