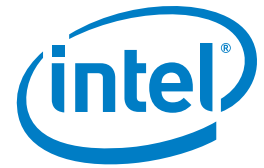


SOLUTION BRIEF

Intel® M2M Reference Design based on Intel® Atom™ processor
Ericsson* F5521GW Mobile Broadband Module
Machine-to-Machine (M2M) Applications



Streamlining M2M Platform Design

Reference Design Features Standards-Based Technologies from Ericsson* and Intel



"We made a conscious decision to stop developing our own platforms, and I think that this type of strategic decision is a growing trend among developers."

*- Nathan Johnston,
Principal Technology Architect, XATA*

The structure of the M2M (machine-to-machine) market today is such that solutions are nearly always customized for a specific vertical market or application. While there is a need for a modest amount of vertical customization, the market can move toward a much more standardized model in the areas of connectivity enablement, hardware platforms and middleware software. Echoing this direction, Nathan Johnston, principal technology architect at XATA said, "We made a conscious decision to stop developing our own platforms, and I think that this type of strategic decision is a growing trend among developers." Mr. Johnston was describing his company's approach to fleet operations management system development at a recent M2M Roundtable in Las Vegas sponsored by Ericsson*.

Providing an alternative to proprietary platforms, the Intel® M2M Reference Design supports standards-based technologies, including the F5521GW mobile broadband module from Ericsson. The reference design spares system developers from designing a board from scratch and mastering the complexities of wireless technology, making it easier and less costly to create M2M applications. With a footprint the size of a credit card¹, the design supports a variety of wireless connectivity and delivers the computing performance required for M2M applications.

3G Opportunities in M2M

Wireless connectivity is driving new M2M opportunities and process changes in many industries. In the energy sector, smart metering is decreasing operational expenses for utility operators, who no longer need technicians to physically read meters. Transportation companies are sending optimized routes over-the-air to vehicles on the road, which lowers cost and improves safety. With telemedical solutions, healthcare providers can keep close tabs on patients whose vitals are transmitted via wireless monitoring devices. Confirming growth in M2M opportunities, the number of cellular M2M (machine-to-machine) connections will quadruple from 2009 to 2015, when it reaches nearly 300 million globally, according to ABI Research*¹.

Extensible, Standards-Based Platform

The pace of innovation in the M2M industry hinges on the availability of standards-based platforms that let developers do what they do best, write and deploy new services, instead of designing devices. Serving this purpose, the Intel M2M Reference Design, based on technologies from Intel and Ericsson, is available to accelerate device development. It is designed with ample computing and connectivity headroom, which provides the flexibility to take



Figure 1. The Ericsson* F5521GW Mobile Broadband Module

on new workloads in support of next generation service models. The result is an extensible and open platform capable of incorporating future M2M services, thus extending the device's useful life.

Advanced Mobile Broadband

Offering true HSPA evolution speeds, the F5521gw mobile broadband module from Ericsson gives embedded machines industry-leading wireless connectivity. This module, pictured in Figure 1, supports 21 Mbps D/L and 5.7 Mbps U/L, which satisfies the most demanding services, such as transmitting video. Higher speed opens the door to machine applications requiring faster response times and larger data transfers.

Uniquely designed with innovative features, the F5521GW mobile broadband module enhances security and manageability. For example, the module remains connected while the machine is in sleep mode, allowing users to remotely wake up the system. This is achieved with wake-on-wireless technology that also enables the ability to disable the machine in case of tampering or theft, and supports instant distribution of important messages and security updates. Ideal for the embedded market, the module has low power consumption and fast start-up time.

The F5521GW module comes with an enhanced GPS solution that utilizes AGPS for fast and accurate location assistance. This GPS functionality lets equipment manufacturers combine the wake-on-wireless feature and embedded network assisted GPS functionality to create a

range of differentiating services, including remote manageability, security updates, asset protection, tracking and geofencing.

Proven Design

Greatly simplifying the design-in effort, the F5521GW module is a complete solution, including hardware, connection manager software, drivers and support. The module provides exceptional coverage, supporting HSPA, WCDMA, EDGE and GPRS technologies, thanks to the Quadband on 3G and 2G. The solution has been tested and pre-approved by operators worldwide, enabling quicker time to market with low risk. The module sits in a standard PCI Express* Full Mini Card slot on the Intel M2M Reference Design board.

Small Wireless Platform

The Intel M2M Reference Design provides a manufacturing-ready platform supporting a variety of wireless connectivity, including WiFi, ZigBee* and mobile broadband solutions from vendors such as Ericsson. Now, manufacturers of connected devices can dramatically lower development and product cost with this Intel® Atom™ processor-based platform in a COM Express* form factor. Measuring a mere 84 mm x 55 mm, this "nano" form factor (Figure 2) is ideal for space-constrained, fanless environments. The module sits on a carrier board in a case measuring 97mm x 67 mm, not including antennas or connectors.





Figure 2. Reference Design COM Express* Module

Benefits for Developers

The Intel® reference design, featuring support for multiple wireless connections, offers significant advantages for developers:

- **Lower Risk:** Without prior wireless experience, equipment manufacturers easily implement wireless technologies designed into proven COM Express modules, allowing an early start to prototyping and software development.
- **Reduced Time-to-Market:** Complete, manufacturing-ready COM Express design reduces product definition effort and development time, thereby shortening product schedules.
- **Diverse Open Source Software:** A wide variety of open source software is available, including the Linux* operating system, chipset drivers and protocol stacks.
- **Optimal System Form Factor:** Low power, small form factor design satisfies requirements for space-constrained environments (e.g., above ceilings and in equipment closets).
- **Simpler Build management:** Equipment manufacturers only need to track one line item for a COM Express module instead of more than a hundred parts associated with the computing system.
- **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.

