

# INCISOR™

for the short  
range connectivity  
environment

Video enabled  Issue 146

June 2010



## ENERGY HARVESTING COMES OF AGE

### THIS ISSUE

ENOCEAN ALLIANCE CELEBRATES LANDMARK BUILDING  
INSTALLATIONS

MOBILE BROADBAND – FACING THE CAPACITY CRUNCH  
CAN THE CB SCHEME HELP YOU?

# jack! locke! sawyer! – i'm still LOST ...

OK so that was a gratuitously topical headline, thrown in there after having watched the LOST finale last night and still wondering what the heck it was all about. That's six years of my life I'll never get back. If I am to believe the web traffic, we are to believe that faith triumphs over science. OK.

However, when you are trying to build a market for technology, you need a healthy portion of faith (Groan .... Am I really continuing to try to wrestle this theme into my intro? Yes I am). The EnOcean community seems to be demonstrating that its faith in energy harvesting technology was valid. At the EnOcean event in London this month, which was attended by the IncisorTV camera team, the Alliance and its members celebrated a number of very significant installations for its technology, including Barclays Bank, which is re-fitting more than 500 of its High Street branches with EnOcean-based systems, and apparently there are now more than 100,000 real installations around the world. EnOcean really does seem to be gathering momentum. You can read our report, and view the movie we made at the event on page 7.

Also this month, Tim Fowler of Cambridge Consultants looks at the real possibility of 'capacity crunch' in the mobile networks, and identifies how the situation might be moved forward, while Joe Lomako of TRaC examines whether the IECEE CB scheme can help your wireless product to market?

And, as we have dallied here with science fiction, we also take a look at 60 GHz technology. The WiGig Alliance is linking up with the Wi-Fi Alliance to create a super high bandwidth next gen extension to Wi-Fi. The briefing seemed to involve some smoke and mirrors. Read about it on page 10 and let me know what you think about prospects for 60 GHz – email me at vholton@incisor.tv

**Vince Holton**

**Publisher & editor-in-chief, Incisor / IncisorTV**

## INCISORTV FOCUS THIS MONTH:



Which is the best Bluetooth in-car choice – factory installed or aftermarket? Incisor.TV considers the options.

## FROM INCISOR'S READERS

"It was a pleasure to meet you at the Bluetooth AHM in Seattle. Always nice to put a face with the blogs and all of the good work you've done in general for the wireless community.

Good luck at Incisor magazine. Hopefully our paths cross again".

**- Josh Schilling, Design engineer, Nonin Medical Inc**

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100K+ installations, new 2-way sensors, it was all happening in London

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### CB OR NOT CB? THAT IS THE QUESTION

By Joe Lomako, TRaC

### SWIMMING WITH DOLPHINS – ENERGY HARVESTING WITH ENOCEAN

Dean Gratton uncorks another vintage.

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## Mitsubishi selects Broadcom's Bluetooth for TVs

Broadcom tells us that Mitsubishi Digital Electronics America has selected Broadcom's Bluetooth technology for streaming stereo audio to the premium audio systems built into select Mitsubishi Unisen Immersive Sound LED televisions.

Frank DeMartin, Vice President of Marketing, Mitsubishi Digital Electronics America commented, "Premium audio quality is a hallmark of our immersive sound television products. We're giving consumers the television experience of an ultra high-end home theatre system, seamlessly integrated into a sleek LED flat panel or large screen 3D TV package you can only get from Mitsubishi. Mitsubishi is pleased to work with Broadcom to extend the premium audio experience to personal media devices, with Bluetooth providing the ideal wireless connection to our Unisen Immersive Sound televisions."

Broadcom Bluetooth technology will enable wireless MP3 and other digital music players to be a sound companion with Unisen HDTVs. Broadcom has adapted and enhanced its Bluetooth solutions to gain broader adoption in consumer electronics applications, such as advanced remote control functionality and wireless audio streaming. Mitsubishi has adopted this technology for several new models in its line of large screen 3D DLP Home Cinema and Unisen Immersive Sound LED TVs.

"Even though many consumers are now familiar with Bluetooth and most have the technology built into their mobile phones, the full potential has hardly been tapped. The addition of Bluetooth by Mitsubishi to select high definition television sets highlights the ever wider array of applications that Bluetooth is expanding



into, showing off how consumers can gain greater value from various devices by using them together," Craig Ochikubo, Vice President & General Manager, Broadcom's Wireless Personal Area Networking line of business.

## Bluetooth SIG hires CTO

Andy Glass has joined the Bluetooth SIG's growing staff as chief technical officer. Glass was most recently a senior leader for Mozy, a cloud computing venture specializing in secure online backup.

He brings more than ten years of Bluetooth experience to the SIG. Early work with Bluetooth started in 2000 when Glass was a member of the Microsoft Windows Core team working on protocol bus architectures. As the Bluetooth technical program manager for Windows, he championed Bluetooth technology both within Microsoft and across the industry, becoming a leading advocate of personal area networking technology. In this position, he led the first two releases of native Windows support for Bluetooth technology and supported the initial development of Microsoft's line of Bluetooth enabled peripherals.

Glass has also held leadership roles within the SIG membership including four years service as an active member of the Bluetooth Architectural Review Board (BARB) during which time the important Bluetooth Core Specification Versions 1.1 and 1.2 were developed, and also held Microsoft's position in the Bluetooth Qualification Review Board (BQRB) during the re-architecture of the Bluetooth Qualification Program to allow for member self-certification. Additionally, Glass served as a member of the Bluetooth SIG Board of Directors from 2003 to 2004.

According to SIG exec director Mike Foley, Glass' primary focus as CTO is to aid the



SIG membership in establishing the vision for Bluetooth technology and creating the specifications that will support that vision. This includes work on profiles and continuing the growth of higher speed and low energy technologies.

## Solar-powered hands-free Bluetooth speakers

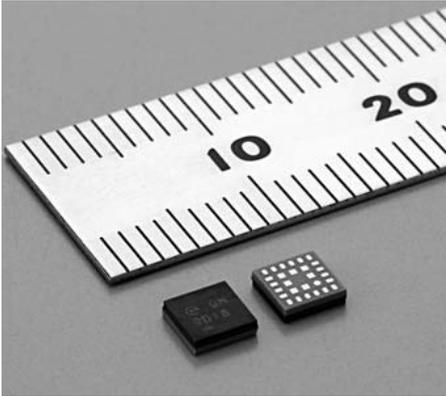
Beewi is shipping a set of pocket-sized Bluetooth speakers. They are pretty compact (10 x 4.8 x 1.2 cm) and lightweight (42g).

Both boast 1W performance, five hours talk time and 40 days of standby time. Beewi is pushing usage beyond the car, saying that the speakers are compatible with all Bluetooth devices, and can be connected to your phone in the office to share your conversations with colleagues and run conference calls.

The solar-powered BBS020 has a speaker on one side and a solar panel on the other. Two suction cups attach it to your car windscreen so it's permanently charging during daylight hours. 'Sounds pretty handy – you can save the environment and never run out of battery power again.

Both the BBS010 and BBS020 have multipoint functionality which allows two mobile phones to pair up to it simultaneously. So if you're driving with a partner or colleague, pair both your mobiles to get instant, hands-free speakerphone audio as soon as either one of you receives a call.

The solar power aspect does sound neat – we will ask Beewi for a sample so that we can test it to find out if this does solve the 'oh no I need to charge my speakerphone and I really needed to make an important call now' problem.



## Murata starts shipping smallest Bluetooth module in the world. Allegedly

Murata has begun shipping the latest version of its LBMA series Bluetooth module, which at 3.5 by 3.5 by 1.0 mm is claimed to be the smallest in the world, 30% smaller than Murata's previous version. The word 'allegedly' is used in the headline in a semi-humorous fashion, by the way, rather than as an insult. It's impossible for us poor journalists to know whether these claims are true or not, but it doesn't stop companies making them in their press releases!

By way of another milestone, Murata is trumpeting the fact that in the ten years since initiating mass production of the original LBMA series in March 2000, it has produced in excess of 500 million units. Once again, Murata is staking a claim, as it states that this is the highest cumulative production volume of Bluetooth modules in the world. The original LBMA Bluetooth module was 14 x 10 mm, so today's version represents a 90% reduction in footprint in the last 10 years.

This latest version of Murata's Bluetooth module technology has been produced, says Murata, to respond to the market's demand for smaller products, using the company's proprietary ceramic substrate, high frequency design/evaluation technologies, and miniaturisation expertise.

According to Murata's hardly shy press release, the Bluetooth module shipping today packs in advanced high frequency design technology, plus excellent EMI resistance through the use of Murata's packaging technology. The module uses Bluetooth Ver2.1+EDR, with sensitivity of -79dBm, output power 0dBm (class 2) and requires a supply voltage of 3.3V.



Murata says that the LBMA series is suitable for mobile phones, portable media players, digital photo frames and other mobile internet devices.

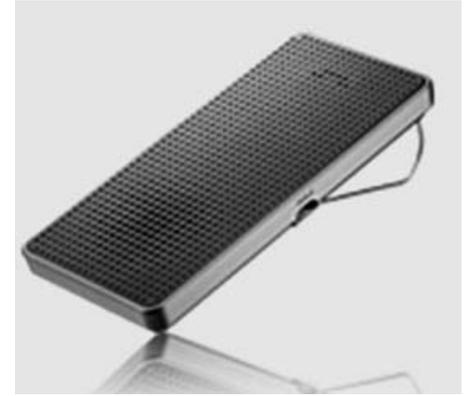
## Chinese take away car joke opportunities

There's no doubt that consumers all over the world have been seeing dramatic improvements in the quality of cars coming from Korea and Taiwan, and maybe it is time to stop making cheap jokes about Chinese cars. At the 2010 Auto China show in Beijing, Strategy Analytics says that it saw much improvement in new models on display.

"The emergence of more discerning consumers and the growth in technical centers of established global vendors working with Chinese OEMs on new product development are encouraging improvement," said the author of this Insight, Kevin Mak, Industry Analyst of the Strategy Analytics Automotive Electronics Service.

The pace of product improvement has quickened as global OEMs ramp up their operations, importing flagship models while looking for new sales from the inland and rural markets. A greater use of platform-based model development has enabled the Chinese players to maintain their cost advantage in these markets, while adding features and entering the higher model segments in the highly competitive markets of the major cities. Some Chinese vendors are using the Australian market as their first steps in exporting cars to mature markets. Furthermore, unit car sales growth will not be as rapid this year as it was during 2009. Chinese OEMs will now emphasize quality and maximizing sales value per unit sold.

