

# INCISOR™

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Video enabled  Issue 156

April 2011



## WHITESPACE SPECIAL FOCUS

### THIS ISSUE

ACCESSING THE CLOUD

WHY YOU NEED TO BE INTERESTED IN WHITESPACE RADIO

INTRODUCING WHITESPACE RADIO

PLUS: THE ZIGBEE SUCCESS STORY

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# preparing for a sea change

Incisor was first published back in December 1998. I could say that Incisor's appearance coincided with the first public roll-out of Bluetooth technology, but, in fact, Incisor exists because of Bluetooth.

Back then, the world hadn't heard of something called Wireless Personal Area Networking. Bluetooth changed all of that. You can point out, with some justification, that most of the world still hasn't heard of Wireless Personal Area Networking, but plenty of market research suggests that a big chunk of the world's population has heard of Bluetooth. Who'd of thought it?

I don't claim to be a genius, but I launched Incisor because I thought I was seeing the start of something big. Well, what do you know? I wasn't wrong.

During an early Bluetooth presentation, I remember CSR co-founder Glenn Collinson talking about Bluetooth representing a 'paradigm change'. Collinson was right, too, and he went on to see CSR become very successful, and he did nicely out of it himself.

I currently feel ready to align my thinking again with Collinson and another CSR co-founder James Collier. With a company called Neul, the two men have set out their stall to develop whitespace radio technology.

Courtesy of Incisor sponsor Cambridge Consultants, I was introduced to the whitespace concept some time ago. I genuinely believe that the potential for whitespace radio is massive. That is why this issue of Incisor has a multi-page special feature on whitespace this month, with contributions from Cambridge Consultants, Neul and an overview from our own Dean Gratton.

If you don't know much about whitespace yet, I honestly recommend that you get up to speed now. It will be very big. Trust me – I've been right before.

**Vince Holton**

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

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## CONTENTS

### WHITESPACE SPECIAL FEATURE - ACCESSING THE CLOUD

Have you considered how much spectrum is required to support the tens of billions of mobile devices that are predicted for the next decade? Fraser Edwards of Cambridge Consultants has the solution.

### WHY YOU NEED TO BE INTERESTED IN WHITESPACE RADIO...

Luke D'Arcy of Neul explains how the problem of today's congested, slow and expensive wireless networks can be fixed.

### INTRODUCING WHITESPACE RADIO

Dean reaches for his glass of red and takes us back to whitespace' roots.

### IN-CAR TECHNOLOGY – IS THE CONSUMER READY?

We are about to experience a new wave of driver information and entertainment systems. Part 2: Vince Holton asks BMW whether the average driver is ready?

### THE ZIGBEE SUCCESS STORY

TRaC Operations Manager Jon Harros reviews the current state of play with ZigBee, and concludes that the technology is here to stay.

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# news



## 35 million+ In-Vehicle Infotainment (IVI) systems to ship in 2015

In an effort to recover from the 2008-2009 downturn in the automotive industry, automakers are starting to capitalize on consumers' demand for the same multimedia experience in the car that they are accustomed to in the home, according to researchers at In-Stat; that is, automakers have begun to integrate in-vehicle infotainment (IVI) systems into a wider range of automobiles in order to re-energize new vehicle sales. As a result, In-Stat is forecasting that over 35 million in-vehicle infotainment (IVI) systems will ship in 2015.

"In order to compete, the automotive industry must now keep pace with the innovation and scalability found in the consumer electronics industry," Stephanie Ethier, senior analyst, told Incisor. "Along with a rich multimedia experience, today's drivers and passengers are also demanding constant connectivity in the car. The majority of automakers are embracing this demand for connectivity and forming strategic partnerships with technology and software companies to offer solutions that will enable consumers to access digital content in and out of the automobile via both wired and wireless options."

In-Stat suggests that:

- Due to the wide consumer acceptance of smartphone apps, the smartphone will be the preliminary source of in-vehicle infotainment and connectivity.
- The semiconductor TAM for IVI system suppliers will grow nearly 110% between 2010 through 2015, with the largest opportunity residing with those companies supplying applications processors, Wi-Fi/Bluetooth/GPS/FM combo chips and SDRAM.
- The BOM of a typical IVI system will be US\$75.78 in 2015.

In-Stat has looked at the major IVI systems incorporated into automobiles today

including: Audi's Multi Media Interface, BMW's iDrive, Ford's SYNC, Kia's UVO, Nissan's Leaf connected by AT&T, and Toyota's Entune.

See "[In-car technology – is the consumer ready? Part 2: BMW gives us the manufacturer's view](#)" in this issue.

## TI sponsors 2011 Bluetooth Innovation World Cup

Texas Instruments (TI) is the new title sponsor for the Bluetooth SIG's 2011 Innovation World Cup, a global competition that is now entering its third year. Besides supporting the competition financially, TI will also give out free Bluetooth low energy development kits to the first 20 developers who submit prototypes for the competition. Developers who submit prototypes after the free kits are gone will be offered a 50 percent price discount. The Bluetooth SIG will begin accepting entries for this year's contest on May 1, 2011.

The competition is looking for innovative product ideas that use Bluetooth low energy technology in three different product categories: sports and fitness, health care and home appliances. For the first time, this year's event will also have a dedicated category for the best-functioning prototype based on Bluetooth low energy technology.

Volker Prüller, marketing manager for low-power RF products at TI commented: "TI continues to invest significantly in the development of Bluetooth low energy technology to further connectivity of innovative personal health and fitness devices as well as home appliances and we are thrilled to play the title sponsor role in this year's Bluetooth Innovation World Cup."

"Bluetooth SIG is very proud to have TI on board as the title sponsor this year," Suke Jawanda, Chief Marketing Officer of the Bluetooth SIG told Incisor. "It has been exciting to see the innovative Bluetooth

enabled concepts and prototypes generated from this global contest over the past two years, and thanks to our sponsors, I look forward to seeing even more prototypes that showcase the transformative potential of Bluetooth low energy technology this year."

## Broadcom turns IP Set-Top boxes into game consoles

Broadcom is to support a motion-sensing video game technology from 3DiJoy Technologies that is claimed to turn a set-top box (STB) into a game console. The Broadcom BCM7231 IP STB system-on-a-chip (SoC) solution integrates an optimized Bluetooth gaming stack to power the gestural remote for use with 3DiJoy's motion-sensing video game technology. 3DiJoy, for those that don't know the company, is an embedded motion-sensing solution provider for video game products.

Broadcom told Incisor that this STB solution brings motion-interactive gaming into the living room without additional hardware or wires. The Broadcom BCM7231 IP STB SoC solution integrates an optimized Bluetooth gaming stack for use with 3DiJoy's motion-sensing video game technology, as well as a 3D graphics acceleration engine for OpenGL ES 2.0 applications, advanced 3D gaming graphics and user interfaces for an exciting gaming and infotainment experience. Broadcom's Bluetooth technology, when supported in an STB, enables the user to take advantage of their existing ecosystem of Bluetooth devices such as mobile phones and stereo headsets.

Dan Marotta, Executive Vice President & General Manager at Broadcom's Broadband Communications Group told Incisor: "Service providers can now add popular gaming applications to their value-added services portfolio for an additional revenue source and exciting new entertainment offerings for their subscribers."

# news



## Man's best toy gets distribution deals

Remember the iGrill? That was the Bluetooth-enabled meat thermometer from iDevices that Incisor saw at CES this year, when Vince Holton interviewed the company's CEO Chris Allen as part of our Bluetooth SIG-sponsored CES video reports.

At the time, Holton came up with what he saw as his 'witty CES observation of the show', suggesting that before gadgets came along, a man's best toy was his barbecue, and now, with the iGrill, the world's men folk could be very happy because there was a product that combined barbecuing with gadgetry.....

You had to be there, but if you want to get as close as you now can, you can see the interview in our [Day 1 CES show report](#), or you can see Chris Allen accepting the SIG's Best Bluetooth of CES award in our [Day 3 CES show report](#).

Anyway, moving on, iDevices has updated Incisor with the news that it has signed a catalogue distribution deal with Frontgate, America's indoor and outdoor home outfitters and a website distribution deal with Omaha Steaks, the Nebraska-based company that manufactures, markets, packages and distributes beef, seafood and other comestibles.

