

# Intel® Connected Services Gateway Reference Design

Full-featured Intel® Atom processor-based platform reduces hardware development cost and accelerates time to market



## Connected Services Gateway

For many consumers and small businesses, the job of managing all of their media and communications services is already too complex. Households need a simple, single point of access and control for the wide range of services they receive, including television programming, Internet service, telephony, utilities and security monitoring. Likewise, small businesses want a single-box, Plug and Play solution to access, manage and store the wide range of media and communications services, such as phone, internet, security and energy management. New service models are also emerging, like home control, home healthcare monitoring, home energy management, solar panel and electric vehicle charging. Moving

forward, there is an opportunity to put new and existing services under one umbrella using a broadband-enabled, wireless gateway device – the Connected Services Gateway - built on a powerful Intel® architecture platform.

Simplifying gateway design, the Intel® Connected Services Gateway Reference Design provides equipment manufacturers and service providers with a validated platform, which greatly reduces development time and cost. This gateway design streamlines the delivery of services by providing convenient access via a single-box solution acting as a gateway, server, router and storage device. The solution can remotely access, monitor and control almost anything

in Plug & Play fashion, while addressing common security and power consumption challenges. This gateway design dramatically simplifies digital life and increases the potential market for current and planned services in communications, entertainment, security, e-health, social networking and more.

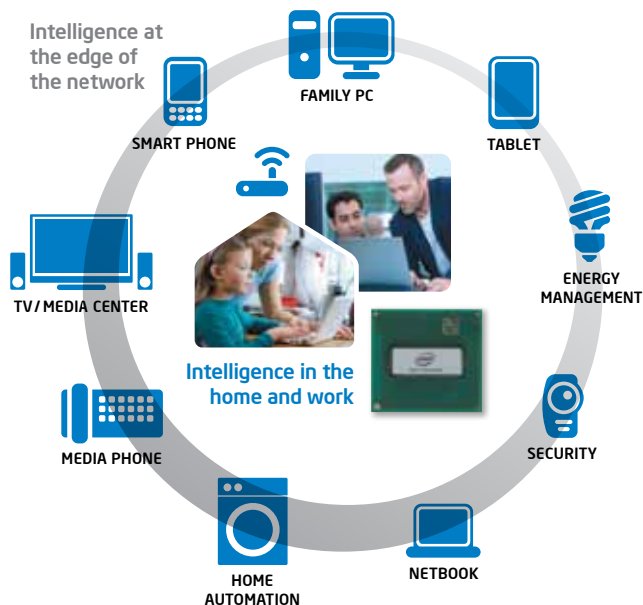


Figure 1. Usage Models for the Intel® Connected Services Gateway Reference Design

## Reference Design Model

The reference design is available through a royalty-free license granted by Intel. Equipment manufacturers and service providers can request the reference design, which includes schematic, layout and Gerber files. The Gerber files are manufacturing-ready, meaning they contain the artwork needed to build a printed circuit board (PCB). Alternatively, manufacturers can start with the schematic and layout files, customize the design and generate a new set of Gerber files.

A number of systems were built for validation purposes and for Intel's Seed Board program, and these evaluation units may be requested for a limited time. Intel is not manufacturing or selling systems based on the reference design. The reference design was developed for the sole purpose of helping solution vendors reduce hardware development cost and accelerate time to market.

## Reference Design Highlights

- **Processor:** The power-efficient Intel® Atom™ processor delivers high computing performance in a small footprint.
- **Fanless:** The design has a low cost thermal solution (main board: 15W)
- **Operating System Neutral:** The gateway runs most operating systems and ships with the Linux\* OS and Asterisk\* software.

- **Connectivity:** The platform supports various interfaces, including Ethernet, WiFi/WiMAX, 3G and ZWAVE\*.
- **Integrated Graphics:** The processor has an integrated enhanced graphics engine that provides a rich visual experience, while eliminating the power consumption and board space needed for a stand-alone graphics solution.
- **Software Stack:** The reference design contains various software components, including TR-069 remote management, parental control, firewall, advanced networking, application store, intelligent network attached storage (NAS) and telephony.