Corresponding Strategy Analytics research also looked at Chinese powertrain developments and the new Android-based



infotainment system, InkaNet, which was deployed on the new Roewe 350 compact sedan.

## There's life at CSR!

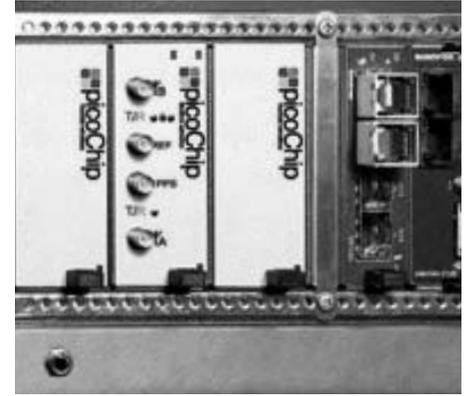
Since the company reinvented itself following the acquisition of US GPS specialist SiRF, we haven't heard much from CSR, which has taken a bit of adjusting to as the company has been, for most of its history, one of the most forward-leaning and communicative wireless semiconductor companies.

It seems there is life post-SiRF though, as Incisor has received a press release from the Cambridge company this month. CSR tells us that LG Electronics' new HBM585 ultra-thin Bluetooth mono headset and HFB320 hands-free car kit both utilise CSR's Bluetooth audio platform with what is now fifth-generation CVC noise and echo reduction.

CSR's single-chip solution comprises an on-chip DSP core, stereo CODEC, audio algorithms and BlueCore Bluetooth functionality. CVC is a manufacturer-tuneable suite of low power audio algorithms that run on CSR's DSP. It provides far-end and near-end noise suppression, echo cancellation, speech intelligibility enhancements, automatic volume control and concealment of packet loss and bit errors.

"We value the opportunity to work closely with LG to bring our very best wireless audio solutions to market in compelling products for the benefit of end users," said Anthony Murray, SVP of CSR's Audio and Consumer Business Unit.

At just 3.8mm the HBM585 is an ultra-thin headset. The LG HFB320 is a Bluetooth car speakerphone which benefits from the latest hands-free echo cancellation that addresses "residual" echo due to speaker distortion. This allows higher audio volumes to be used without perceptible echo in car speakerphones.



## Cambridge Consultants extends Iridium innovation

Cambridge Consultants tells Incisor it has achieved another milestone in its collaborative relationship with Iridium Communications Inc. In coordination with Iridium's engineering team, Cambridge Consultants led the design process of the new Iridium 9602 short burst data (SBD) transceiver, which is nearly 70% smaller than the previous model, contains approximately half the number of parts and is now commercially available.

The Iridium 9602 is smaller, lighter and costs less to manufacture than the previous model, the Iridium 9601 transceiver. According to Iridium, the core technology will have a significant impact on its future product roadmap with new opportunities for Iridium-integrated devices and solutions. Iridium believes that the 9602 revolutionises global two-way data communications, opening up new opportunities for Iridium development and distribution partners in global machine-to-machine (M2M) and asset tracking markets.

"The Iridium 9602 is the latest achievement from our eight year collaborative relationship with Iridium and we are extremely proud of our contributions to the company's success," said Richard Traherne, head of wireless at Cambridge Consultants. "The Iridium 9602 utilises two customised, application-specific integrated circuits (ASICs), greatly reducing the number of parts from 769 in the previous device to 384."

The use of the two ASICs makes the Iridium 9602 approximately 70% smaller in size and 74% lighter in weight than its predecessor. The customised ASICs also improve the lifecycle of the Iridium 9602 compared to devices created with ready-made, commercial-off-the-shelf parts.

"The Iridium 9602 offers a more efficient design, coupled with global real-time service, making it the best value in the industry," said David Schoen, vice president, product development and chief technology officer, Iridium. "Cambridge Consultants is a valuable, long-term partner and provides Iridium flexible access to one of the largest wireless contract development teams in the world. Cambridge Consultants' expertise minimises our R&D cost, allowing us to quickly bring to market innovative, game-changing products such as the Iridium 9602. Our design partnership with Cambridge Consultants is a key component of our successful product innovation."

After a two-year R&D program, the Iridium 9602 has completed system testing and is now shipping.

## Handset navigation shipments to reach 180 million by 2015

A new ABI Research forecast for handset-based navigation shipments finds they are expected to grow at a Compound Annual Growth Rate (CAGR) of 43% over the next five years, rising from 30 million in 2010 to 181 million in 2015. The handset navigation boom is largely driven by free turn-by-turn navigation solutions recently made available by Nokia and Google. During its last earnings call, Nokia announced that Ovi Maps had already been downloaded more than 10 million times. While Google Maps Navigation was initially only available on Android phones in the US, it is expected to be introduced gradually on other platforms and in other markets, as demonstrated by the recent launch in the UK.

Increasingly, navigation services – but also LBS (Location-Based Services) – are being included in packaged offers from handset vendors and carriers, subsidized by

smartphone hardware or data communication revenues. These new business model paradigms upset the traditional value chain in which the end user pays directly for value-added mobile services. They put pressure on the smaller independent vendors which are unable to leverage market share and brand to generate new revenue streams such as advertising, to reduce costs through crowd sourcing, or to offer bundled services. Consolidation, says ABI, will be unavoidable.

## picoChip's PC960x LTE femtocell wins award

picoChip's PC960x product received the Best Enabling Product/Technology Award at the Informa LTE Awards during the recent LTE World Summit in Amsterdam. The PC960x is a reference design for an LTE "small cell" basestation or femtocell.

Developed in conjunction with Continuous Computing and Cavium Networks, the PC960x delivers full evaluation and prototyping capabilities for small form factor LTE products ("Home eNode B") optimized for metropolitan, enterprise and residential applications.

"Many analyst reports, including recent work from Rethink Wireless and Signals Research, point out that LTE requires a dense network of small cells optimized for high-capacity data services to deliver on its full potential. The PC960x is the first product explicitly designed to enable this 'metrozone' architecture," said Rupert Baines, VP of Marketing at picoChip.

The Informa LTE Awards took place at the LTE World Summit. Entries were examined by an independent panel of judges, against criteria including the product's contribution to making LTE more attractive to an operator to deploy and differentiation from other products on the market.

# British drivers least likely to get jiggy behind the wheel

**Seat belts, airbags, hands-free driving laws and devices – they’re all designed to help make us safer and more responsible on the roads. However, new survey results, sponsored by headset and in-car speakerphone trailblazer Jabra, suggest we’re anything but responsible when driving.**

Despite technology to help keep both hands on the wheel, people are choosing to use their hands elsewhere whilst driving. The most common activities for the six countries polled ( US, UK, France, Germany, Russia, Japan) include eating, changing clothes, operating GPS systems, yelling at other drivers, texting and even performing sexual acts whilst behind the wheel. To compound issues, only about half of the survey respondents reported they’re using a hands-free device, which is the law in many countries.

For commuters, some activities may seem time-saving, with nearly 25 percent admitting to styling their hair or changing clothes while the car is in motion, but ultimately these acts are perilous, potentially resulting in serious injuries.

The majority of respondents (72%) also admitted to eating food regularly while driving, which might seem convenient with fast food and drive-throughs, but for others’ safety it is important to keep both hands on the wheel, not the meal.

Further survey findings include:

- 29% of respondents admitted to kissing others while driving, whereas a smaller, but surprising number (15%) said they’ve performed sex or other sexual acts while driving
- 28% confirmed they text while driving
- 25% admitted to changing clothes while driving, whereas much fewer (5%) have shaved while behind the wheel
- 13% reported they apply make up while driving
- 10% also reported reading newspapers or magazines while driving
- 5% confessed to playing video games, while even more (12%) admitted to writing or reading emails while driving



“We have seen the demand for hands-free devices increase as most of Europe and numerous American states pass laws prohibiting the use of hand-held devices while driving, but we are honestly shocked at what people are doing with their hands – even when not using a headset or speakerphone,” said Anne Raaen Rasmussen, Vice President of the Mobile division at Jabra. “Jabra’s products are designed to help drivers keep both hands on the wheel – not the meal, newspaper, make-up, or another person in the car. The bad behaviour that was revealed in the survey at first seemed to be a joke, but in reality they are really quite frightening and a threat to everyone’s safety on the road.”

Road rage in general appears to be a global issue, with 63 percent reporting that they yell at other motorists while driving – and the French appear to be the biggest offenders. Young people (age 18-35) from all countries also appear to be engaging in bad driving behaviour with higher frequency, but at the same time don’t feel that these activities are as dangerous as perceived by those who are older. Across the board, the Japanese are the worst offenders when it comes to personal grooming while driving and electronic distractions like video games, movies, audio books, and music devices. At the opposite end of the scale, the British appear to be more safety oriented with the highest level of awareness around highly dangerous driving behaviour.

## INCISOR EVENT REPORT

# EnOcean Alliance validates UK foothold with major building references

**At its first London Open House Exhibition on the 20th of May, the EnOcean Alliance announced the growing presence of self-powered wireless technology in the UK, and revealed first time details of high profile residential, commercial and industrial building automation projects across the country. Member companies involved in the event included Beckhoff, Distech Controls, EnOcean, Leviton, MK Electric, Wago, Wieland and Thermokon.**

IncisorTV attended the Open House Exhibition, where EnOcean Alliance member companies demonstrated a broad selection of energy saving products ranging from occupancy sensors, key cards, LED-dimmer systems, thermostats, window contacts and CO2 sensors. Furthermore, the world's first solar energy free ventilation application for schools was showcased by Distech Controls. Utilising a combination of free ventilation and solar power, via a solar-powered radio sensor module from EnOcean, the Solar EnergyMax manages air supply and extraction in buildings. The internal fan unit has a D.C motor which is driven by either a solar photovoltaic cell or a dry cell battery to keep it constantly charged for operation through the night and enabled for up to three days without any form of light. The Solar EnergyMax system is currently rolling out to schools throughout the North and South of England.

Visitors were offered practical advice from member companies on how to simply and quickly save energy and carbon footprint in existing and new buildings. Using self-powered wireless switches and sensors enabled by the EnOcean standard building professionals can reduce planning, installation and rework time and costs - even retrofit without any disruption.