"We are extremely excited to have partnered with these two outstanding companies," Chris Allen told Incisor. "Frontgate will bring us into the homes of consumers across America and Omaha Steaks will put us in front of our target market. Both of these companies dominate their industry, so the choice to partner with them fit our niche distribution strategy perfectly."

If you're barbecuing this weekend and you need to buy today, you can get the iGrill in Black or White through Apple Stores or the iGrill Site, priced at \$99.99.

## Handset chips at \$82 Billion in 2015, but Bluetooth revenues could shrink – In-Stat

Researchers at In-Stat have been looking at the chip market, and have told Incisor that in 2010, the value of semiconductors used across all mobile handsets exceeded \$55 billion dollars, and smartphones are poised to drive much of the growth over the next five years.

Smartphones are a semiconductor manufacturer's dream come true. These devices contain the latest semiconductor technology, shrunk down to fit in your shirt pocket. It should not come as any surprise that mobile phone semiconductor component revenue will exceed \$80 billion in 2015, a compound annual growth rate of 10.8%, according to In-Stat.

Allen Noguee, an analyst at In-Stat told Incisor: "While most handset component markets are growing in revenue, a few face significant challenges. For example the baseband semiconductor content of non-smartphones is slowly decreasing, as all costs are being wrung out of non-smartphone chips, and volume increases are not enough to compensate for the loss per device. Bluetooth semiconductor revenue in handsets is another area that is actually shrinking, as the Bluetooth function is integrated with other functions."

Amongst the stats emerging from recent In-Stat research was the fact that there are over 60 semiconductor companies worldwide producing semiconductor components for mobile phones, and that revenue from smartphone processors - Wi-Fi, GPS, touchscreen controllers, gyros, and pico projectors - will grow much faster than the average. And the growth in smartphone sales seems relentless - they are expected to make up 45.3% of all handsets shipped

by 2015. Meanwhile, semiconductor revenue associated with accelerometers and/or gyros will exceed \$300 million by 2014.

## Gadgets get the Internet

Mobile connected devices and stationary home electronics are set to see rapid adoption over the next 5 years, according to Infinite Research, with total shipments of consumer connected devices growing exponentially.

Overall shipments of consumer connected devices will increase from 262.1 million units in 2010 to 712.1 million units in 2015. Shipment growth is being driven by product manufacturers who are increasingly incorporating cellular and/or Wi-Fi connectivity into their devices. This trend will cause the global installed base of Consumer Connected Devices to swell to 2.1 billion units in 2015.

Virtually all mobile devices, including e-readers, tablet computers, portable games consoles, media players, digital cameras, and camcorders, are now being embedded with Internet connectivity. The same is true for stationary consumer electronics devices; smart-TVs, connected Set-Top Boxes, video game consoles, Blu-Ray / DVD players, digital photo frames, and media phones are all being equipped with Internet connectivity.

The explosion of connected devices is being driven by consumers seeking on-demand access to movies, music, social networking services, applications (apps), connected services, and other content. Additionally, wireless modules have hit price points that encourage device manufacturers to add Internet connectivity to their products. "This fact, in combination with falling device prices and fundamental demand, is driving consumer adoption of mobile connected devices and connected home electronics" Mark Ritorto, President, Infinite Research told Incisor.

## news



## Nordic $\mu$ Blue equips Casio Bluetooth low energy watch

Remember the Bluetooth Low Energy Watch prototype developed by Casio Computer – you would have seen it in [this Incisor.TV video report from CES?](#) Well, Nordic Semiconductor tells Incisor that it is based on a Nordic  $\mu$ Blue nRF8001 single-chip-connectivity Bluetooth low energy solution.

Nordic claims that the nRF8001's ultra-low power performance will enable Casio's prototype watch to benefit from the advantages of Bluetooth while offering a similar battery life to a conventional Casio wristwatch. As such, the Casio watch prototype can run from a single conventional CR2032 button-cell watch battery for up to two years, while providing up to 12-hours per day of continuous wireless communication with any Bluetooth v4.0-equipped smartphone or other device.

"From 1974 when Casio released its very first digital wristwatch, we recognized that long battery life was crucial for end-user convenience and so commercial success," Etsuro Nakajima, Senior Manager within the Timepiece Division of Casio told Incisor. "Now,

thanks to Nordic Semiconductor's technology, our customers will soon be able to wear a Bluetooth low energy-enabled Watch every day like a regular wristwatch without having to worry about frequent recharging cycles."

Nakajima continued: "We know Nordic Semiconductor is a pioneer of ultra-low power wireless connectivity and its expertise in this technology is evident in the power consumption performance of the nRF8001 that was superior to other Bluetooth low energy chips we assessed."

Nakajima told Incisor that Casio is encouraging enquiries from potential partner companies seeking to develop applications compatible with smartphones and other household devices in market segments such as sports and fitness, health, home entertainment, security (e.g. panic alarms), and remote monitoring.

## Best sounding pocket-sized stereo Bluetooth speaker. Apparently.

Soundmatters has sent Incisor a press release telling us about its pocket-sized foxL Bluetooth

portable speakers. These were apparently developed by former NASA/audio engineer Dr. Godehard Guenther.

Modestly described as "the ultimate wireless portable speaker for the iPad, iPhone or any phone/pad with Bluetooth connectivity and the perfect iPad or Xoom travel companion", Soundmatters claims that foxL Bluetooth is the first pocket-sized wireless speaker that audio purists love.

FoxL's has included sound features that it calls "Twoofers" and "BassBattery," and also other technologies that it says provide a deeper bass and an "open & airy" listening experience..

The foxLv2 Bluetooth is priced at \$199, and is available immediately. Incisor has put in a review request, and we'll let you know if the reality matches up to the press release promise!

UPDATE: Since writing our optimistic story, we've heard from Soundmatters' PR company that they can't ship review samples outside of the USA, so, sorry, Incisor readers, you'll just have to wait for, well, who knows how long, before Soundmatters' bold claims can be tested. Isn't there some sort of lesson, or message, here for marketeers?

## Industry leaders use **INCISOR.TV** web video

Incisor.TV creates high-quality web TV content for companies in the technology sector. Here are examples of recent Incisor.TV movies. These are now showing on the web sites of Bluetooth headset company Jabra, and the energy harvesting technologists at the EnOcean Alliance.

Click on the images to view the movies at the Jabra and EnOcean web sites.

If you wish to include high-quality Internet TV content on your web site, and whether it is a two minute commercial, a CEO blog or a full company profile, Incisor.TV can deliver.

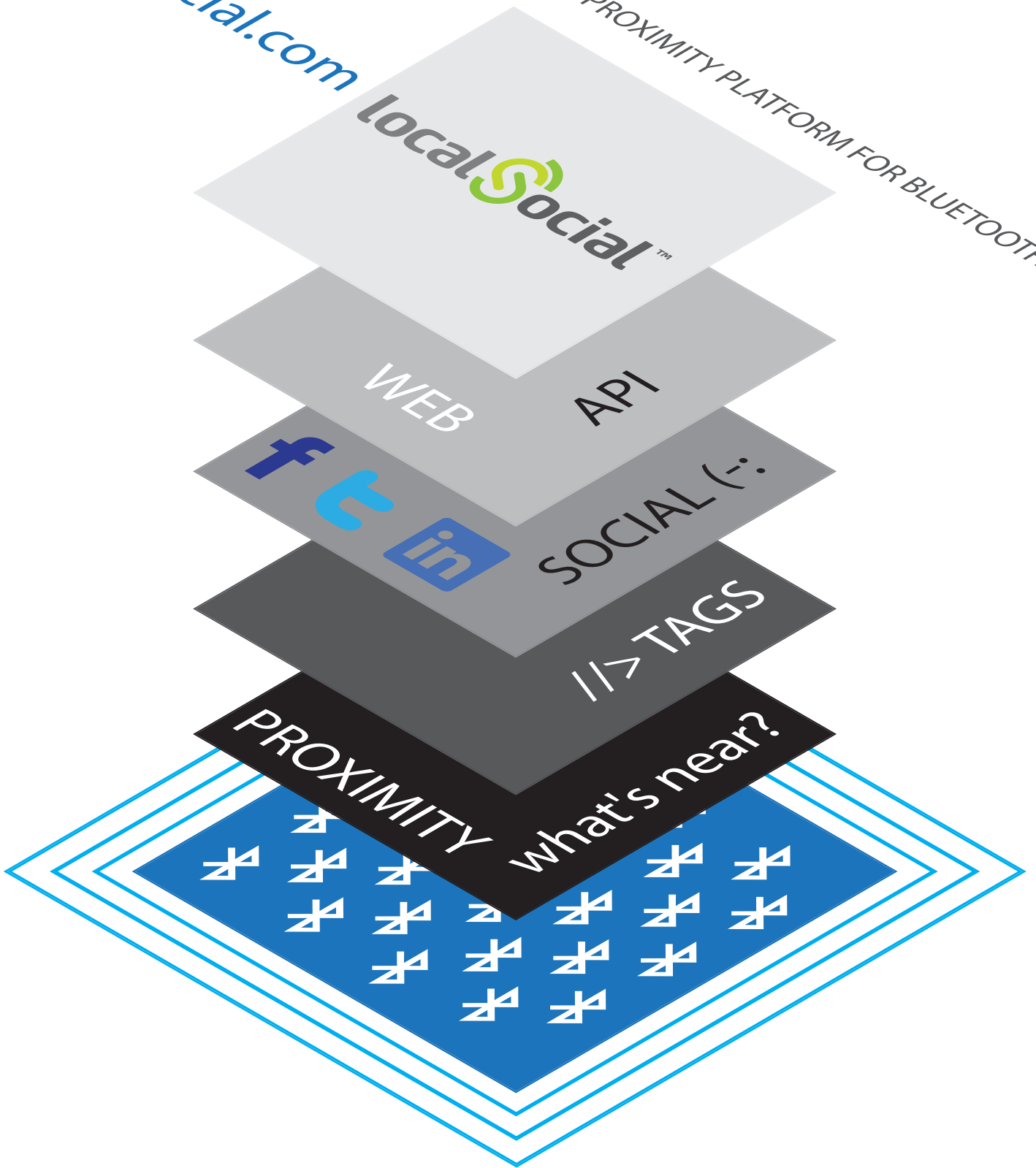
Our turn-key service includes concept, scripting, filming, editing, output to your spec and all pre- and post-production. Anywhere in the world, at an extraordinarily low cost.