## Power-Efficient Intel® Atom™ Processor

The Intel® Connected Services Gateway Reference Design, illustrated in Figure 2, is based on Intel architecture, the platform for over 90 percent of the world's software. The gateway is equipped with the Intel® Atom™ processor N450<sup>4</sup> that integrates a memory controller and an enhanced graphics engine. Incorporating the Intel® 82801HM chipset, this two-chip solution provides an Intel® High Definition Audio<sup>1</sup> interface, along with rich I/O capabilities and flexibility through high bandwidth interfaces such as PCI Express\*, PCI, Serial ATA and Hi-Speed USB 2.0 connectivity.

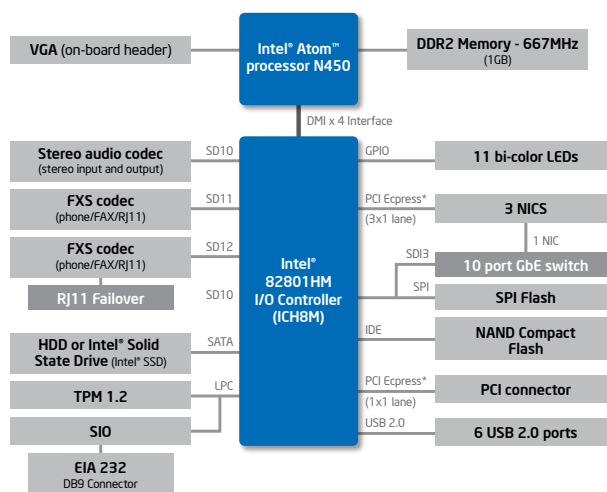


Figure 2. Block Diagram of the Intel® Connected Services Gateway Reference Design

The processor features Intel® Hyper-Threading Technology<sup>2</sup>, which allows it to process two tasks (or software threads) concurrently, increasing performance when gateways are servicing multiple interfaces simultaneously. To conserve energy, the processor enters enhanced Intel® Deeper Sleep (C4/C4E) during periods of inactivity. Moreover, Intel's hafnium-based 45nm Hi-k metal gate silicon process technology further reduces power consumption, improves switching speed and significantly increases transistor density over previous 65nm technology.



## Simplicity

While the exact design of a connected services gateway will vary based on the manufacturer and service provider, a typical solution will provide the following benefits to end customers and service providers:

### Consumers:

- **Simplifies digital life:** A single, multi-purpose device provides one-touch access to the applications and services in the home and for small businesses.
- **Reduces complexity:** One unified interface accesses a wide range of media and communications services—no more juggling multiple interfaces, devices, etc.
- **Eases management:** A central point of control makes it easier for a homeowner or small business manager to operate, manage and troubleshoot the home or small office network.

### Service Providers:

- **Aids service delivery:** This reliable consumer infrastructure creates an established, common vehicle for service delivery now and long-term.
- **Meets future service needs:** Intel architecture supports current and future applications for phone, entertainment, Internet, home security, home automation, smart metering, e-health, etc.
- **Protects investment:** Service providers can amortize their product investments over an extended period by using long life support (7 years) for embedded Intel® products.

## Versatility and Extensibility

Designed with versatility and extensibility, the Intel Connected Services Gateway Reference Design delivers value to consumers and Service providers today and over an extended period of service:

- Supports many services where consumers see value.
- Facilitates service providers seeking high margin services to drive customer loyalty and retention.
- Provides the performance and computing headroom to support new services.
- Partitions user and service provider software to accommodate the changing needs of both.
- Enables remote service support.

## Chassis Design

The reference design is supported by a third-party chassis vendor, and contact information is available through Intel. The chassis, as shown in Figure 2, supports a large number of light-emitting diodes (LEDs) indicating status about the operation of the box. The back panel has connectors for ten gigabit Ethernet LAN ports, telephony with failover, audio and a serial port.

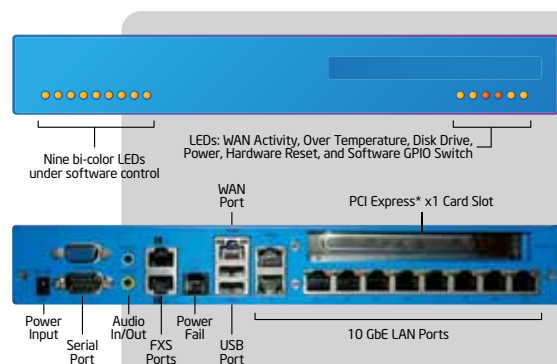


Figure 2. Reference Design Chassis (front and back)

## Reference Design Features

The standards-based Intel® Connected Services Gateway Reference Design supports a number of industry standard interfaces and commercially available modules via PCI Express expansion ports, as indicated in Table 1. Equipment manufacturers can create different versions by populating the PCI Express\* expansion slots with graphics cards and wireless adapters.