From a technology point of view, EnOcean GmbH demonstrated the world's first sensor modules based on its bi-directional and energy autonomous Dolphin platform. The Dolphin platform

enables sensors to communicate in two directions, resulting in a sensor network dialogue that facilitates entirely new possibilities in building automation and a variety of other processes.

## Several new reference projects in UK

During the event, Nick Clark of Client Support Services UK, Mark Davenport of Distech Controls and Graham Martin of the EnOcean Alliance presented on the market opportunity for intelligent automation technology, highlighting Barclays Bank, O2 Headquarters, Scottish and Southern Energy (SEE), GlaxoSmithKline (GSK) amongst the many successful UK references.

The Barclays Bank installation in particular was extremely impressive. Upwards of 500 High Street branches are now in the process of converting to EnOcean-based systems. According to Clark and Davenport, the project has been quick to install, simple

in operation and is already achieving a very fast return on Investment.

## Just flick a switch ...

One hackneyed wireless semiconductor industry veteran, who confessed to having come to the EnOcean event with a somewhat jaded mindset in relation to new technologies, told IncisorTV that once he saw EnOcean Alliance Executive Director Graham Martin press the EnOcean light switch he was holding while making his presentation, and a light bulb flashed on across the room, another one did so inside his head. So, there we are - another convert to EnOcean technology! Strangely, this is the same reaction that Incisor had at a first meeting with Martin in London a couple of years ago.

Want to learn more? No problem. IncisorTV filmed the EnOcean event, and you can watch an overview here by clicking on the movie screen. Beyond that, go to: [www.enocean-alliance.org](http://www.enocean-alliance.org)





Tim Fowler  
Commercial Director,  
Wireless Division,  
Cambridge  
Consultants

# The mobile capacity crunch - is there hope?

By Tim Fowler  
Commercial Director, Wireless Division,  
Cambridge Consultants

Twenty years ago, in the embryonic days of 3G, fast mobile data was projected to be an imminent user demand. Even before the world-wide-web was part of our daily lives, data services held much promise. While the capability arguably was available, for a long time consumers just didn't seem interested.

Then in 2007, on the eve of the Launch of the iPhone, the New York Times quoted the CEO of AT&T...

["AT&T has invested \\$16 billion in its network over the last two years, and the network is now designed to handle the expected increase in wireless data users... Capacity won't be an issue. The network is ready"](#)

Two years later, a Newsday article reads less favourably...

["According to AT&T all those dropped calls, dead spots, and slow download speeds isn't their fault, it's yours"](#)

AT&T have been pioneering this market and are by no means alone, but what went wrong, and what is being done now that the consumer demand, that seemed elusive for so long, has exploded into life?

With one of the largest independent wireless development teams in the world, Cambridge Consultants has been a key developer of broadband wireless technology through this period, providing our clients with valuable business insight and technology design services. In this edition of Incisor, we examine the 'capacity crunch' issue to identify how the situation might be moved forward.

Having invested heavily in spectrum, networks and marketing, service providers want users not only to adopt,



but become reliant upon mobile broadband technology. Users are already sufficiently reliant on mobile voice services that they will sign up for long term contracts or pay in advance for this utility. For data services to become equally essential, consumers have to perceive enough value from the service that they cannot do without it. This is where the challenge lay for so long – how do you make consumers think that a service they've lived without is now essential? This required an emotional attachment – and this was where the iPhone was a market-changer.

At the same time, business (BlackBerry) users found new PC-dongles beneficial. And, while mobile broadband consumer numbers had remained relatively small,

operators had been changing their pricing models to offer flat-fee mobile broadband data bundles in an attempt to kick the market into life. These three factors together (pricing, Smartphones and PC-Dongles) led to a massive growth in both attach-rates and usage. More than 100,000 Smartphones sell globally per day. Each Smartphone uses roughly the same capacity as 30 standard phones and a PC dongle as many as 450. But the flat-fee is not 450 or even 30 times the standard monthly mobile phone fee. So the networks have become very busy, very quickly, but without the growth in revenues. The genie is definitely out of the bottle.

Voice services are very predictable. Some users may make more calls than



others, but users are hard pushed to make more than one call at a time, certainly not 30. But the usage of Mobile broadband services in terms of megabytes is completely independent of the service the user sees. Consumers have no idea how much data will download when clicking on a web-link. This is why flat-fees are essential to comfort consumers of mobile broadband services. Consumers struggle to understand how to modify their behaviour to affect charges when they pay per megabyte. When talking on the phone we know that long calls cost more than short ones, but for Internet services, consumers have no idea what they will consume from one minute to the next, only that they will consume. This makes it very difficult to price average consumers out of more costly usage behaviour. They would just get frustrated and angry. So pricing appears too blunt a tool to generally raise revenues, which in turn means a genuine reduction in operator costs is the key to future success. The flat-fee for a bundle that meets the vast majority of user's needs, with penalties for small number of users who abuse the service seems likely to remain for the near term.

Reducing cost needs technological solutions and several broadband wireless technologies are aimed squarely at addressing this issue. LTE is probably the most talked about offering, promising higher bandwidths, lower latency, flatter all-IP networks and, importantly, lower operational costs. Getting more efficiency from the spectrum overall is the task at hand however; but we don't just need higher bits per hertz, but Gigabytes of payload carried per megahertz per month per square kilometre per unit cost is the more complex measure that really matters. Wireless technology clearly has a significant part to play in terms of getting higher bandwidths over more of the cell area, improving cell-edge performance and increasing the efficiency of use of the air interface when shared between large numbers of users. LTE promises to help here.

To improve the overall measure of efficiency, an appropriate network architecture is needed that allows more cells per square kilometre at economic cost points to make best use of the finite spectrum resource. Publicly funded studies have suggested that between 1700MHz and 2400MHz of spectrum could be needed to meet demand. That means almost all of the useful spectrum available today would have to be handed over to cellular use – something that is impossible in a generation, let alone a few years. Smaller cells will become essential to fit more traffic into the finite spectrum available. To reduce costs,

base stations, backhaul technology and core networks need to be optimised in cost terms. This is where Pico and Femto cellular base stations will grow in importance.

The current dilemma of the divergence between costs and revenues will place a high demand and a potential high-reward to those who can provide the innovation to make the changes necessary to change the game. Wireless Broadband Technology is here to stay. Its rapid evolution over the next few years is essential to the future profitability of the operators and hence the suppliers who rely upon them, and also the satisfaction of the users who have only started to adopt these services.

[www.cambridgeconsultants.com](http://www.cambridgeconsultants.com)

## INCISOR TV

### Video presentations

When it comes to assessing what is really going on in the market, there is no substitute for seeing products in action and hearing 100% accurate information from the people at the sharp end. Incisor TV provides that insight.

**Click on the links below to watch recent Incisor TV presentations**

- [Bluetooth 2010 All Hands Meeting](#)
- [Anoto - 10 years of digital pen and paper](#)
- [BiteBack Sweden](#)
- [CES 2010 Daily Show report – Day 1](#)
- [CES 2010 Daily Show report – Day 1](#)
- [CES 2010 Daily Show report – Day 1](#)
- [BiteBack Asia](#)
- [BiteBack USA](#)
- [BitBack UK](#)
- [IncisorTV commercial for CSR/SiRF merger](#)
- [DECT Forum and CAT-iq in 2009](#)
- [Bluetooth SIG – Best of CES 2009](#)
- [WiMedia Alliance – UWB in 2009](#)
- [Incisor showreel](#)
- [WiMedia special - UWB - a high performance solution / part 1](#)
- [WiMedia special - UWB - a high performance solution / part 2](#)
- [WiMedia special - WiMedia and Bluetooth](#)
- [WiMedia special - Updating the WiMedia roadmap](#)
- [WiMedia - The future for UWB](#)
- [Bluetooth low energy wireless technology](#)
- [IncisorTV commercial for CSR – BlueCore7](#)
- [IncisorTV commercial for CSR RoadTunes](#)
- [IncisorTV commercial for CSR BlueCore Player](#)
- [A guide to Bluetooth Version 2.1 + EDR](#)
- [10 years of Bluetooth / Best Bluetooth of CES 2008](#)
- [CES 2008 – Profile of Parrot](#)
- [Introducing Incisor](#)
- [2007 Wireless Symposium](#)
- [Bluetooth / Wibree launch event \(full version\)](#)
- [Incisor TV overview: the Bluetooth SIG / Wibree Forum merge](#)
- [Best Bluetooth of CES 2007](#)
- [Incisor profile: Icron Technologies and Extreme USB](#)
- [Wireless USB special - Introducing Wireless USB](#)
- [Wireless USB special - Wireless USB in use](#)
- [Wireless USB Special - Regulatory, approvals and interoperability](#)
- [Wireless USB special - The future for Wireless USB and UWB](#)

# Where goes WiGig?

## 60 GHz wireless won't pass through paper, but will it pass muster?

By Vince Holton

**I've just had my second briefing from the WiGig Alliance. For those of you a little confused about which wireless industry alliance is which, WiGig is one of the players in the unlicensed 60 GHz part of the spectrum, and is corraling members to help promote multi-gigabit – 7GBps – wireless solutions under royalty free terms.**

Competition for WiGig in the 60 GHz space includes the WirelessHD Consortium, which is aiming for a whopping 28Gbps of bandwidth in order to service support for 3D video, 240Hz frequencies, and 4K resolution, and which also happened to have announced the availability of its WirelessHD specification on the 19th of May. More of WirelessHD later ...

So, what was my 'briefer' - Bruce Montag, WiGig Board of Directors member, and a member of the Senior Technical Staff in the Office of the CTO at Dell - talking about?

Well, WiGig is trumpeting a partnership with the Wi-Fi Alliance. The two "will share technology specifications for the development of a next-generation Wi-Fi Alliance certification program supporting Wi-Fi operation in the 60 GHz frequency band." There wasn't much more to that part of the announcement, and as such it's not exactly an announcement that you can get your teeth into.

Should the partnership build into something substantial, then it's possible to see how both sides could benefit. WiGig instantly gains the credibility of a 'by proxy' association with the Wi-Fi Alliance, an organisation whose technology is well established and widely used, and which has a great deal of global awareness – and clout. The Wi-Fi Alliance gains something perhaps more tangible, and that is a route to bandwidth well beyond the capabilities of its existing 802.11 a/b/g or even 'n' specs. The WiGig spec is, after all, already complete, having been released in December 2009.