Click [here](#) to see other examples, and contact [Vince Holton](#) for more information.



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# In-car technology – is the consumer ready?

## Part 2: BMW gives us the manufacturer's view

By Vince Holton

In last month's issue we looked at the implementation of in-car driver information and entertainment systems from a technology developer's point of view, when I interviewed Henri Seydoux of Parrot. Seydoux's company has blazed the trail for in-car connected systems. As well as selling products into the aftermarket, Parrot supplies many car manufacturers with handsfree and connectivity solutions that are fitted to cars as they are built.

I thought it would be a good idea to talk directly with one of the mainstream manufacturers, to see how much awareness there was of the technology that is available today, and how soon it will be fitted to the cars we drive. I selected BMW, because with its [ConnectedDrive](#) system and standard fit embedded phone module and SIM in all of its cars, the company seems to have gone furthest to

provide its customers with intelligent and connected systems.

BMW ConnectedDrive comprises five services: [BMW Assist](#), [BMW Online](#), [BMW Tracking](#), [BMW TeleServices](#) and [in-vehicle internet access](#) that are fully integrated with the car's navigation and Bluetooth telephone system, and which provide the driver and passengers access to telematic and online services from within the vehicle. Every new BMW vehicle equipped with Bluetooth telephone preparation and a navigation system is entitled to a free of charge three year BMW Assist account. Yup – you read that right – three years free!

Our BMW spokesperson, Ian Munday, who is BMW UK's product manager for ConnectedDrive, pointed out that while other manufacturers are attempting to provide similar services – he name-checked Audi – they rely on using the

customer's own cellphone to provide connectivity, and that this is a much less seamless and much more problematic solution.

I fired the same set of questions at Ian as those I asked Henri Seydoux.

**VH:** An avalanche of new in-car infotainment systems seems to be about to land in our cars, but have consumers come to terms even with hands-free calling?

**IM:** I think that consumers are much more aware than they were a few years ago. When the idea of in-car telephony was first introduced, people simply didn't understand it, and, as a result, the systems weren't used. The type of in-car phones that were first fitted also required customers to swap their SIM cards between their handset and their car, or to



have two different phone numbers. People didn't like this.

Now, things are much simpler. Bluetooth has played a big part in making in-car telephony simple and viable, and a basic Bluetooth system is now standard fit on all BMW cars from the 5-Series and up. We're now extending the basic call-handling functionality to include other applications such as music streaming, integration of office features such as notes, calendar and e-mail. And life is simpler now too. The early issues we had with compatibility between the car system and the customer's Bluetooth handset have largely gone away. As another bonus, Bluetooth has also helped car companies reduce costs, as there are fewer components and hardware involved.



*Ian Munday,  
Connected Drive  
products manager,  
BMW UK.*

**VH:** How ready do you think the market is for in-car mobile Internet?

**IM:** Its early days. We are already providing in-car Internet in our cars in Germany, and this will be extended to the UK and other countries later this year. At this time it is a cost option, so we're interested to see whether customers will order it. Certainly it will be useful for rear-seat passengers using headrest displays. We believe it will probably be used more for information provision – searches – than for general surfing.

**VH:** What are the legislative implications?

**IM:** There are people out there who are very aware of and driven by in-car safety, and by the legislation that governs what people can and can't do in their cars. Different car manufacturers will implement

their in-car information systems in different ways, which will create some sort of a challenge for the legislators. The manufacturers do spend a lot of time thinking about these issues, and we are not only driven by legislation. We talk to each other too, and the [Alliance of Automobile Manufacturers](#) is a platform where new ideas can be submitted, reviewed, and changed as necessary. At BMW we are fully committed to making sure that the driver is not distracted from the job of driving the car safely.

**VH:** Will there be a war to establish a dominant operating system for in-car systems? If so, will it come from the computing or the mobile phone industry, and which OS will win?

**IM:** I don't think that people will want to know – or care – what operating system is in use, they just need to know that it works for them, and they will want to know what functions it will support – in other words, what it will do for them.

**VH:** What are the main technical challenges that have to be addressed?

**IM:** This is an area where we feel that BMW does very well. In common with all car companies, our production lines used to be really inflexible – pretty much fixed for the life cycle of the vehicle, and production runs last for many years. Now, though, our production lines have been developed so that we have the flexibility to make changes during the life cycle of the vehicle. This means that if we want to do something such as add Internet capability, or a deeper level of iPod integration with the [iDrive controller](#), or adding in-car Facebook or Twitter feeds, for example, we can do so.

We've gone a stage further too. We now have what is called the ComBox. This is an

extension to the telephone control unit that allows for connectivity features such as Bluetooth music streaming to be over-the-air retro-fitted to cars already in the field, as well as software uploads for updates to components such as the phonebook or handsfree system. This is managed by the car's compatibility configurator.

**VH:** Does wireless technology have a role to play, and if so, what will prevail – Bluetooth? Wi-Fi? Something else?

**IM:** This will be lead by the type of devices that are used in the car. The reality is that customers do expect connectivity in their cars, and today it is Bluetooth that has become the default wireless technology solution.

Outside of the car, the cellular networks link the driver to the rest of the world. There are already more than 50,000 BMWs on the roads of the UK with embedded SIMs that provide the driver with access to connected services. These services are free for three years, whereas manufacturers such as Audi require the customer not only to use his own handset, but there is a subscription charge too.

(Yes, we think Ian sees Audi as a key rival, too ☺)

**VH:** Car companies are looking to address the market. Ford and BMW especially. At BMW you have recently been showcasing Vision ConnectedDrive (Ed: see BMW's movie with this story), which, amongst other things, is using sensors to allow cars to communicate with those around them, providing advanced warnings of accidents, delays, poor road conditions etc. Which do you think that consumers want more – warnings of impending danger, or Facebook in the car?



**IM:** We believe that the three key elements are convenience, safety and infotainment. If you were to ask most drivers the question, they would probably say that safety is the most important.

Connectivity is now universally expected, but there is not a great deal of 'pull' for mobile Internet in the car at the moment. We believe that the move towards an acceptance and use of Internet in the car will be organic, as the European telematic infrastructure develops and the customer starts to make more use of connected services to find and make reservations at hotels and restaurants, fuel stations or other GPS-assisted applications.

**VH:** Can the existing user interface (i.e. relatively small screens) cope with the needs of advanced systems, or are Head Up Displays (HUDs) the way forward?