## Benefits for Developers

This Intel® Connected Services Gateway Reference Design, supporting a wide range of connected services, offers significant advantages for developers:

- **Reduced Time-to-Market:** Complete, manufacturing-ready board design helps reduce development time and risk.

FEATURES	DETAILED DESCRIPTION
Intel® Processor	Intel® Atom™ Processor N450 (1.66 GHz, 5.5W)
Base CPU Socket	FCBGA (559)
Intel® Chipset	Intel® 82801HM I/O Controller (ICH8M)
Memory: 1 channel	1024 MB DDR 2-667 MHz
Chassis Dimensions	1-3/4"(height) X 11-1/2"(width) X 8-5/8"(depth)
Display Interfaces	1 x VGA
Storage	SATA interface for hard disk drive or solid state drive IDE interface for compact FLASH
Ethernet Switch	10 x GbE ports managed switch, controlled by the Intel chipset or the daughter board. (10 x RJ-45 connectors for external WAN and LAN connections)
I/O Ports	6 x USB 2.0 (2-internal, 2-external, 2-auxiliary) 2 x FXS (Foreign Exchange Subscriber) ports with FXO failover SPI interface for serial flash device Stereo Line-in/Stereo Line-out General purpose I/O (GPIO) for LED's
Expansion Ports	4x PCI Express* x1 lanes, used as follows: 1) Ethernet switch 2) Daughter board via Ethernet 3) WAN connection 4) 2/3 length daughter card
Power Supply	12V DC Input, 65W

Table 1. Reference Design Features

- **Architectural Familiarity:** Nearly every software engineer has had education and training on writing code that runs on Intel architecture processors.
- **Optimal System Form Factor:** Low-power, small form factor design satisfies requirements for space-constrained environments (e.g., above ceilings and in equipment closets).
- **Architectural Compatibility:** Intel architecture crosses multiple environments – in the home, business, mobile and embedded.
- **Broad Range of Solutions:** Intel reference designs are supported and enriched by a strong ecosystem of hardware and software providers, including members of the Intel® Embedded Alliance. [www.intel.com/go/embeddedalliance](http://www.intel.com/go/embeddedalliance)

## Jump Starting Your Next Gateway Design

Intel is enabling its ecosystem partners to develop and build the reference design, which will be available as a commercial off-the-shelf (COTS) product for system manufacturers. This design is the hardware basis for a family of products capable of servicing a large portion of the connected services gateway market. The reference design uses Intel Atom processors to provide the computing horsepower needed for compute-intensive functions like telephony and processing network stacks. By supporting the right features in a flexible platform, the Intel® Connected Services Gateway Reference Design can reduce development cost and accelerate time to market for equipment manufacturers.

To learn more about Intel's solutions for digital signage, please visit [www.intel.com/go/connecteddevices](http://www.intel.com/go/connecteddevices)

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† Intel processor numbers are not a measure of performance. Processor numbers differentiate features within each processor family, not across different processor families. See [www.intel.com/products/processor/processor\\_number](http://www.intel.com/products/processor/processor_number) for details.

<sup>1</sup> Intel® High Definition Audio requires a system with an appropriate Intel® chipset and a motherboard with an appropriate codec and the necessary drivers installed. System sound quality will vary depending on actual implementation, controller, codec, drivers and speakers. For more information about Intel® HD audio, refer to <http://www.intel.com>.

<sup>2</sup> Intel® Hyper-Threading Technology (Intel® HT Technology) requires a computer system with an Intel® processor supporting Intel HT Technology and an Intel HT Technology enabled chipset, BIOS, and operating system. Performance will vary depending on the specific hardware and software you use. See [www.intel.com/products/ht/hyperthreading\\_more.htm](http://www.intel.com/products/ht/hyperthreading_more.htm) for more information including details on which processors support Intel HT Technology.

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