However, I came away from the briefing feeling a little unconvinced. First off, I



asked Montag about the target markets for WiGig, and I was told these were wireless docking of PCs and wirelessly connecting media devices to displays to play video/TV content. Not a very broad set of apps, I thought, and then remembered that Montag's day job is at Dell, and what does Dell do? It makes computers. Then, when I asked Montag for timescales, he had nothing to tell. Specifically, I asked when any of the silicon companies would have WiGig chips, and he was unable to give me any idea at all. "Talk to the silicon companies" was all I got. Now, I would have thought that a BoD member for an organisation such as WiGig, and especially the poor sap who is being pushed forward to brief the media, would have some positive sounding, albeit probably vague, statement to make about when companies would be able to start working with WiGig. But no.

But then, by some spooky coincidence, I learned that one of the wireless chip vendors – SiBeam – is planning to be the first company to ship a WiGig 1.0 chip. Its SB8110 includes WiGig functionality and is sampling now, apparently, with a developer's kit hitting the streets during June. That's got to be good news for WiGig (although why did Montag not talk about this?), hasn't it, but it is also strange, strange, strange. Why so? Because SiBeam is one of the WirelessHD trailblazers, and the SB8110 is essentially

a WirelessHD solution. WirelessHD is a technology that exists in the 60 GHz space and provides super high speed wireless bandwidth.

Er... Aren't WiGig and WirelessHD competing with each other?

SiBeam's position could be seen as quite clever. SiBeam is the company that is leading the pack in CMOS silicon design for the 60 GHz sector, and just maybe the company is thinking that by developing a WirelessHD + WiGig chip it will be the only company supplying silicon for two 60GHz markets simultaneously. What's more, by tying the two specifications together in one piece of silicon, SiBeam may create a market for WirelessHD among those PC and CE OEMs who might not have otherwise considered it. And third, by having a foot in both camps, SiBeam is protected against the possibility that WiGig's 60 GHz pitch could win out over WirelessHD. I think this is called dancing clever.

Making the silicon story a little bit more plausible, Cambridge Consultants (see Luke D'Arcy's sidebar piece) told us just before we went to press, that IBM and Mediatek had also recently announced 60 GHz silicon solutions.

So, I'll admit that my briefing by the WiGig Alliance left me feeling a little un-moved



and that the presentation was a bit 'thin' – i.e. lacking in substance. But, there's no doubt that a) there is a demand for high speed wireless technology (see the comments made by Bluetooth SIG members during the Board of Directors panel session at the recent All Hands Meeting in Seattle, for example – [view the IncisorTV movie here](#)), and that b) 60 GHz is a route that is being examined by many. Is 60 GHz the right solution though? In conversation with a number of people in the industry, I have heard a number of comments about potential restrictions. Mainly, these are about range. 60 GHz is generally accepted to be a 'within room' technology, as it has little or no ability to pass through walls are around obstacles.

## The Blue View:

We're keeping an interested eye on what's going on in the 60 GHz space. We're examining how the technology could fit into the Bluetooth ecosystem and will move forward with the appropriate solution when the time is right.

Since Bluetooth technology is built in such a way as to be an easy plug and play application layer over the eventual transport, a 60 GHz solution would be a

"It couldn't pass through a sheet of paper" was one amusing comment.

You will see that we've gathered opinions on both the technical and commercial promise of 60 GHz from a number of industry luminaries. One thing for sure is that too many of the movers and shiffters are looking to 60 GHz for the technology to simply go away. Incisor will be running another feature shortly that goes beyond the WiGig/Wi-Fi Alliance tie-up, and examines more closely the real prospects for this technology, which, today, has something of an ethereal or spectral quality.

We don't say that very often about wireless industry matters!

natural extension to the Bluetooth family of specifications. However, there's still a lot of questions to answer and time and energy to be spent.



**Mike Foley**  
Executive director,  
Bluetooth Special  
Interest Group.

## The product development specialist view:

Some of the key strengths of 60 GHz technology are that there is lots of available spectrum and the signal does not penetrate walls. This means that virtually all the spectrum is reusable on room by room basis. 7GHz of free bandwidth enables very high data transfer rates - >1Gb/s will be possible, with no interference problems. Plus, the high frequency means the antenna size is very small. As a result it is practical to have military style antenna arrays that can focus and direct beam like signals. This is very attractive because it means that the transmitter can bounce signals off walls to reach the receiver, avoiding any obstacles that might otherwise block the transmission.

Conversely, there are weaknesses too: 60GHz signals don't go very far in air because they are strongly absorbed by oxygen. They are also blocked by solid objects, including sheets of paper. This limits them to a single room at best. Then there is very high power consumption, at least in the early silicon, and it will be very expensive (e.g. adding ~\$100 to the cost of a TV), at least for the early silicon.

Wireless docking requires the simplest possible transmission method, which makes it easy to see why WiGig is going for this first. Any applications have to be bounded by in room communication. I am dubious

about other applications because they are mainly targeting connecting up static devices (e.g. BlueRay player and a TV; a docked laptop and a monitor). Nearly all successful mass market wireless technologies involve some element of mobility (e.g. a cellphone, Bluetooth headset, laptop/Wi-Fi access point). Mobility is arguably the most attractive thing about making something wireless. A non-mobile wireless product is a bit like a Ferrari pulling a caravan - it can do it, but it's missing the point (and it's not the cheapest way of pulling the caravan either).

30 member companies and 15 adopters may not seem like many, but if they are all serious about it then this is easily enough to get WiGig off the ground. However, at least some of the member companies will be just watching to see what happens.

Also they need to be able to articulate some really valuable end-use benefit. UWB had a lot of supporter companies but it still failed, mainly because they were not able to do this.



**Luke D'Arcy**  
Business development  
manager  
Cambridge Consultants

## The market research company view:

I've been researching for my upcoming report: The World Market for WLAN - 2010. Many of the companies I'm interviewing (IC suppliers, OEMs and others) are taking a 'technology neutral' approach and will support whichever high speed technology prevails, be it Bluetooth high speed or Wi-Fi direct – or 60 GHz.

The idea that WiGig will take the baton from Wi-Fi Direct is a very appealing concept. Firstly it will mean that WiGig technology will have an established infrastructure and, by working with the Wi-Fi Alliance, WiGig is not a competing technology but the next generation. Many in the industry are very optimistic about the technology and like the fact that Wi-Fi is developing a long term strategy. Essentially this technology has only just begun to be developed; the road from inception to mass adoption is long.

There are some concerns:

- The 60 GHz frequency is limited in range and essentially will be confined to line-of-sight cable replacement, providing a technology that solves only a limited set of problems.
- In the course of research for my P2P high-speed wireless report, many considered that such a high carrier frequency (an order of magnitude higher than that of current standards) makes the analogue and antenna design difficult.
- In addition, challenges are posed by the huge bandwidth of 7-GHz with the 60 GHz band. Operating frequencies can vary about 15% as opposed to only 3% in 802.11 standards.

Despite the fact that 60 GHz technology has received positive publicity, many technologies in the past began well, but suffered as they promised too much and delivered too little. So, as usual, it's a case of time will tell.



**Filomena Berardi**,  
Market research analyst  
IMS Research



Joe Lomako,  
TRaC

# Can the CB scheme help your wireless product to market?

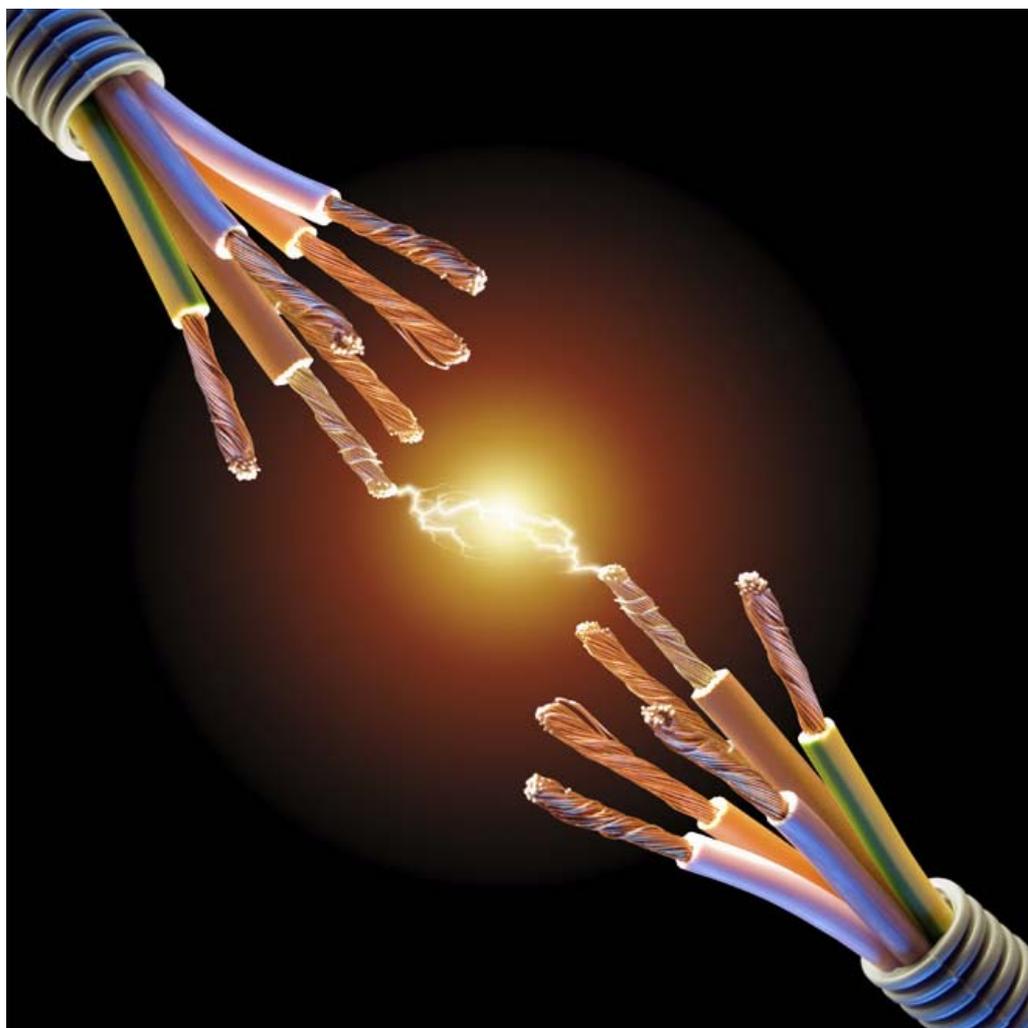
By Joe Lomako,  
Business Development Manager, TRaC

**CB or not CB: that is the question.** When you have worked in the telecoms and electronics approvals industry for many years, I think you tend to forget that to some people the compliance and approvals process can appear to be very complex. That's usually because it can be!

