

# Intamac Smart Wi-Fi Node Reference Design Product Sheet

## Overview

This document describes the design of a Smart Wi-Fi Node (SWN) with a number of options which can be customised and adapted to address the variable market requirements for the rapidly evolving connected home appliance market. The design is targeted at appliance manufacturers wishing to add connectivity to their equipment to allow connection to internet and smart phone apps. A fully tested design can be provided in conjunction with the provision of a mechanical housing, subject to technical feasibility, or a customer can elect to carry out all mechanical design and testing using their own resource, with support from the design team.

## Technical overview

### Core system

The core of the unit uses the CC3200 SimpleLink processor from Texas Instruments to deliver both the Wi-Fi functionality and run embedded applications developed to the particular need of the customer.

- The processor is an ARM-Cortex-M4 at 80MHz with single-cycle on chip RAM.
- On Chip memory is fixed at 256Kbytes of RAM. This is used by the embedded Operating System, Wi-Fi Stack, and customised application code, though this is strictly limited.
- External SPI NORFlash is supported with 512Kbytes, the standard – The system boots from this device and all embedded software is stored in this device. Larger (or smaller) flash memory is possible.
- The core chip contains embedded Wi-Fi which can run as either endpoint or access point with hardware encryption acceleration, TCP offload engine and TI SmartConfig systems all included.

### External Peripherals

The following external connections are available:

- 1x I2C
- 2x SPI (master and slave)
- 2x UART
- 1x I2S
- 1x fast parallel interface for video
- GPIOs

Though not all of these can be used at once as pin count and multiplexing factors come into play to place constraints on these options. The particular combinations can be discussed in context of any particular application.

### External subsystems

Various other radios can be interfaced to this core module:

- 868MHz via SPI to a CC110L low-cost transceiver
- Bluetooth via CC2560 (or similar)
- Zigbee via CC2538 (or similar)

### Form Factor

As an example, the SWN with an additional 868MHz radio would require a PCB of less than 60mm x 40mm depending upon the connectors and power supply arrangements.

### Power

The device can be powered from a single 3.3V semi-regulated supply. Power requirements are approximately 4W peak with a 1W average sustained load (much of this is the Wi-Fi system naturally). No low power standby is currently provided, but one could be created if required and design parameters were known.

### Bill Of Materials

BoM cost is expected to be approximately \$10 for the SWN without any additional peripherals.

## Software

### Operating System and Embedded Libraries

A custom embedded OS is provided and chosen to enable the functioning of the system within the very small memory constraints. A server manager is provided which talks out to cloud services https. Other application software can be developed to deliver the required appliance monitoring function, and to interface to devices over the various I/O interfaces, or via external additional radios.

### Intamac ensoAgent™ embedded software

The SWN can use the ensoAgent™ embedded software to allow communication to the Intamac ensoCloud™ platform, and thence to smart phone and web apps. This requires a server adaptor which runs on the server and compresses/tokenises the data to and from these SWN. The embedded version of ensoAgent™ comprises the following elements:

- **The Rhenium Rules Engine – Re**

For the SWN a fully tokenised compact implementation of Re is required. This will accept tokenised rules from the ensoCloud™ platform and run them semi-autonomously until further notice. It can survive long periods with no Internet connectivity.

- **The Communications Manager – Cm**

This carries out the IP connectivity connections out to the ensoCloud™ platform and deals with delivery of telemetry and event based messages to that platform. It also polls for and receives commands and new configurations of rules etc from the platform.

- **The Device Manager – Dm**

This is available to manage through-connection to other devices via other low-power RF or directly wired peripherals.

- **Appliance Control Engine (e.g. Heating Control Engine – He)**

This accepts and manages tabular schedule data sets designed to enable the control of home-heating, hot-water systems, ovens and other home appliances and, for example, allows the scheduling of target temperature / time / day and different modes of operation. It can be customised to support different formats.

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## Conformance

The design is intended to enable compliance with the following standards and approvals, subject to the appropriate measures in mechanical enclosure design and integration:

- EU Directive on the Restriction of the use of Certain Hazardous Substances in Electrical and Electronic Equipment (ROHS2) [2011/65/EC].
- EU Directive on Waste Electrical and Electronic Equipment (WEEE) [2002/96/EC].
- EN60950 Specification for Safety of Information Technology Equipment including Electrical Business Equipment.
- EU Directive on Electro Magnetic Compatibility (EMC) [2004/108/EC].
- Tested as Class-B IT equipment.
- EN55022 Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement.
- EN55024 Information technology equipment - Immunity characteristics - Limits and methods of measurement.
- EN61000 Electromagnetic Compatibility.
- Wi-Fi conformance to R&TTE standards for Europe. A pre-approved Wi-Fi Module is used which may enable FCC certification.
- FCC-15 class B emissions.
- UL 1950, Standard for Safety of Information Technology Equipment, Including Electrical Business Equipment, Third Edition, Underwriters Laboratories Inc.

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