**IM:** Well, the size of the car comes into play to some extent. Bigger cars can provide bigger displays. The three interface technologies as we see them are display screens, Head Up Displays (HUDs) and voice control. The paramount need is that whichever interface is to be used, it must provide the maximum safety for the driver. Voice control will become increasingly important, but we feel that it is not yet ready to take over from display panels and/or HUDs, which still offer development potential.

Regardless of which type of interface it is that the driver is using, today's systems have improved massively. They are much more intuitive, they react quickly and they are better integrated into the car.

**VH:** How much information SHOULD the car be sending to the driver, or is this all a distraction, and the driver should be concentrating on the task of driving the car?

**IM:** There is communication in two directions – from the car to the driver, and

from the driver to the car. Information that is being provided by the car to the driver will always be vital. Traffic information, for example, will always be from the car to the driver. While there is limited or no legislation relating to today's increasing use of driver and passenger infotainment systems, a manufacturer's goal has to be to make its systems as safe as possible. Drivers have to take a certain amount of responsibility too, and car manufacturers have to provide the right tools to help them. The new display screens that are appearing in cars today are a good example. They can display entertainment content for the passenger, and yet to the driver sitting alongside them the screen is either blank or simply displays standard content such as sat-nav or trip computer data.

**VH:** Will the integration of information systems push us ever closer to sci-fi style automated transport systems, where we don't drive our cars, we just climb in, programme where we want to go, and it takes us there while we watch movies/write spreadsheets/update our Facebook page or maybe just get friendly with our fellow passengers?

**IM:** I can't see this type of experience becoming reality within at least the next 5-10 years. It is sensible to keep an open mind, though. In the last 5 years there has been massive development - compare today's cars with those of just 5 years go - but it has to be said that the same basic principles have been in place. Staying with the topic we're talking about here, they have become much better connected.

Here at BMW we are developing advanced systems that will enhance ease of use, all aspects of performance and sustainability, and which will always acknowledge the need to maximise the safety of the driver and passengers.

## BMW'S VISION CONNECTEDDRIVE STORY



Click the screen above to learn about BMW's vision for the connected car of the future, revealed during March at the Geneva Motor Show.

# 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**

[IncisorTV at CES 2011 – Bluetooth Best of CES](#)

[IncisorTV at CES 2011 – Day 2](#)

[IncisorTV at CES 2011 – Day 1](#)

[Rococo discusses LocalSocial](#)

[Bluetooth High Speed Technology](#)

[Frontline – Interoperability testing](#)

[Bluetooth SIG BETS programme](#)

[Frontline – BPA500 protocol analyser](#)

[Aftermarket Bluetooth versus Factory fit](#)

[Who needs stress? Says Jabra](#)

[EnOcean Alliance – energy harvesting technology](#)

[Aftermarket Bluetooth versus factory fit](#)

[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](#)

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[WiMedia special - Updating the WiMedia roadmap](#)

[WiMedia - The future for UWB](#)

[Bluetooth low energy wireless technology](#)

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[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](#)

# Incisor special feature: All you need to know about whitespace radio



In this section, experts from Cambridge Consultants and Neul, plus our resident techxpert Dean Gratton examine the potential of a technology that could revolutionise the mobile data market.

Are you tired of having to compete for bandwidth on cellular data networks?

Are you astounded at the size of your phone bill?

Frustrated at having to sign a new, binding contract with the network operators for every new data device you want to use?

Then read on, as whitespace radio is set to change all of this.





Fraser Edwards,  
Cambridge  
Consultants

# Accessing the Cloud

By Fraser Edwards, Group Head,  
Radio Systems, Cambridge Consultants

Over the last few years the landscape for internet access, staying in touch with friends, and supplying media services to the individual has grown exponentially. It shows no sign of abating. With a pervasive monotony we are bombarded with new ads for the latest smart phone or tablet computers. There is a promise of an omni-present connection to the 'Cloud' and instant access to a vast choice of services. The latest generation has grown to expect an immediate response to requests for online services. Gone are the days when people would tolerate dial-up data rates. The information itself, like modern magazine editing, is presented in small digestible chunks – keeping within the attention span of the user. For example 'YouTube' videos are typically three minutes long. With a reported growth of 20hrs of video a minute and 14 billion video downloads a month this is a lot of bandwidth. The question now is how much spectrum is required to support tens of billions of mobile devices that are predicted for the next decade?

With one of the largest independent wireless development teams in the world, Cambridge Consultants has a pedigree of creating 'world firsts' in wireless communications and providing solutions that underpin a specific business need. Our work includes the sectors of satellite communications, broadband communications, drug delivery, surgery and all aspects of wireless. In this edition of Incisor, we look at some of the enablers that might be needed to capitalise on an ever increasing demand for access to the 'Cloud'.

Many years ago a block of spectrum was allocated, for unlicensed use, to a largely unheard of (by the general public) band



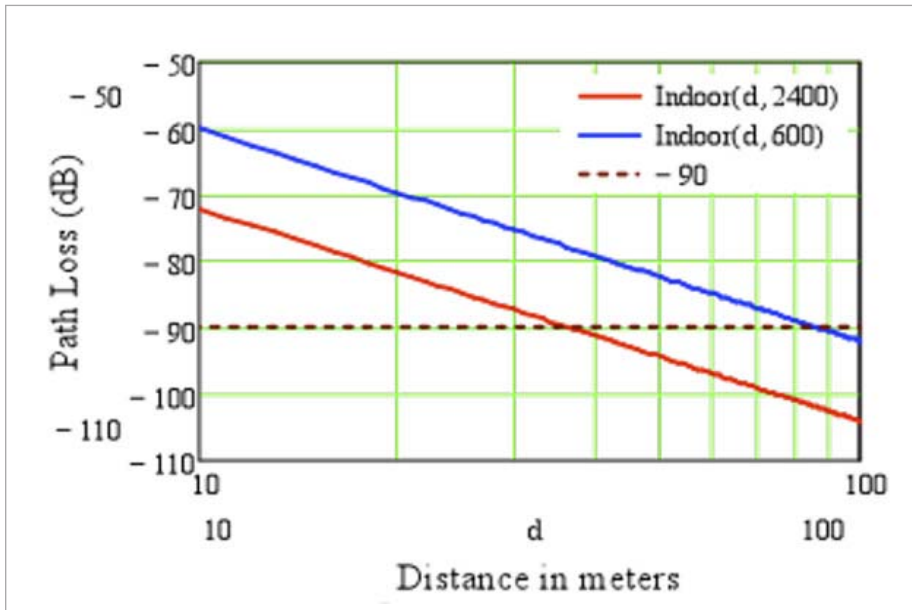
of frequencies covering 2400 to 2480MHz. Its purpose was mainly for applications in industry but also for short range consumer devices such as automatic door openers. This was not considered high value spectrum and there was no particular expectation that it might be used for anything else. Nothing could have been further from the truth. With a bit of thought and the setting out of standards for Wi-Fi, an entire industry has grown up for local

broadband delivery in the home. Writing the standards catalysed the industry into investing in the technology that was needed.

## Relieving spectrum crunch

Wi-Fi did not have a monopoly. It was not long before the mobile operators wanted to compete. This in turn spawned the development of smart phones and tablets to give Wi-Fi like access to the cloud but





in a fully mobile manner. With all this data the inevitable happened – the networks could not sustain the traffic and in many situations now need to offload mobile traffic onto Wi-Fi. This relieves the pressure on the mobile networks but reduces revenue for the operator. The increase in demand for mobile traffic has driven the need for more spectrum to be made available and has spawned the phrase ‘the spectrum crunch’. In the USA the National Broadband plan calls for 500MHz of spectrum to be made available to stimulate economic growth and help pay off the national deficit.

In the UK the regulator OFCOM published its rules for using interleaved TV spectrum, the so called Whitespaces, to provide further unlicensed capacity. The idea is that a database of incumbents will allow potential new users of the spectrum to access the spectrum not used by local serving TV transmitters. This can then be used for applications such as broadband access and as an alternative to Wi-Fi. With the basic rules in place this now sets the scene to allow industry development.

At these UHF frequencies much has been said of Whitespace being a better alternative to Wi-Fi. The lower frequencies theoretically allow for a longer range and better local coverage from a Whitespace device as compared to Wi-Fi.