Take the manufacturer of a Bluetooth or ZigBee product. These radio modules are now incorporated into thousands of different product types, with a truly global market reach. So when it comes to compliance testing, the manufacturer usually knows that it needs to go through EMC and radio testing, but the safety aspect of the testing can often be overlooked; and when it comes to marketing the product in various countries around the world the proverbial brick wall can be encountered. This can be particularly frustrating as many different countries around the world have varying requirements for the safety testing of products which are to be allowed in their territory.

However, all is not lost!

Enter the **"IECEE CB Scheme"** for safety. The IECEE CB Scheme is an international system which applies to the safety of electrical and electronic products so that they can be readily accepted in international markets. It is essentially a **Passport for safety compliance**, and can be used in support of applications for National Marks such as UL or CSA. It provides an excellent conformity assessment platform for manufacturers wanting to trade in global markets and whose products need to demonstrate third party conformity to relevant standards. It consists of 54 member bodies whose aim is to promote mutual recognition of the testing process. It is also possible for some



countries which are not part of the CB scheme to accept CB certified reports as a demonstration of compliance.

So how does it work? Well we mentioned earlier that many different countries have varying requirements; well that is also true of the countries participating in the CB

scheme, but fortunately they have agreed on a common framework. Let's look at an example as a way of explanation:

Consider a ZigBee product manufacturer who has an In Home Display (IHD) device displaying information from a smart meter, which he wishes to market in Argentina,



Singapore, South Africa, Malaysia and Taiwan. The product is simply presented to a CB recognised Test Laboratory (CBTL) who will perform "base" testing to a common standard, IEC 60950-1. Then additional testing is performed which covers the additional test requirements for each of the countries required. A test report is produced which is then sent to a National certification Body (NCB) for review (An NCB is a body authorised to assess and certify CB test reports - of which TRaC is one), after which a "CB certificate" is issued. This test report can then be presented, as part of the regulatory process, to the regulatory authorities of the target territory in which the manufacturer wishes to market his product. Countries such as Malaysia, which are part of the CB scheme, will accept the report and certificate in its entirety. Even countries which are not part of the CB scheme (eg. Taiwan) will accept the report as part of their approvals process.

Some certification marks may require a small amount of additional testing dependent on the product type, as in this case of an IHD device; however a safety approvals expert should always be consulted when planning the compliance program to ensure efficient and cost effective access to market.

The beauty of the CB process is that it is scalable. Imagine our manufacturer wishes to add a further country after he has performed this initial testing, say 6 months after the original test. Because he has entered the CB scheme he can simply have the CBTL perform further testing which covers the variants for that country, then have this testing reviewed by the NCB and then have the CB certificate updated. This is particularly beneficial for ongoing compliance of a developing product; if there is an update or a variant of a previously tested product, the initial testing can be re-visited and partial testing performed only on the update. This again saves valuable resource and expedites time to market.

This versatility can also be applied to a manufacturer who has no idea which countries he is yet to market his product in. He may wish to start his marketing campaign in his own (national) country, so a suitable process would be to have testing performed by the CBTL to IEC 60950-1, perform the additional testing to satisfy his national requirements (if needed), and then acquire his CB certificate. He then he has a good foundation on which to build should he wish to expand his market reach at a later date.

Conversely, it is worth noting the potential consequences of not going through the CB route. Let's take again our



conscientious manufacturer of ZigBee IHD. For examples sake; he is UK based and has performed his testing to EN 60950-1 (not IEC 60950-1 which has a number of differences). He is OK for the EU, but should he wish to market his product farther afield (we initially said Argentina, Singapore, South Africa, Malaysia and Taiwan), then he will have to start from scratch, which is inevitably going to cost more money for the testing and of course is going to be time consuming, which could obviously have an effect of the product timeline.

Although our examples above reference IEC 60950-1, there are many other standards in the CB scheme which can be applied; for example products such as audio/visual or household equipment.

So, the question was CB or not CB? (Yes I know it's corny, but I can resist it)

The choice is up to the manufacturer, but if there is even the slightest chance that the target market for a product could expand, then the CB route for safety compliance should seriously be considered, because spending maybe an extra £1000 pounds at this stage could save you many thousands later on,.....so really it's "YES CB" !!

#### About TRaC

*TRaC is a leading test group with accreditations for all major markets worldwide. It has established itself with a reputation for unrivalled excellence in global approvals, testing and certification. TRaC provides the assessment route to product manufacturers and designers to ensure they fulfil their legal obligations and demonstrate full compliance with the requirements of countries around the world. For more information, visit [www.tracglobal.com](http://www.tracglobal.com)*

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## Cambridge Consultants Blogs

**Why are we blogging?** We believe that the technology market is much better when it is highly connected, and social media is a fantastic tool that instantly connects people who face similar challenges, irrespective of whether they are budding entrepreneurs running their first high growth start up company or a captain of industry in charge of a global bluechip company. So, if you'd like to add to the debates, please feel free to comment on any of our blogs. It would be great to hear from you.

Patrick Pordage  
Marketing Communications Director  
Cambridge Consultants.

#### Corporate Blog

Our corporate blog covers new product development, open innovation, accelerating start up companies and other topics that involve using innovation to achieve market leadership, along with technology stories that we hope you will find interesting/

#### Consumer Products Blog

Topics include connected devices, beverage dispensing, eco innovation, new product introduction (NPI), open innovation, novel control interfaces and other topics related to our development of innovative consumer electronics, domestic appliances and fast moving consumer goods.

#### Wireless Medical Blog

Examining mobilehealth and telehealth technology ad market challenges, this blog provides insight from implantable and hospital communications to consumer health applications.

#### Mobile Wireless Technology Blog

Smartphones, netbooks and tablet PCs are making mobile connectivity an essential part of everyday life for many people. This blog examines the issues faced by technology professionals, network operators and industry analysts working to keep people connected on the move.

#### Short Range Radar Blog

Devoted to the topics surrounding short range radar systems in the 0 to 10km range. Examples of systems covered include in-wall, through wall, short range border surveillance and in-fill radar for both ATC and military applications.



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# Swimming with Dolphins:

## How EnOcean's new energy harvesting platform will keep wireless afloat

by Dean Anthony Gratton

I RECEIVED AN EMAIL A WEEK OR SO AGO FROM THE ENOCEAN ALLIANCE, INVITING ME TO ITS FIRST OPEN HOUSE EXHIBITION IN LONDON. THE EXHIBITION WAS STAGED TO SHOWCASE THE CONTINUING SUCCESS AND GROWTH OF ENOCEAN TECHNOLOGY, DRAWING ON THE FACT THAT THE TECHNOLOGY HAS ALREADY BEEN SUCCESSFULLY DEPLOYED IN OVER 100,000 BUILDINGS ACROSS THE WORLD. FURTHERMORE, ENOCEAN BOASTS SEVERAL PROMINENT BRITISH COMPANIES AS PART OF ITS ALLIANCE, NAMELY BARCLAYS BANK, O2 AND SCOTTISH & SOUTHERN ENERGY. THE STAR OF THIS GREAT EVENT, HOWEVER, WAS UNDOUBTEDLY ENOCEAN'S ALL NEW WIRELESS SENSOR NETWORK AND SOFTWARE DEVELOPMENT KIT, THE DOLPHIN PLATFORM.



It was the focus of unrivalled attention during the exhibition, thanks to its unique sensor modules (a world's first according to EnOcean) that facilitate new and exciting possibilities in building automation, along with many other processes. Personally, I'm devastated that, due to personal circumstances, I had to miss out on the opportunity to attend the exhibition (thanks anyway Graham) and, of course, I'm also referring to the opportunity to consume unnecessary quantities of wine!

### Are we there yet?

Anyhow, a day or two following the exhibition, Vince dropped me an email asking me to pick up the story. So, it's a late Saturday afternoon and I'm sipping my way through a glass of red, whilst eyeing up the rest of the bottle (no surprises there then). I have Shakira's 'She Wolf' playing in the background and I'm now ready to break the blank page. Okay, I will have to be honest and confess to some overindulging following my wife's birthday celebrations yesterday. We had a smashing time (I think) – food and wine, but not necessarily in that order! Nevertheless, the glass of vino, and Shakira serenading me in the background seem to be the perfect remedy for my fuzzy noggin. Back to the story ...

To begin with, my Inbox was dutifully inundated with all kinds of paperwork, to include numerous PDF and Microsoft Word documents, PowerPoint presentations and whatnot – so much to read through and understand. Naturally, I needed to acquire as much information as possible to be able to confidently convey EnOcean's technology. Moreover, it's late in the month and I'm seriously running behind schedule with this feature (I swear I can hear Vince's voice in my ear saying 'are we there yet?').

### EnOcean's solid foundation

Sifting through the material, what really caught my attention was the short document covering the new Dolphin system architecture. I have no doubt that many readers are already aware of EnOcean, but I'm going to provide a brief introduction, just in case. EnOcean has been developing wireless sensor networking modules since 2001 and what I find ingenious is the technology's ability to acquire power from ambient sources; an alternative energy source, which is

indeed very topical and eco-friendly. In other words, wireless sensor nodes derive their power from linear motion, light or fluctuations in ambient temperature. As such, with EnOcean technology 'batteries are not included' surely every kid's nightmare; nevertheless, with EnOcean's energy harvesting technology batteries are certainly not required.

### EnOcean synonymous with energy harvesting

Arguably (for some), EnOcean is synonymous with energy harvesting – acquiring energy that's sufficient for a wireless node to transmit data. For example, with a mere 50µWs, a standard wireless node can transmit a signal 300m (free field) afar and 30m in a building context. Likewise, with a repeater, the range can be further extended. EnOcean uses several techniques to conserve energy, one of which is the short transmission window used in so many low energy technologies. In essence, the transmission window is open, data delivered and the window is closed in under a thousandth of a second (or so). If you caught my column last month you would have read that ANT Wireless (thisisant.com) utilises a similar scheme to ensure the shortest transmission window, in turn, conserving as much energy as possible.

