

Intamac Flexible Smart Gateway (FSG) Reference Design

Product Sheet

Overview

This document describes the design parameters of a smart gateway product with a number of options which can be factory-fit or no-fit in order to address the variable market requirements for the rapidly evolving connected home market. The gateway is targeted at consumer service operating companies such as telecoms providers and utility companies or others wishing to deploy connected home services and can be tailored to customer requirements.

The baseline options are:

- Wired and/or Wireless Ethernet for connectivity to cloud based services.
- Zigbee and/or Z-Wave for in home connectivity to sensors and devices.
- USB port for further external expansion.
- Audio output jack and/or loudspeaker.
- 5V DC input power with optional battery backup.

Care has been taken at the design stage to ensure a flexible design, without allowing excessive incremental cost in the bill of materials. Mechanical enclosure design is flexible but as a guide there needs to be approximately 125 x 125mm of PCB area. The software environment is Linux-based for maximum connectivity, device support and application porting compatibility.

Internet connection

The gateway can link to the internet using Internet Protocol using:

- Built in 10/100 baseT Ethernet, via the RJ45 connector.
- Built in Wi-Fi module 802.11 a/b/g/n as a pre-approved on-board module.
- A WPS (Wi-Fi Protected Setup) button is provided for easy setup. If this is not present then use of the wire-line Ethernet to initial set up followed by configuration of the Wi-Fi interface via this route is suggested.
- Optical coupling is an alternative, but there may be patent implications.
- Connections to the outside world and cloud services should be via HTTPS connections from the internal software so that third-party home firewalls do not block them.

Core processor and memory architecture

The gateway is required to communicate with a wide range of other devices and protocols and to be able to support a sophisticated software environment. Therefore a processor capable of handling this and the necessary memory footprint is required. The Texas Instruments AM335x series provides this, and offers sufficient powering of the low end options while offering higher performance chips if needed. These devices can also interface to the most up to date DRAM and Flash memories so that a core block can be provided which meets requirements at a commodity price point.

- Processor: TI AM3352 or higher.
- DRAM: 128Mbytes of DDR3 memory or larger.
- Flash Memory: 128Mbytes, code storage, configuration parameters and boot from flash.

Low power RF modules

The gateway provides the option of one or two active internal low-power RF modules. These are fitted as PCB-tiles and connected via a generic interface that provides power, ground, and commonly available serial-type interfaces so that other types and variants of tile can be added easily.

Initial tile designs exist for:

- Zigbee Pro 2.4GHz using the TI CC2538 integrated micro and radio.
- Z-Wave using the Sigma designs reference implementation.

The mechanical design needs to be sympathetic to the antenna placement for the radios, and guidance can be given during any final product development. Others which might be added and have been considered are:

- Bluetooth LE.
- Proprietary 868 or 433 MHz radios.

Audio output/loudspeaker

Drive circuitry is supported to include the option to fit an internal loudspeaker and / or drive audio output from a jack socket if required. A possible upgrade to the design is the addition of a microphone.

External Expansion via USB Port

An external USB 2.0 port is provided for expansion purposes to cover such functions as:

- 3G or LTE modem.
- Hard-disc or other local storage.
- Web-Cam.

In each case the device drivers for such devices will need to be obtained separately. Consideration has been given in the design of the power regime to support these likely options.

Power supply

Standard: 5v DC input.

The design is intended to have power brought in to the system as a 5V 2A feed such that the unit can have enough power for its own use and to power a selection of external devices on the USB port. Provision is made for a DC jack connection. This can be varied if required.

Option: Rechargeable batteries.

The option to add rechargeable batteries as back up is included in the internal power supply and management design.

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Software

The system is provisioned with software to bring it up and run the various interfaces.

- Bootloader with digital signature checking.
- Linux Operating System, file-system and common libraries.
- Drivers for USB, Ethernet, Audio, and other internal devices.
- Power Management software.
- Wi-Fi Drivers.
- Low Power RF drivers for the radio tiles.
- Firmware update over Ethernet or USB is provided.

Application software can be developed and / or ported to the system subject to the requirements of the end customer.

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.

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.

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