There is a general belief that as a result of the increased range of UHF signals, the Whitespace radio makes it an excellent alternative to Wi-Fi. However, the comparison of Wi-Fi against Whitespace coverage is predicated based on using an antenna of similar performance. With current devices this can only be achieved by using a

physically bigger antenna. Typically for a Wi-Fi device the maximum range for indoor use is about 32m or 100ft. Compare this to a Whitespace solution where, assuming we are using the previously mentioned bigger antenna, the range, at 600MHz, increases to about 90m or 300ft. This is shown in the figure above which compares the expected range for the two cases of a typical Wi-Fi device. We do know of course that the operating range of Wi-Fi varies depending on building layout and can be a lot less than 100ft. Nevertheless, a three-fold increase in range at Whitespace frequencies would present a very attractive proposition. In reality Whitespace antennas of similar size as those used for Wi-Fi can be a factor of 10 worse in performance. Therefore if we use this same technology then the gain in using Whitespace spectrum is negated. If we want to maximise performance for Whitespace devices, whilst retaining small and discreet antennas, new solutions are required.

As a company we recognise that not only do the regulatory aspects need to be in place but also that the technology to capitalise on the available Whitespace spectrum needs to be developed. As a result and in conjunction with our Cambridge MA office, we are taking a long hard look at novel wideband antenna technology. As well as keeping a watchful eye on the regulatory aspects, we are developing IP and pragmatic hardware to support the evolution of the standard.

Our main aim is to remain at the leading edge of wireless technology through revolution and not just evolution. We expect to be doing this for many years to come.

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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.

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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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Luke D'Arcy, Neul

# Why you need to be interested in White Space radio...

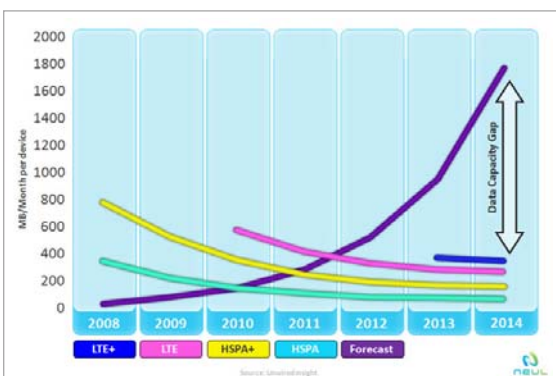
By Luke D'Arcy, Neul

Facebook on your phone, iPlayer on the train and email everywhere, there's no denying that mobile data has transformed the way we all live our lives. And with another 20bn machine to machine connections forecast over the next ten years or so this is only the beginning. Children born today will laugh at the thought of a car that can't tell you about the traffic on the roads ahead, and the idea of "estimated" electricity bills. Or will they...

Partly as a result of the huge growth in demand, wireless networks are now congested, slow and expensive. It's hard to see how current technology, or even next generation 4G networks, can possibly meet forecast demand. The market needs a new, disruptive technology that offers a step change in wireless data capacity. Neul's new technology, based on White Space radio, delivers exactly this.

Users complain that existing cellular technologies promise very attractive data rates but don't deliver. Recent research suggests that they are right - in the UK typical data rates are 1Mb/s or less, even in areas with strong 3G signals<sup>(1)</sup>. OFCOM (the UK regulator) agrees - they recently commissioned a "networking audit" to highlight the real situation.

HSDPA, the latest version of 3G, has a headline data rate of 14.4Mb/s, much higher than typical home broadband. But real world performance falls far short of this. The



Network capacity stretched,



theoretical maximum data rate is not the problem, it is network congestion due to lack of capacity that causes the poor performance.

This lack of capacity has driven up the cost of a wireless broadband connection to more than £100/year for a basic service, and much more for heavy users. One by one each of the network operators has discontinued unlimited data services. In several countries operators have introduced tiered quality of service agreements, where customers who pay more get priority access to overstretched networks. All this shows that existing cellular networks simply do not have the capacity to support current mobile data demand, let alone the forecasted growth.

This is certainly the case for the fast growing machine to machine communications market. Currently most long range M2M connections are handled using cellular connections, particularly GPRS. Although, at \$15, GPRS modules are expensive, and their power consumption does not allow long term battery power, they are just about acceptable for high value products such as connected personal navigation devices. But GPRS capacity will fall sharply over the next few years.

Many operators, particularly in Europe, are obligated under the terms of their license agreements to use 2G technology in much of their spectrum allocation. This means that they have excess GPRS capacity to fill and, for now, M2M connections do a fine job with this. However, regulators will soon lift spectrum use restrictions. Once this happens operators will replace 2G networks with more



efficient, faster 3G systems that go some way towards meeting growing demand for fast connections for smart phones. In the UK the operator O2 has already started to do this. This will result in a significant reduction in the 2G capacity available for M2M connections – but certainly not the huge increase in capacity that will be needed to meet forecasted demand.

Some M2M applications will switch to 3G, but the high power consumption and high cost of 3G technology means that this will only be possible for a small minority. A 3G module costs three times as much as a GPRS module, and 3G capacity is already stretched to the limit. Many valuable applications will only be viable with a new low cost, low power communications technology.

Neul's disruptive new technology uses White Space radio to deliver a huge amount of new data capacity to frustrated users. White Space radio takes advantage of TV channels that are no longer needed because of the switch from analogue to digital TV. This frees up 150MHz of high quality spectrum. For comparison, a typical nationwide 3G network has to make do with only 30MHz of spectrum. Used correctly, White Space radio can provide a massive boost in data capacity, helping to relieve some of the pressure on overstretched cellular networks. And White Space radio spectrum is available free of charge, transforming the economics of wireless data.

Until now White Space radio has only been accessible in the lab with specialist equipment. Neul makes it easy and cost effective for anybody to investigate the potential for low cost, reliable data connections delivered on the frequencies that used to carry your TV signals.

## Transforming the economics of wireless networks

Free, high quality White Space radio spectrum has the potential to transform the economics of virtually any wireless market. Here are three examples:

### Machine-to-Machine communications

Automatic communication between machines is set to expand rapidly as access costs reduce and the reliability and security of services increase. Commentators agree that in the next ten years there is the opportunity for up to 20 billion M2M connections. But this assumes that there is an economically and technically viable way to connect them all up. Neul's new system, designed with M2M connections in mind, delivers the low cost, low power connections needed to enable the M2M market reach its full potential. It offers

- The scale to support billions of devices simultaneously with high Quality-of-Service

for M2M traffic.

- Terminals that are ultra-low power and which can operate for years off primary and coin-cell batteries.
- Very low cost network terminal modules (<\$5) that work 'straight out of the box'.
- The best network for continuous device connection and the best security against unauthorised network access, fraud and denial of service attacks.

All at an operating tariff to customers that are lower than other M2M operator tariffs.

### Electronic media and content delivery

Content from existing media and broadcast companies, internet media companies and social networks will increasingly be delivered directly to customers' tablets, eReaders, internet radio players and cars, without the need for the consumer to enter into a separate contract with a wireless operator. He is just delighted and amazed to be able download the latest bestseller to read on the train. While he is on the train.

Devices such as the Amazon Kindle already offer this very attractive function, at least in high end models. Neul's new system enables always on connectivity across the entire range, including low cost devices, by enabling:

- Sub \$5 cost for the hardware module, allowing wide area connections to become as inexpensive and common as Bluetooth and Wi-Fi are today
- Ultra low power consumption, preserving the multi-day battery life demanded by e-Reader customers.
- Always on connectivity, allowing impulse buying of new content.
- Extremely low network fees, improving profits for e-book vendors, and enabling cheaper books.

### Rural broadband

The internet is now so important for the necessities of life that people who cannot get good wired broadband at home or in the office are at a severe disadvantage. Unfortunately it is uneconomic to build new wired infrastructure to serve small communities. Wireless systems are potentially cheaper to install, but existing systems tend to work best with a line of sight between the base station and the subscriber's home. In mountainous or forested areas this is often not possible, forcing providers to install expensive intermediate repeater hardware.

Neul's new system is particularly suitable for serving rural communities due to its ability to provide:

- Long range – wired DSL systems can already serve customers with fast

broadband over up to 3km. Any wireless broadband system needs to do considerably better than this to be useful. Even low power White Space radio signals travel long distances, due to the fantastic propagation characteristics of the TV band.

- Lack of requirement for line of sight. Low frequency TV band signals are much less susceptible to blocking by obstructions between the base station and the subscriber than existing rural broadband systems based on 2.4 or 5GHz. This relaxes the requirement for a clear line of sight, reducing the cost of installing a network to serve a community by up to 75%.
- Up to 12Mb/s real data throughput – more than enough to support the latest internet services such as video on demand.