The technology further boasts a high data rate transmission for sensor information at 125kb/s providing successful interoperability and coexistence with other wireless systems. The high reliability of the technology is explained by its use of the license-free 868MHz and 315MHz frequency bands, ensuring the technology's successful coexistence within an industrial environment and no interference from DECT, Wireless LAN (WLAN), Private Mobile Radio (PMR) or other similar systems.

### EnOcean's continued success story

So, what's new about the new Dolphin platform? I started talking about this, but was momentarily distracted by EnOcean's basic technology premise. As I mentioned at the beginning of this feature, EnOcean recently launched its first Open House, showcasing its technology and its success to date with a proven track record of having established the technology in over 100,000 buildings.

It's abundantly clear that, in holding the exhibition, EnOcean was emphasising its dominant position within the building automation arena, with over 150 companies already supporting the technology and a portfolio of 500 products. The Dolphin platform is testimony to EnOcean's continuing growth and the evolution of its already successful product portfolio and software development platform. I need to catch up with Graham Martin, CEO & Chairmain, EnOcean Alliance at this point, as I want to be absolutely crystal clear about EnOcean's objectives and motivation.

(Calling his number – thirty minutes or so later ...)

I caught up with Graham in Kuwait, although there was some initial confusion (on my part), as I thought he may have been filling his car up with petrol and I was gravely concerned. After all, you're not permitted to use a mobile phone in close proximity to a fuel pump. Anyhow, I managed to speak with him and he was very happy to share with me EnOcean's motivation and continued success. I'm now going to elaborate.

### The new Dolphin platform

The new Dolphin offering from EnOcean is a third-generation developer platform, offering bi-directional communication in addition to a host of new features. Okay, so bi-directional wireless communication isn't necessarily new. Nevertheless, the previous Dolphin platforms only supported uni-directional communication, so bi-directional communication is new for EnOcean and its new product portfolio. In previous EnOcean topologies a dedicated receiver or gateway was used to collate data from the surrounding sensors, enabling a backend system to react to the environment. Likewise, remote management was supported, ensuring the building and its environment was at its optimal and most cost-effective. The introduction of bi-directional sensors provides greater scope and flexibility in terms of monitoring and ensuring successful data exchanges made between devices further assuring the user of an optimised environment.

It means that the new Dolphin platform will provide more efficient energy autonomous optimisation. In other words, a sensor within the EnOcean network topology could be sent to sleep



and only awoken under certain conditions – of course, this would further ensure the life of the sensor and sustainability of the building environment. Graham was very conscience of the need to ensure that future features within the product range didn't impact upon the longevity of the sensors whilst being aware of some potential trade-offs as a result of this. Ultimately he reassured me that EnOcean will continue to provide an excellent return-on-investment. He further highlighted the success stories and case studies during the Open House exhibition, where the likes of Barclays Bank and O2 have already adopted EnOcean's technology. In one such example, the O2 United Kingdom office based in Slough supports 100 control zones on each floor with 64 receivers and 560 switches.

### Dispelling the doubters

I'm sure there are many doubters among you, seething at the seemingly impossible notion that EnOcean is the only wireless technology dominating the building automation industry. But, let's put the cat among the pigeons here and ask some questions about EnOcean's competitors. Firstly, what about ZigBee? I recall some time ago (2009 to be more exact) when ZigBee made an announcement that it would provide a battery-less solution by the end of 2009, with products to emerge soon after. Was this just marketing hype? I hope the ZigBee Alliance offers me an opportunity to explore and answer that question, but for now let's move on to Bluetooth low energy. It's clear that the technology is new and has only been recently announced (the new v4.0 specification). Naturally, Bluetooth wireless technology has enjoyed several success stories, so we will have to wait and see as to how its new sibling fares within the market it's evidently vying for.

I asked Graham about his thoughts regarding Bluetooth low energy and he stated "Bluetooth low energy is another ZigBee" – he continued and explained how EnOcean differed, proudly stating that, "EnOcean was specifically designed to be battery-less from day one". He went on to exclaim that "All other similar systems have been architected to run via battery for two to three years and any attempt to become battery-less now would compromise the standards they are built upon". In other words, Graham suggests that the existing low energy sensor technologies have been designed specifically with battery power in mind, whereas the EnOcean solution was derived from a foundation where the initial generation of products would be energy autonomous. In essence, the protocol stacks that make-up Bluetooth low energy and ZigBee, for example, have not been architected and optimised for battery-less

operation. Graham further remarked "these stacks are larger, heavier and power-consuming, in terms of normal operation. Anyone claiming otherwise simply hasn't done their homework".

I am confident that EnOcean will continue to evolve its successful Dolphin platform. The second generation offering boasts new features, as well as bi-directional communication, in turn, supporting an efficient eco-system. Clearly, EnOcean is completely aware of the trade-offs that may come about in evolving a technology which ultimately bodes well for future generations. In the meantime, EnOcean claims it will remain the pivotal leader in energy autonomous wireless communication. So, ultimately, where is ZigBee? I guess, trying to keep a battery-powered technology afloat in a new eco-friendly world ... sounds to me a lot like swimming with sharks!

### Until next month ...

I really like the EnOcean concept but, of course, I should remain unbiased and favour all the short-range RF space neutrally. So, whilst remaining unbiased about the short-range RF domain, I find myself thinking about next month's feature. I have been debating with Vince over DASH7, normally via Skype, where our bad typing just ends up confusing the other party. In short, neither of us seemed really sure about the scope of the technology, its intended market and audience. Admittedly, we have some vague ideas, but if someone would like to drop me an email with some background research to use in next month's issue and, in turn, persuade Vince, then I'd certainly appreciate it.

Another month and summer is definitely on its way ... on that final note, this is where Dr G signs off and I'm now heading to the garden with the rest of this bottle.

**About the Author**  
[Dr Dean Anthony Gratton](#) is a bestselling author and columnist. He has authored several patents, contentious articles and a number of bestselling books on wireless technology. He has worked within the telecommunications industry for over sixteen years and provides consultancy to a number of high profile companies.



You can contact Dean at [incisor@deangratton.com](mailto:incisor@deangratton.com) and follow him on Twitter [@grattonboy](#), but you can read more about his work at [www.deangratton.com](http://www.deangratton.com).

# Snippets

## LTE Ramps to 42% of Modem Sales

The sales of new devices with integrated mobile broadband connectivity, together with external USB modems, will top 100 million in 2010, as mobile broadband makes major inroads into the mass market, stimulated by new devices such as the Amazon Kindle and Apple iPad and more aggressive tariffs from mobile operators, according to Strategy Analytics.

According to its new Wireless Enterprise Strategies (WES) service report, "Untethering the User: Mobile Broadband Market Outlook on USB Modems, PC Cards & Embedded Cellular Connectivity," the installed base of mobile broadband modems will have grown to 415 million devices by 2014, highlighting the need for true, ubiquitous mobility, that enables users to engage with their contacts and content whatever their location.

## Cost Savings from mobile health monitoring to rocket

According to Juniper Research's Mobile Health Opportunities Report, public and private healthcare providers will be able to save between \$1.96 billion and \$5.83 billion in healthcare costs through the use of remote patient monitoring using cellular networks by the year 2014.

The US and Canadian markets will generate the most cost savings, due to the inherent structure of their health systems, high healthcare costs, and more advanced remote monitoring roll outs: "The cost of a hospital bed, used as a proxy for cost, is much higher in the North American region, partly due to the role of health insurance in the US healthcare sector," says Anthony Cox, Senior Analyst at Juniper Research and author of the report. "This has a direct impact on how much cost remote monitoring can save," he says.

## Are loud mobile phone users making us more stressed?

CSR has carried out a survey looking at what annoys people about mobile phone use, particularly those who talk loudly to make themselves heard. The survey was carried out by Toluna on behalf of CSR.

As it turns out 88% of the British public have felt anywhere from slightly annoyed to angry at inconsiderately loud mobile phone users. The survey also found that public transport is the most irritating place for people to use their phones.

[Click this link](#) to read the full findings, and also include a quote from Jim Taylor, (Ph.D., Psychology and blogger on the Psychology of Technology).

# Femtocells fly out of home

By Esteban Monturus,  
Market Analyst – Europe & Backhaul, Maravedis

**Femtocells deployed outdoors, is this not a huge contradiction? Back in 2007, when the Femto Forum was founded, femtocells were devised to solve indoor connectivity problems in HSPA, WiMAX, and LTE networks using frequency bands over 2 GHz. The subsequent explosion in data demand from customers has shown the data offloading feature to be even more interesting when deploying femtocells, or femto access points (FAPs), as they are also known.**

Femtocells initially targeted the residential market. The Plug & Play feature was a must-have for such a device that had to be brought home and installed by the customer, so a specific interface called "luh" was developed to ensure a smooth integration of femtocells into the cellular architecture. Given the current economic recession, finding new use cases for existing equipment is more desirable than ever. Therefore, the first evolution of femtocells are enterprise femtocells; a kind of femtocell on steroids with increased number of parallel connections allowed (for WCDMA-flavor, 16 users with throughputs between 21 and 6 Mbps or up to 40 users with low-connectivity needs), and more complex features such as IP-PBX functionality.

When deploying new 4G networks, small cells such as residential femtocells and

all-outdoor pico-micro base stations are going to be undoubtedly fundamental. Moreover, Andy Germano, the Femto Forum's Vice Chairman, recently declared during a Maravedis' 4Ggear briefing that in 2009 femtocell shipments counted 500,000. Germano said the forecast for 2010 will be 3 million, approximately equalling the number of macrocell shipments predicted for this year.

Following Germano, the main benefit of femtocell architecture - compared to alternative deployment models, such as distributed antenna systems and picocells - is not in its radio interface, but instead its Plug & Play deployment. The key for such easy deployment is the introduction of a new type of node into the cellular infrastructure: the femtocell gateway, which also isolates the cellular core from extra signalling generated by femtocells. The Femto Forum sees outdoor deployment as the next big evolution, with specific application in rural areas, where operators often cannot justify macrocell deployments. Vendors are increasing FAP capacity and power, and ruggedizing the equipment case. During Femtocells Asia 2010, SK Telecom already showed defined technical requirements for its outdoor HSPA femtocells: 8-channel capacity, 2 km coverage and half watt transmit power.