COM Express* Advantages

COM Express is a Computer-on-Module (COM) mezzanine architecture that places the processor, chipset and memory in a compute module that is seated under the carrier board. This solution, illustrated in Figure 3, makes it possible to swap in different COM Express modules for the right level of performance, especially since the same carrier boards can be used with

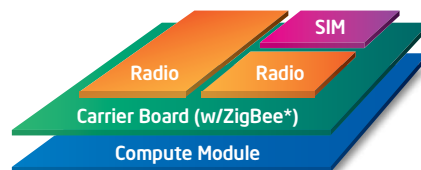


Figure 3. Reference Design Stackup

multiple generations of compute modules. The nano-sized module is an extension of the COM Express architecture to a smaller (84x55mm) form factor that maintains

backwards compatibility with the COM Express connector and pin definitions, thus enabling vendors to meet smaller footprints. Applying the COM Express modular architectural approach, equipment manufacturers can reduce development effort and risk, simplify manufacturing and streamline support processes, compared to fully custom designs.

COM Express* Carrier Board

The Intel M2M Reference Design based on the Intel Atom processor employs a carrier board that is nearly the same size as its companion nano-sized COM Express computing module with a Type 1 or Type 10 connector. The design, illustrated in Figure 4, supports two PCI Express Mini Cards for wireless connectivity: a full-size card for a mobile broadband module, such as the Ericsson

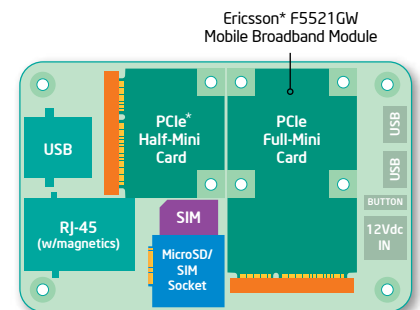


Figure 4. Reference Design Carrier Board

F5521GW, and a half-size card for a WiFi, Bluetooth* or WiMAX module.

The carrier board also has an 802.15.4 radio to support wireless PAN protocols such as Zigbee. Three USB ports are available to support additional connectivity or interfaces. There is an RJ-45 connector with onboard magnetics for connecting to a wired Ethernet LAN. An accelerometer is attached to the I²C bus.



Power-efficient Intel® Atom™ Processors

The reference design's block diagram, illustrated in Figure 5, meets the needs of a large assortment of performance-intensive, small form factor systems that require low power. An Intel® Atom™ processor Z5xx series, paired with the highly integrated Intel® System Controller Hub US15W (Intel® SCH US15W), has a combined thermal design power (TDP) under 5 watts.² The Intel® chipset integrates a graphics engine supporting 2D and advanced 3D graphics, high-definition video decode, image processing and LVDS/SDVO display interfaces. This platform's low power consumption and embedded lifecycle support is ideal for many embedded markets, especially those requiring fanless operation.

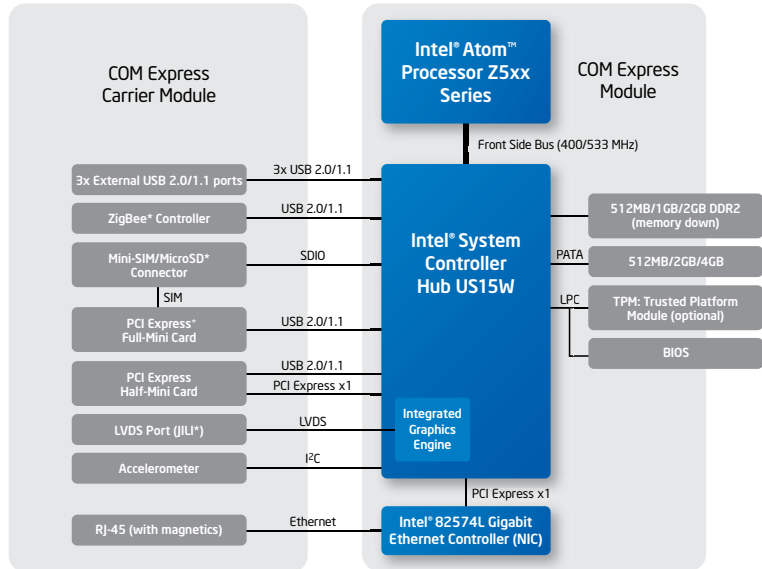


Figure 5. Reference Design Block Diagram

Jumpstart Your Wireless Design

Simplifying M2M machine design, the Intel M2M Reference Design, based on the Intel Atom processor and the Ericsson F5521GW mobile broadband module, provides equipment manufacturers and independent software vendors (ISVs) with a platform that can greatly reduce development time and cost. The design features standards-based technologies that enable equipment manufacturers to streamline product development and get to market faster.

As the M2M industry evolves, network connectivity will be a check-off requirement for most every device. Satisfying this expectation, the reference design delivers a small, powerful and low power solution.

To learn more about the Ericsson Mobile Broadband Modules, please visit <http://www.ericsson.com/ourportfolio/products/mobile-broadband-modules>

To learn more about Intel's solutions for wireless connected devices, please visit www.intel.com/embedded/connecteddevices

† Compute card is about the size of a credit card, the carrier board and case are slightly larger

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¹ Source: <http://www.abiresearch.com/research/1003047-Cellular+M2M+Connectivity+Services>

² Source: <http://ark.intel.com/system.aspx?groupID=41175&configID=27616&chipsetID=41241>

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