Capacity and cost: is White Space radio the answer?

## Democratising high quality wireless data connections

It took a while, but mainstream users are at last starting to embrace wireless data services. Meeting this need offers huge opportunities for the entire wireless industry. However, this is threatened by the current lack of overall capacity for wireless communications. Existing networks are struggling - not surprisingly given the unprecedented growth in demand so far, and this is just the beginning.

The only way to meet the new demand is to add new data carrying capacity. White Space radio does exactly this, delivering up to 150MHz of high quality new spectrum free of charge. Handled correctly this has the potential to transform the economics of many wireless applications, making existing applications cheaper and better, and enabling entirely new applications that are currently uneconomic.

Neul's technology makes White Space radio available and easy to use for everybody. It will transform the economics of wireless wide area networks, democratising high quality wireless data connections, and enabling the next generation of wireless innovators.

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



# Whitespace radio - the new wireless buzzword

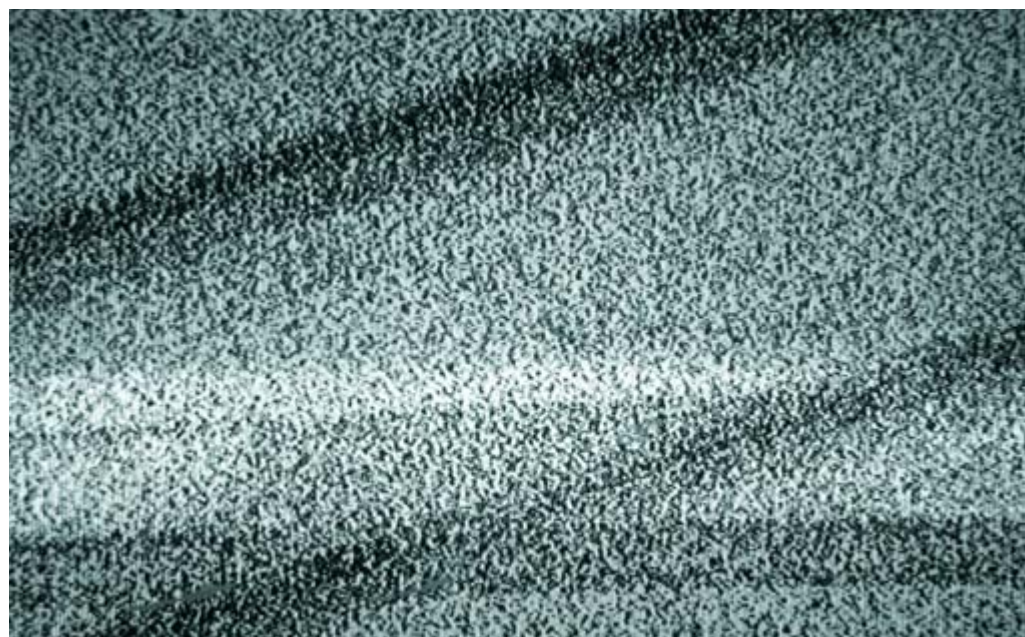
by Dean Anthony Gratton

I have been scratching my head with this one! In this month's issue of Incisor, whitespace radio is indeed a common theme throughout and I thought I'd take on more of an introductory review to the technology, as it seems to be the new wireless buzzword. I guess this introduction should serve nicely – not just for you, but for me as well! I have seen the technology bouncing around the press and certainly mentioned in several stories over the last few years and, to be honest, this is my first opportunity to follow up and offer my take on the technology. So, cranking up my Windows Media Player I begin to listen to the new debut album from Jessie J, *Who You Are* – now I'm just about primed to introduce whitespace radio. Hang on, just one more thing, the clocks have moved forward to British summer time and I'm chilling on a glass of beer this early Sunday afternoon.

## So, what is whitespace radio?

I'm sure you are already aware that radio frequencies are assigned to specific functions for broadcasting purposes – typically government agencies or bodies are responsible for their assignment. When these frequencies are assigned, channels are spaced so that interference doesn't occur between them, or perhaps a guard band is used to further ensure delimitation. Moreover, as a consequence, potential radio spectrum is becoming available. In one such example, the switchover from analog to digital TV will ultimately render the analog frequencies redundant, increasing the availability of unused radio spectrum. With digital transmission techniques, channels can now be compressed, enabling them to be transmitted adjacently, whilst confidently knowing that there is no interference. Whitespace refers to this unused set of frequencies and, in fact, a lot of attention has been given to those frequencies that are normally reserved for television broadcast.

The lower range, 50MHz to 700MHz, will become available, but proponents of whitespace radio have focused their attention on 600MHz, as this frequency "has excellent propagation characteristics – signals travel a



long way, and pass easily through walls" according to a Cambridge Consultants' ([cambridgeconsultants.com](http://cambridgeconsultants.com)) report, namely: "Whitespace: a revolution in wireless communications?"

## Controversy surrounding whitespace radio

It wouldn't be wireless technology if it wasn't fraught with a smidgen of controversy – nothing is ever that straight forward, right? It may come to you as no surprise, but TV broadcasters have expressed their concerns regarding the use of the unused spectrum suggesting that its use may cause interference. Likewise, other unlicensed users have also shared similar concerns where there's potential interference with wireless microphones for live music events, as an example. What's more, according to Cambridge Consultants' report, "concerns were not eased when several prototype whitespace radio devices failed to meet the full expectations of the FCC in initial tests. Much of the initial discussion in the group was focused on the technical feasibility of sharing the TV band without causing interference."

From what I can gather, the dust has yet to settle regarding its use within the United Kingdom. The UK has yet to complete its full transition from analog to digital which, in the meantime, enables Ofcom to prepare a regulatory and technical regime prior to supporting whitespace technology (current estimation - by the end of 2011). However, in the United States, following a heated debate with broadcasters and other companies using the whitespace spectrum, the Federal Communications Commission (FCC) agreed to release the unused spectrum once broadcasters switched over to the new digital service, which was originally targeted mid-2009. Now, with the recent authorisation from the FCC, an opportunity is offered for a wealth of consumer electronics devices to increase their bandwidth, along with the inevitable use case scenarios, which have now begun to effervescently emerge.

## Why whitespace radio?

The excitement surrounding whitespace radio is primarily focused on its ability to travel great distances, along with the enviable penetration of walls and whatnot. Indeed, the likes of Bluetooth and Wi-Fi may look





upon whitespace radio with envy, as a whitespace-enabled access point would cover an area ten times greater than Wi-Fi, according to Cambridge Consultants. Inevitably, there are several clichéd euphemisms to include whitespace radio being regarded as ‘super Wi-Fi’. I’m sure this comparison will endure to a satisfactory resolution. I can’t help wonder how the hell do we explain whitespace to everyday consumers?

Anyhow, whilst the FCC and Ofcom diligently monitor the industry’s adoption, alas the stipulation for new whitespace-enabled products needs to be modestly more intelligent. In other words, any whitespace-enabled product needs to ensure that there is no degradation to existing TV systems, as well as other products using the technology. Unfortunately, this has a knock-on effect for most consumer electronics products in terms of up-cost, as Cambridge Consultants’ report confirms “This will increase the cost of whitespace devices compared with existing unlicensed radios.” So, for the time being the viability of whitespace-enabled devices for the consumer electronics industry or, as Cambridge Consultants describes it ‘in-home media distribution,’ seems to have faltered – well, for the time being! Perhaps, the initial shortcomings should become apparent in a moment, since the basic premise is not to interfere, but this has a consequence on other factors and not just cost.

#### What’s all the excitement about?

Nonetheless, the industry remains excited and somewhat cautious despite the initial shortcomings. Most are taking a longer-term perspective. With consumers reaching out and purchasing smartphones and tablets in their millions there’s also an equal need to remain connected and, I dare say, for rural and municipal located consumers a reliable wireless broadband service is desperately needed. If I recall correctly, femtocells would remedy this, right? Never mind! This is where many industries are forecasting whitespace’s initial success and use case. Naturally, this poses several problems given the initial stipulation - you mustn’t interfere! The intelligent system suggested is a robust cognitive radio system.