It is clear that the femto architecture eases the deployment of small cells, but there

are no massive deployments yet which can probe the robustness of such architecture. On the other hand, the use of an additional gateway could kill LTE's acclaimed flat architecture because the huge number of small cells expected in 4G deployments would make femto gateways necessary - playing a similar role as RNCs had in 3G. Also, the most effective location for femto gateways within the backbone must be found, along with the never-ending compromise between deployment cost and data offload.

It must not be forgotten that wired is not the only type of backhaul employed for small cells. We also have wireless (satellite or microwave backhauled microcells, relay stations) and fiber backhaul (remote radio heads, RRHs). Microwave backhaul could implement the luh interface, since it is IP-based. But, do we need such an interface when not having to traverse other operators' DSL access to reach the core network? For relay stations and RRHs, luh makes no sense, so operators must think about the suitability of deploying a kind of gateway that fails to control all their small cells, even when operating in proximity. 4G networks' Self Organizing Network features solve the same problem without adding complexity to the core and without leaving any kind of small cell out of the system; so the femto architecture could represent just a temporary solution until pure packet cores are operational.

## Snippets

### Bluetooth low energy and coin cells – interesting blog ....

Texas Instruments has been using one of its finest low energy resources (he'll love that!), Karl Torvmark, to blog about the use of coin cell batteries in Bluetooth low energy applications. Here's an extract:

"One of the most anticipated features of Bluetooth low energy will be the ability to

run on lithium coin cells. Although some companies have launched regular Bluetooth products that do use coin-cells, most current Bluetooth products run on rechargeable batteries (either Li-ion or NiMH) as the battery life usually is not long enough to justify the use of primary (non-rechargeable) batteries. Conventional wisdom has it that coin cells have a hard limit on the maximum peak current that can be sourced, and this is usually given

as 15 mA or 20 mA. However, peak duration is usually not mentioned, so it is hard to figure out how "peak current" actually differs from the maximum constant current load. Many battery datasheets are not much help, as they often provide data only for the constant current case."

To read the full blog, [click here](#), and tell Karl we sent you!

# wi-fi / wlan news



## Silver Jubilee of the rules that enabled Wi-Fi

On May 24, 2010 it will be exactly 25 years since the Federal Communications Commission (FCC), the regulator of the radio spectrum for public use in the USA, released the decision to permit unlicensed access to the radio spectrum for communications, provided the devices use "Spread Spectrum".

That paved the way for the IEEE 802.11 committee to start developing "Wi-Fi" – an interoperability standard for Wireless Local Area Networks (WLANs) – which encouraged regulators in other countries to adopt similar rules. Canada and the European countries agreed first, then dozens more governments allowed license-free use of the radio spectrum by WLANs.

"Prior to the FCC decision, spectrum was released only in response to carefully documented 'requirements'. This process was much slower than the rate of innovation in the IT community", said Michael Marcus, the person behind the FCC decision. "The way industry and end-users embraced this new approach to spectrum regulation and the creativity it unleashed, surpassed our wildest dreams", said Vic Hayes, the co-establisher and 10 year leader of the IEEE 802.11 working group, nicknamed "Father of Wi-Fi".

Today Wi-Fi is built into all lap-top computers and it is becoming a "must have" feature in smart phones and consumer electronics generally. Internet access through Wi-Fi is now common at home, in offices, in hotels, restaurants, coffee shops, at airports, railway stations, on university campuses and even in airplanes and trains. Many communities use Wi-Fi for providing broadband internet access in areas where operators cannot or will not provide service. Wi-Fi is a major driver of ubiquitous connectivity. In 2008, the readers of Stuff magazine voted it the best technical innovation of the last decade.

Other license-exempt devices enabled by the FCC's decision are Bluetooth and ZigBee.

Incisor was reminded of the anniversary by the Open Spectrum Alliance (OSA), which promotes innovative public policies and the allocation of more unlicensed spectrum to realize the potential social and economic benefits of wireless media. Working with other stakeholders, particularly in Europe, the OSA often cites Wi-Fi as an example of what license-free communications can deliver.

## WiGig cooperates with Wi-Fi Alliance to expand Wi-Fi

The Wi-Fi Alliance and the Wireless Gigabit Alliance (WiGig Alliance) have announced a cooperation agreement for multi-gigabit wireless networking. The Wi-Fi Alliance and the WiGig Alliance will share technology specifications for the development of a next-generation Wi-Fi Alliance certification program supporting Wi-Fi operation in the 60 GHz frequency band.

The intention is apparently for device connectivity in the 60 GHz band to complement the current family of Wi-Fi technologies. Targeted primarily for applications that require gigabit speeds, 60 GHz products are expected to be used in a wide range of high-performance devices. A significant portion, if not all, of these devices are expected to also support traditional Wi-Fi networking in the 2.4 and 5 GHz bands.

"60 GHz device connectivity will be an exciting enhancement to the capabilities of today's Wi-Fi technologies. It will expand the utility of Wi-Fi, used by hundreds of millions of people every day," said Wi-Fi Alliance chief executive officer Edgar Figueroa. "From its inception, the WiGig specification was designed to work on a wide variety of devices, making it a compelling input as we begin to define our certification program for 60 GHz wireless." The WiGig specification defines protocols to deliver data transfer rates measured in gigabits rather than megabits and supports a new range of applications and usages. The

specification also defines procedures to enable WiGig-compliant devices to hand over sessions to operate in the 2.4 or 5 GHz band. It is expected that a new class of tri-band Wi-Fi Certified devices will offer multi-gigabit wireless speeds while helping to ensure backward compatibility.

The WiGig Alliance also announced the publication of its unified wireless specification and the opening of its Adopter Program. Cisco has joined the WiGig Alliance Board of Directors, and Harman International, Peraso Technologies and Samsung Electro-Mechanics have also joined WiGig as contributing members.

For Incisor analysis, see our feature 'Where goes WiGig?' in this issue.

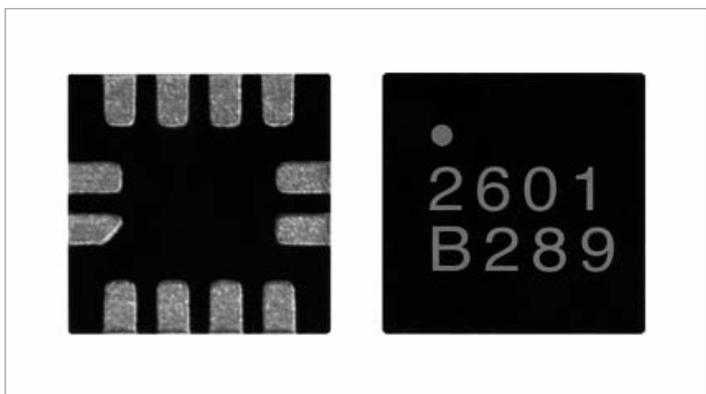
## AT4 qualifies to test 802.11n programme

AT4 wireless, an Authorized Test Laboratory (ATL) of the Wi-Fi Alliance has become qualified for testing the Wi-Fi Certified n certification program. Certification services for the Wi-Fi Certified n program are offered by a group of Wi-Fi Alliance authorized test laboratories.

"This new certification program complements AT4 wireless' offer for wireless devices vendors. Our services portfolio on this field also includes Bluetooth qualification, Continua Health Alliance certification, GCF, PTCRB and CTIA certification and WIMAX Forum certification along with Regulatory testing and Worldwide Compliance Services (WCS)," said Jose de la Plaza, Telecommunications Laboratory Manager at AT4 wireless Spain.

"We congratulate AT4 wireless on qualification for the Wi-Fi Certified n program," said Wi-Fi Alliance chief executive officer Edgar Figueroa. "Wi-Fi Certified n testing helps OEMs provide the best user experience on a broad range of products implementing next-generation Wi-Fi."

# wi-fi / wlan news



## SiGe launches silicon-based Wi-Fi Front End IC

SiGe Semiconductor has expanded its product range by introducing the SE2601T, a RF switch/LNA Front End IC (FEIC) designed to enhance the performance and functionality of converged Bluetooth/Wi-Fi chipsets for embedded applications.

Commenting on the new device, Sanjiv Shah, Marketing Director Embedded Products at SiGe said, "With the SE2601T we are providing our customers with a single-chip solution integrating a SP3T RF switch and Wi-Fi receive path low noise amplifier (LNA)". Shah added, "The SE2601T, which integrates features that until now have been discrete on the device motherboard or inside of a module solution, occupies less board space and offers significant advantages for designers of today's cool, feature-rich mobile devices".

SiGe developed the SE2601T to enhance the performance and functionality of Bluetooth/Wi-Fi chipset solutions utilizing an integrated CMOS power amplifier (PA). The 2601T is claimed to improve the connectivity range of the Wi-Fi solution by placing a high-performance LNA between the antenna and the RF receiver. Often, says SiGe, the LNA function is omitted in embedded applications such as smartphones due to physical space constraints on the Wi-Fi solution, degrading connectivity performance. This LNA increases the sensitivity of the Wi-Fi receiving system – critical in embedded applications where physically small antennas are limited in their contribution to signal quality. The RF switch function – supporting antenna sharing between Bluetooth and 802.11b/g/n functions – is typically a discrete device requiring additional

passives and consuming more space than the integrated 2601T solution.

"The SE2601T provides our customers with an integrated solution for their designs, addressing some of the industry's fastest growing market segments," Shah concluded. "The reduced design time it supports, with the smallest footprint for its functionality as well as the reduction of the number of components required all make the SE2601T a device of choice for converged Bluetooth/Wi-Fi-enabled smartphones and other embedded devices".

The SE2601T comes in a small lead and halogen free, ROHS-compliant, 2mm x 2mm x 0.6mm QFN package and is sampling now.

## Wi-Fi security patent for Ruckus

Ruckus Wireless has been granted a patent by the United States Patent and Trademark Office (USPTO) for an innovation that simplifies the configuration, administration and strength of wireless network security.

The new technique, called Dynamic Pre-Shared Key (PSK), effectively eliminates manual installation of encryption keys, passphrases or user credentials needed to securely access a wireless network. Dynamic PSK changes this model by dynamically generating strong, unique security keys for each authenticated user, automatically installing these encryption keys on end user devices.

With the explosive growth of Wi-Fi networks around the world, organizations have struggled with how to streamline the complexity and cost of implementing robust wireless security. Many companies

have used a passphrase that must be shared among many users and manually entered into client devices. If this "pre-shared key" becomes known or stolen it must be changed for all users and manually re-entered into every client device.

