



# Embedded Sensor Node Software

## Application Development Platform for the GS1011

### OVERVIEW

The GainSpan Embedded Sensor Node Software is a complete platform for developing applications for the GS1011 wireless single chip. It simplifies and speeds up customer software development and deployment efforts. It provides all the building blocks needed for a complete wireless sensor node solution.

The Software includes a comprehensive, yet simple, set of APIs that abstracts the hardware complexity, and embedded software that optimizes power management, system management and configuration, security, IPv4 network, and SNMP stack for a complete system solution for Wi-Fi sensors based on GainSpan's GS1011.

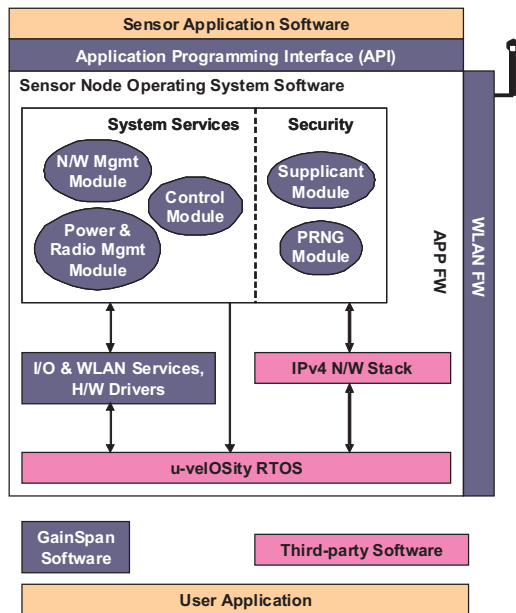
The GainSpan Embedded Software consists of wireless LAN firmware (WLAN FW) and application firmware (APP FW). Each runs on a dedicated ARM7 core within the device. The WLAN FW is provided in binary format, while the APP FW comes in linkable object and source format.

The WLAN FW contains:

- An 802.11 MAC/PHY and baseband driver functionality

The APP FW contains:

- About 60 APIs for managing and configuring / communicating with the device
- An IPv4 network and SNMP management stack (TCP/IP/ARP/DHCP)
- 802.11i security (WPA2-PSK) and EAPFAST authentication
- Low-footprint, reliable, and fast RTOS
- System services for control, power, and network management functionality
- I/O drivers to interact with external devices



### FEATURES & BENEFITS

- **Wireless capability (802.11):**
  - Wireless firmware that provides 802.11b/g compatible MAC/PHY and baseband functionality. Allows device to connect to the widely-deployed Wi-Fi infrastructure, reducing cost of deployment.
- **GS1011 APIs:**
  - Comprehensive set of APIs that help reduce complexity and enables faster time-to-market and deployment. Saves as much as 12-18 man-months of development effort.
- **Power management:**
  - Optimized power management enables years-long battery life. Simple APIs that enable fast lowpower state transitions for easy code development.
- **Network management:**
  - SNMP manager used for communication of management and data packets through UDP/IP. Simple API that reduces complexity of developing network management features.
- **I/O services and drivers:**
  - Enables sensor applications to interact with external sensors. Simplifies customer application development.
- **Security:**
  - Provides enterprise-level 802.11i security service (WPA2-PSK) for key generation and authentication (EAPFAST) with server. Does not require customer to spend development time on security.
- **Network stack:**
  - Green Hills Software's IPv4 network stack that supports TCP/IP/ARP/ICMP/DHCP protocols. Provides customer with a full IP functionality on a sensor node.
- **Real time operating system:**
  - Greens Hills Software's  $\mu$ VelOSity Real Time Operating System (RTOS) which provides fast boot up times, small size, multi-tasking functionality, real-time response via interrupts and timers. Provides customers with design flexibility.
- **Application software:**
  - GainSpan's reference sensor application (temperature, light, pressure, accelerometer) provides examples that can be easily modified to fit customer applications, thus speeding up product development.



### GAINSPAN EMBEDDED SOFTWARE MODULES

#### Drivers and WLAN firmware:

- Provides WLAN MAC and baseband capabilities. Supports over-the-air firmware update for ease of maintenance and future upgrades.

#### System services modules:

- SNMP manager for interoperability, device configuration, and power management functions.

#### I/O services modules:

- Enables sensor applications to interact with external sensors.

#### Supplicant (optional):

- Provides enterprise-level 802.11i security service for key generation and authentication with server.

#### GS1011 APIs:

- Reduces complexity and development time for customer application software.

#### Network stack:

- Third-party network stack that supports TCP/IP/ ARP/ICMP/DHCP protocols.

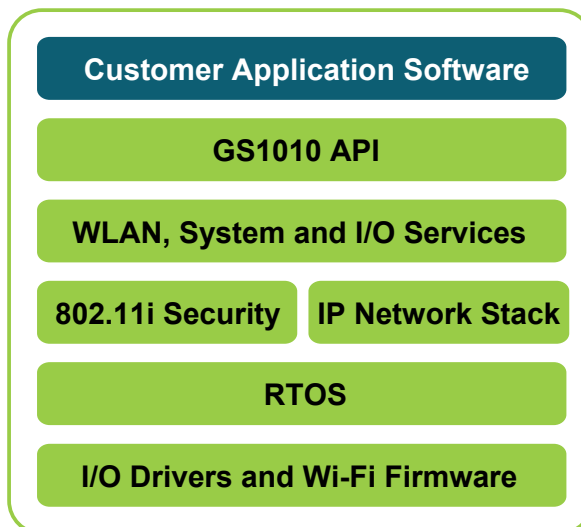
#### Real time operating system:

- Green Hills Software’s *μVeLOSity Real Time Operating System* (RTOS) provides interrupts and timers.

#### Application software:

- Customer sensor application software and GSDemo application.

### GAINSPAN EMBEDDED SOFTWARE STACK



#### GS1011 APIs

The GS1011 APIs abstract all the hardware complexity into simple and clear APIs that reduce development time and help improve product maintainability. GainSpan has developed APIs to cover most of the hardware features of the device. Refer to the *GS1011 Application Programmers Guide* for the latest list of APIs and detailed descriptions of each API and its usage.

### GAINSPAN EMBEDDED SOFTWARE API GROUPS

The table below describes the functions supported by each API group provided with the GS1011 Embedded Software. There are currently 58 APIs included with the package. APIs are updated and added as new features are requested by customers.

API Group	No. of APIs	Description
Peripherals	26	Provides read, write, and control for all the SPI, UART, I C, ADC, GPIO, and PWM I/Os on the device. Allows customer to easily develop code for reading external sensors or communicating with external devices.
Flash	2	Supports read and write configuration parameters from flash memory.
RTC	1	Ability to read the real time clock.
Power management	5	Ability to put the device into low-power state.
Network management and socket services	3	Perform configuration, link-up, or firmware update and send UDP or TCP packets.
Timers	3	Start, stop, and control of timers.
System services	9	Services to enable watch dog timers, scanning for access points, and setting parameters for WLAN activities.
IEEE 1588 (TSYNC)	9	Get a more granular timestamp by setting start, stop, and reading timers per IEEE 1588.