In its report, Cambridge Consultants suggests “A new approach to spectrum usage is inevitable and spectrum sharing through cognitive radio techniques offers a way to greatly increase spectrum usage, benefiting everybody.” With this in mind, it’s proposed that the intelligent or cognitive radio system would simply listen on a particular channel and if it detects it being

used it will react quickly (so as not to interfere with a TV broadcast, for example) and the channel will be regarded as busy. The radio system will continue its search. It’s also suggested that a database look-up scheme could be used to determine free channels, something which has successfully been used for wireless microphones in an attempt to offer efficient channel selection.

I understand that it’s early days for whitespace radio and I hope I have provided a sufficient status of how, what, why and where we are with the technology. I guess since I now know more about the technology (at this time) and its associated agenda, for both short- and long-term perspectives, I’ll be keeping a closer eye on its development. And, I’m sure I will read over the next few years how whitespace radio, once proven affordable to integrate into everyday consumer electronics and its resounding prevalence, will undoubtedly be responsible for another death match of the wireless personal area networking space. Yep, it’s inevitable...

#### Until next month ...

Next month I think I’m taking a look at wireless sensor networks. I can’t recall specifically the agenda, but it’s certainly a hot topic especially with the emergence of Bluetooth low energy. I have seen some recent reports of ANT Wireless appearing in mobile devices and I heard a rumour that ZigBee might be up to some unlikely shenanigans, but it’s all hush-hush for now! I daren’t mention my book, but have you seen my new Bluetooth blockbuster (check out my website for more gossip)? I am really excited about this and its planned release in Autumn this year!

So, this is where Dr G signs off for this month!

#### About the Author

*Dr Dean Anthony Gratton is a bestselling author and columnist, and has worked extensively within the wireless telecommunications R&D industry. He was an Editor of the Specification of the Bluetooth System: Profiles, v1.1, participated in defining the initial Bluetooth Personal Area Networking profiles, and was active in the Near Field Communication technology and marketing committees. His wireless research work has been patented.*

*You can contact Dean at [books@deanratton.com](mailto:books@deanratton.com) and follow him on Twitter (@grattonboy). Additionally, you can read more about his work at [deanratton.com](http://deanratton.com).*

## Snippets

### Jabra Mobile is market leader in Top 5 European countries

Jabra has become the leading headset provider in the top five European markets, according to a new report from international research institute, GfK. The GfK report, published on 9 March 2011, places Jabra in the number one position for Bluetooth headsets in the top five European countries. These five countries consist of the UK, France, Italy, Germany and Russia.

### Sony Ericsson shuffles PR and marketing execs

Sony Ericsson has announced that Cathy Davies will assume the role of Global Head of Communications and PR following the recent announcement Aldo Liguori was stepping down from the post. Steve Walker, currently acting Head of Marketing is confirmed as the new Global Head of Marketing. Both roles were effective from the 1st March.

### New Bluetooth market research

IMS Research has just published two reports “The World Market for Single Mode Bluetooth low energy – 2011 Edition” and “The World Market for Bluetooth – 2011 Edition” providing a detailed analysis of the market, with numerous segmentations by application, and 5 year growth forecasts.

### Tablet Shipments to pass 58M units in 2014

Along with the iPad introduction, market drivers for tablet shipments include an increase in the availability of new media, like magazines, newspaper and books, as well as in the number of applications available for mobile computing, such as web browsing, email, social networks, and video consumption. According to In-Stat, applications like complex games that are more immersive, compared to those designed for smartphones or other mobile devices, will be developed at a rapid pace this year, helping to drive content and therefore demand for tablets to where unit shipments will surpass 58 million in 2014.

### Over 1/3 of new base stations to be in China, India, or the US

Mobile phone usage is changing and becoming richer with applications. The movement from 2G to 3G is helping to facilitate texting and web-browsing. Now, video-intensive applications are being accessed by mobile phones, which is adding to the pressure on mobile networks globally. As a result, the number of macro base stations deployed will increase to over 6 million by 2014, says In-Stat, and most will be in China, India or the US.

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**ZigBee**  
Member



Jon Harros, TRaC

**So, as I make arrangements for my upcoming presentation at this year's European ZigBee Developers conference, I've found myself reflecting on the progress made during the last 12 months by this low power protocol technology known as ZigBee.**

I found myself remembering an article I wrote whilst at last year's Developers conference, where I was looking at the indicators that suggested that ZigBee was a technology that was beginning to show the potential for growth. In the crowded world of WPAN it looked like the year ahead would be an exciting time for ZigBee.

So now, not quite a full year on, I've decided to review the current state of play with ZigBee.

The first thing that springs to mind is that thoughts of whether or not this technology will take off are now long past. It is clear that ZigBee is here to stay in some form or another. All the indicators reflect this and so find that the more pertinent question is: what makes ZigBee a success?

There are currently a lot of different technologies that are offering "low power" wireless solutions. However ZigBee has a number of both technical and non-technical features that have seen it selected for key trials and deployments.

#### **Very fit for purpose**

On the technical side, ZigBee offers a truly low power solution for wireless protocol communication. Granted the data rate is not in the order of mainstream options such as Bluetooth or Wi-Fi, but then the applications to which it has been put do not require such a large data rate. ZigBee was never intended as a technology that would

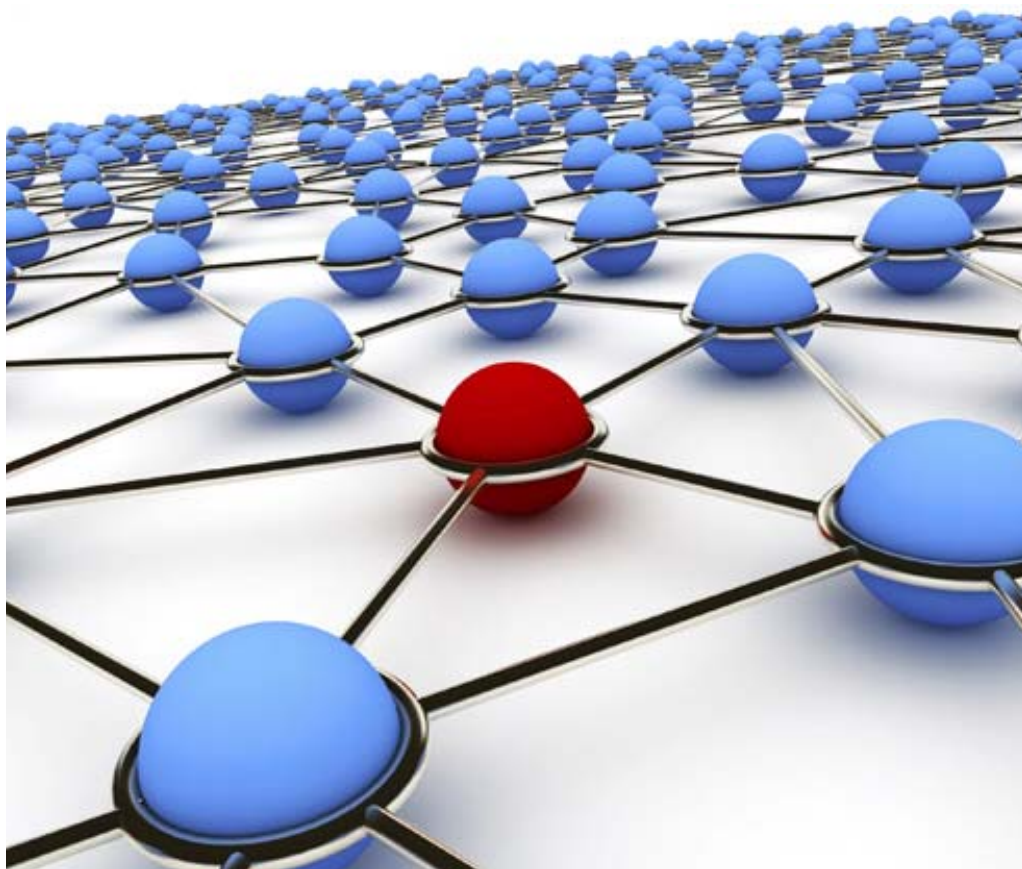
permit high definition video streaming or real-time gaming.

Another technical benefit of the technology is that, unlike other wireless communications, ZigBee can be configured in more than just Star or Tree topologies. ZigBee also allows Mesh topology. The advantage of this type of topology is that it allows devices to route packets around potential wireless black-spots or physical obstructions. This makes ZigBee particularly useful in environments where other star topology technologies are not practical (e.g. building sites, buildings with solid brick walls, locations with mobile obstructions, etc.).