A popular alternative to the pre-shared key approach is an elaborate security framework (eg. 802.1X) that requires information, such as unique certificates or supplicants, to be installed on every user device. Deploying such systems requires a high level of technical expertise as well as ongoing technical support for users.

"With Wi-Fi there has historically been two ends of the security spectrum," said Steve Martin, VP of Engineering for Ruckus Wireless. "On one end is the simple approach that makes life easy for network managers but creates potential security concerns for companies. On the other end is a very robust but often overwhelming security framework, such as 802.1X, that requires a tremendous amount of time and effort to implement and administer. We've created the best of both worlds with a user-friendly and low maintenance method for providing a high level of wireless security."

# low energy wireless news



## TRaC initiates test services for both ZigBee Health Care & ZigBee Telecoms Services

Within days of the Profile being ratified by the ZigBee Alliance, TRaC has extended its testing and certification services by adding formal certification testing to the new ZigBee Health Care Profile. Alongside the ZigBee Health Care Profile, TRaC has added certification testing for the ZigBee Telecoms Services Profile.

The ZigBee Telecoms Service Profile sets out a global standard for wireless sensor networks, which will supply consumer devices with information, location-based services, entertainment content, payment and billing services, and data-exchange services. It will enable consumer devices with a new range of services, based around the mobile phone. Every such offering will require the verification of its compliance to the standards and definitions set out by the ZigBee Alliance, and also, where they interact with other telecoms services, for conformity to the standards that apply to those systems.

TRaC has also added the ZigBee Health Care Profile. ZigBee Health Care is one of the technologies chosen by the Continua Alliance to support its range of health care products. It provides a global standard for low-power, interoperable devices for monitoring-and-management roles in non-acute healthcare situations for use in the home, in medical centres, and in nursing homes, by both patients and healthcare workers.

TRaC's ability to test and certify compliance with the ZigBee Health Care Profile Specification is helped by the fact that the company has an established service, fully accredited, in testing to several other standards which are very likely to apply to new products which the industry brings forward in this sector, such as the Low Voltage Directive (LVD), and the Medical Devices Directive (MDD).

TRaC, which is one of only three ZigBee Alliance recognised test houses (and the only one with its main offices in Europe), has contributed to defining the testing requirements as they have evolved, and to the establishment of reference units, also known as "golden units".

## ZigBee/IPSO focus on furthering use of IP in the HAN standard

The ZigBee Alliance and the IPSO (IP for Smart Objects) Alliance have announced today an agreement to collaborate on wireless home area networks (HAN) using the ZigBee IP specification and the ZigBee Smart Energy version 2.0 standard. The two alliances will collaborate on expanding HANs by using IP technology.

ZigBee Smart Energy is the wireless HAN standard. The ZigBee Alliance quotes data that suggests there are more than 40 million smart meters being installed around the world. Common HAN devices include utility meters, thermostats, pool pumps, water heaters, appliances and plug-in electric vehicles. It was developed by industry utilities, suppliers and technology companies to connect those everyday household devices to the Smart Grid. Last year, it was selected by the U.S. Department of Energy and the National Institute of Standards and Technology (NIST) as an initial interoperable standard for HAN devices.

"By using IP technology, ZigBee Smart Energy will give utilities more flexibility in future Smart Grid deployments," said Bob Heile, chairman of the ZigBee Alliance.

IPSO is the latest organization to collaborate on ZigBee Smart Energy. Four other organizations are working to expand this standard for HANs, including DLMS, EPRI, ESMIG, and HomePlug Powerline Alliance.

"We have been playing an active role in this space and our contributions to ZigBee Smart Energy and the ZigBee IP specification will help

speed adoption of the Smart Grid," said Geoff Mulligan, chairman of the IPSO Alliance.

## Rail Cargo Austria fits scalable D-GPS & ZigBee sensors

Freight company Rail Cargo Austria (RCA) has fitted its Wels container terminal with a complete sensor equipment solution from Symeo, a technology provider specialising in radio based solutions for distance measurement, position detection and anti collision. The solution includes all components for D-GPS based position detection of reach stackers and gantry cranes as well as for load detection on the units' spreaders.

Plans have been made to fit all RCA's terminals with Symeo's positioning systems. Symeo will be providing an integrated solution composed of radio based D-GPS positioning for vehicles and cranes and load recording sensors used for container detection on the spreaders and connected by ZigBee close range wireless links.

## Ember enables next gen ZigBee home security

uControl has teamed with Ember to deliver a new line of wireless ZigBee security sensors. These are aimed at Broadband Service Providers looking to deliver the next generation of services for the Connected Home.

The new uControl SMA Platform includes and integrates a wide variety of ZigBee sensors including motion, smoke and glass break detectors, door and window contacts, key fobs, wireless keypads and much more.

uControl's system pairs its technology agnostic software infrastructure with an "All-In-One" SMA TouchScreen that combines an alarm system, communications gateway and home automation platform into one device. uControl chose Ember's latest ZigBee chipset to power its line of sensors and peripherals.

# low energy wireless news



## Freescall launches smart meter chips

Freescall Semiconductor has introduced three microcontroller (MCU) solutions targeting electricity and flow meters along with smart-meter reference design solutions. Freescall's microcontrollers enable smart meters to be designed with tamper detection mechanisms and real time usage monitoring, providing customers an extra layer of security, says Freescall, for their smart meter products.

"Our goal is to provide developers with comprehensive plug-and-play solutions designed to alleviate cost and time-to-market concerns, while bringing everyone a step closer to a unified smart grid," said Jeff Bock, director of product marketing for Industrial and Multi-Market microcontrollers at Freescall. "Freescall's smart energy technologies address smart metering and smart grid applications across the grid, enabling customers worldwide to provide secure, next-generation energy management solutions."

The Freescall devices have several key functions combined on one chip, which until now has been unavailable in a single solution. Thanks to the real-time clock (RTC) on Freescall's metering solutions, utility companies may be able to implement different tariffs depending on time of the day, maximum demand and load availability. In addition, the RTC has tamper detection mechanisms to detect fraud and send a trigger or error notice to the utility company when tampering is detected. It can also run separately with its own battery power supply in the event of a main power failure, which adds an additional layer of security in case tampering occurs during a power outage. Two separate blocks of flash memory allow a meter to continue operating on one flash bank while the other is being updated with new firmware, avoiding costly downtime.



Freescall plans to announce a series of metering solutions later this year that fit into different points along the smart grid. General availability of the MC9S08GW64 products will be announced later this year.

## Chipset independent NFC API for Android

Stollmann has announced what it is claiming is the first chip set independent NFC API for Android. The "NFaCe+A" API from Stollmann supports all NFC modes and features and follows the design rules of the Android community. It can be used with different chip sets and NFC protocol stacks, supporting a variety of NFC chips from vendors like STMicroelectronics, NXP, Innovision, Polaric etc.

Stollmann told Incisor that the API is targeted to developers of standard NFC applications for devices based on the open handset platform Android. Those applications will drive the 'app stores' for Android and will be a major source of revenues for handset manufacturers and mobile operators. The development of NFC applications largely depends on the availability of a standard API to allow developers to write applications independently of the underlying hardware.

The API will be implemented in a portable Android 'Dalvik' Layer as part of an Integration Package. The Integration Package will be freely available in source code for integration in different Android platforms and for different NFC chips and protocol stacks. The NFCStack+ protocol stack of Stollmann will be one possible choice.

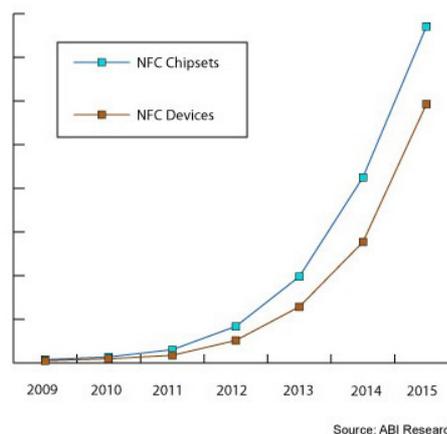
The API specification is available free of charge from Stollmann. A complete Software Development Kit supporting the NFaCe+A API based on a standard „Beagle“ platform will be available in Q2/2010.



## MicroSD offers a new approach to NFC

Mobile contactless payments and a wealth of other applications enabled by Near Field Communication are coming to mobile handsets over the next 12 months, but not in the format originally envisioned. A lack of commercially available NFC-embedded handsets combined with the rise of mobile handsets with microSD slots has helped shape a new approach to NFC that promises to bypass both handset vendors' and mobile network operators' core involvement.

**Total NFC-Enabled Device and Chipset Shipments World Market, Forecast: 2009 - 2015**



New microSD offerings with NFC functionality are coming to market, joining stickers as a way to bring contactless connectivity to existing mobile handsets. NFC ICs will approach 300 million shipments in 2015. Mobile handsets remain the key market for NFC but increasingly the potential of the technology is driving NFC into other devices and form factors. The potential to offer NFC to handsets with microSD slots is helping to change the mobile handset landscape for many NFC vendors and supporters.

# events



DATE	EVENT	LOCATION	NOTES	LINK
June 7 - 11 2010	Bluetooth SIG UnPlugFest 36	Beijing, China	-	<a href="http://www.bluetooth.org">www.bluetooth.org</a>
June 8 - 10 2010	Connections US	Santa Clara, California, USA	Digital living conference & showcase	<a href="http://www.parksassociates.com/events/connections/2010/">http://www.parksassociates.com/events/connections/2010/</a>
June 14 - 16 2010	CAT-iq 2.0 Plug Fest	ETSI Premises, Sophia Antipolis, France	-	<a href="http://www.dect.org/">http://www.dect.org/</a>
June 15 - 18 2010	Smart Grid Interoperability Summit	Toronto, Canada	-	<a href="http://www.smartgridinterop.com/">http://www.smartgridinterop.com/</a>
June 16 - 17 2010	WiMAX Forum Global Congress 10	RAI, Amsterdam, The Netherlands	-	<a href="http://www.wimaxforumglobalevents.com/global10/">http://www.wimaxforumglobalevents.com/global10/</a>
Oct 4 - 8 2010	Bluetooth SIG UnPlugFest 37	Barcelona, Spain	-	<a href="http://www.bluetooth.org">www.bluetooth.org</a>
Oct 19 - 20 2010	CAT-iq Market & Developer Conference	High-Tech-Campus, Eindhoven (The Netherlands)	-	<a href="http://www.catiqconference.com">www.catiqconference.com</a>

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