This rerouting within the Mesh also allows for node failure recovery. In other words, when a ZigBee device, within a

# The ZigBee success story

By Jon Harros, Operations Manager, TRaC



ZigBee network, stops operating properly, the rest of the network devices treat it as a black spot and look for alternative routes to the packet's destination.

However, in the WPAN arena there are a few other technologies that also have meshing capabilities, and so it is the next feature of ZigBee that really makes the difference from a technical point of view. That is, that ZigBee allows the option of a very high level of security.





As a technology, ZigBee offers manufacturers a number of different levels of security. For some applications, a normal level of security is sufficient and ZigBee allows for this, thus increasing available memory and processing for the actual functionality of the device. This level of security still protects the network from intrusion, but provides a balance with available functionality.

In contrast, there are some applications (e.g. Smart Energy applications) where the security of the network is of paramount importance. For such applications, ZigBee offers the designer and manufacturer of the product a much higher and more complex level of security. This makes the ZigBee technology a very good fit for situations and environments where wireless flexibility and routing robustness are coupled with a need for a high degree of integrity and confidentiality of the data being transmitted.

And it's easy to see that there are a plethora of applications out there for which ZigBee is suited. Looking at the [ZigBee Alliance home page](#) will give you a feel for what I'm talking about. There are currently 9 different "public profiles" listed which range from the obvious - ZigBee Home Automation - to the latest - ZigBee Sync 3D which is intended for the new fashion in 3D TVs, goggles and other display related devices.

But, as I mentioned at the beginning of this article, there is more to the success of ZigBee than just the technology...

### Strength in numbers

There are also a number of non-technical factors that contribute greatly to the success that ZigBee is seeing.

The most obvious of these is the sheer volume of participation in this technology. A quick look at the ZigBee Alliance website highlights a membership in excess of 370 companies. The simple size of this number is significant. When you have that kind of membership you know that there are a lot of people working towards making the technology a success.

But size isn't everything, and it is certainly true that the quality of the membership is also important. To this end it is interesting to see that the membership also includes a real "who's who" of the top silicon manufacturers in the world. This is a very healthy scenario for a technology to be in, as it provides for design and manufacturing options. This in turn helps to make the technology more efficient whilst at the same time driving down costs to a price point where application innovation becomes cost efficient and practical.

The final piece of the ZigBee success puzzle is the product ecosystem. There are now over 150 different products listed on the Certified Products pages of the ZigBee Alliance. Although a big portion of these are related to the ZigBee Smart Energy Profile, this was the first of the profiles to be properly issued by the

ZigBee Alliance and there does look to be traction within the later profiles.

An ecosystem this large tends to generate its own momentum, as product designers and manufacturers see opportunities to leverage the functionality of the already certified products, or identify new possibilities for innovation.

As a test house involved in testing lots of different technologies (including ZigBee), here at TRaC we are always interested in tracking the progress of the technologies we test, as this provides an indication of the future potential.

So, looking back to when I wrote that article at last year's European ZigBee Developers Conference about how ZigBee was showing the potential to grow, all the same indicators are now confirming that ZigBee has become a success. It has firmly established its position within the WPAN arena, and this success appears to be based on good fundamentals. As such, this suggests that ZigBee has reached a growth period. It will be interesting to see at what rate ZigBee grows now that the building blocks are in place.

[www.tracglobal.com/zigbee](http://www.tracglobal.com/zigbee)

# Leaving the lights on in Las Vegas

## Investigating claims for largest Z-Wave installation ever

**Evolve Guest Controls, which has adopted Z-Wave technology, has designed, developed and implemented what it claims is the single largest deployment of wireless RF lighting and energy management devices to date at the Wynn hotel in Las Vegas – more than 65,000 devices in more than 2,800 rooms and suites.**

“This is part of a much larger initiative and is one of many of deployments we are executing in hotels across the U.S.,” Avi Rosenthal, vice president of Evolve Guest Controls, told Incisor. “We selected Z-Wave as our platform because it’s an open protocol and, as such, allows us to listen to what our customers’ needs are and then design around any potential roadblocks along the way. We believe Z-Wave is the best platform for hospitality and we’re seeing ROI for our customers in as little as two years.”

Evolve claims that its hotel customers have reported a 25 to 40 percent savings since the deployment of the company’s wireless RF system.

Here at Incisor we thought that the idea of there being 65,000 devices in one hotel was a bit hard to believe, so we thought we would get a comment from another organization that is heavily involved in in-building control systems, the EnOcean Alliance. We spoke to Graham Martin, chairman and CEO of the Alliance.

Martin commented: “It is a pretty impressive claim and it is a pretty impressive project. The Wynn is a huge hotel and if they have installed this into every room it will be a large number. However, if I do the maths, at 2,800 rooms with 65,000 nodes it adds up to around 25 components per room – which I find a little bit excessive for a hotel room – even with the fantastic rooms the Wynn have. What I also find hard to believe is that the 65,000 devices are claimed to be “in a network”. I assume that each room will have its own individual point to point system of devices (I would guess 5 – 15 devices per room to be a normal number for such a hotel



room). Maybe they chose 65,000 to top ZigBee’s claim of being able to do 64,000 nodes in a network and / or to top ZigBee’s claim of having 60,000 nodes in the City Center in Las Vegas (although I have heard varying claims from ZigBee of between 40,000 and 75,000 nodes).”

“I would certainly recommend checking the number of nodes per room with Z-Wave and also check if all rooms have really been installed. It is a normal procedure for hotels to install technologies in a few rooms or on one floor and test them for many months before deciding to install the technology in the entire building. Even after technology approval they then usually do it floor per floor over a multi-year period. It is very uncommon for a hotel (especially such a large one like Wynn) to

retrofit all rooms at once and install one technology immediately into all of them. Maybe 2,800 rooms is the target for a later date? Maybe only a couple of floors have been installed to date? It would be interesting to get the timescales of the project and the installation routines.”

“What is also not clear to me is how the nodes are powered? If they are battery powered, with 2 -3 years battery life, then congratulations to the battery changer at the Wynn as he has just secured his job for a long time to come! In any case I congratulate Z-Wave on this significant deployment which is certainly a great achievement for them.”

Incisor would welcome either Evolve or the Z-Wave Alliance responding to Martin’s observations.

# Home of the future one step closer

## New framework for interoperability across devices



**Intelligent homes which can manage energy usage, monitor security and support independent living for the elderly and disadvantaged are closer to becoming a reality, apparently.**

Researchers at De Montfort University Leicester (DMU) have been developing an international framework that will enable products and applications from different suppliers to work together in the same house. Their work has now been adopted by CENELEC – a European standards organisation – as a new standard.

DMU is a member of The Application Home Initiative (TAHI), a group that works to help develop technology to make the 'future home' possible.

One of the key challenges facing future technology is interoperability: ensuring products and appliances do not interfere with each other's operation and that they are able to communicate with each other in a consistent way. For example, a security system could work with another supplier's web application to enable remote monitoring. Interoperability standards enable such services to work seamlessly together.

During the project, known as the Interoperability Framework Requirements Specification (IFRS), researchers developed an international standard to allow manufacturers to create new products and applications that work in harmony with each other, regardless of which company made them.

As well as DMU, IFRS involves experts from the University of Bristol and Telemetry Associates, a company specialising in the latest electronic communication technologies. The project was sponsored by TAHI.

Dr Xi Chen, the university's prime architect on the project and a member of DMU's Mechatronics Research Centre, told Incisor: "The purpose of the project is to give consumers the confidence to buy home and building automation products

from different companies, knowing that they will operate together and interact effectively with each other.

"Interoperability is something that consumers aren't really aware of when they use a product, but it is fundamental if the home of the future is to work as it should."

He added: "The framework allows a diverse range of products to work together, enabling intelligent systems to be developed in a variety of areas. This could mean that services and products we think of as being some way in the future could rapidly become ubiquitous and commonplace.

"These could include, for example, systems that provide entertainment on demand through devices that are integrated into the home or that regulate the environment and energy usage, from controlling the temperature to automatically switching off devices that are not in use."

The framework provides specifications enabling applications using different standards to operate together as required by the user. It also provides a common set of guidelines that would help in product development.

Professor Phil Moore, DMU's director of research and a board member of TAHI, added: "For 20 years people have talked about the potential for technology in homes but because of interoperability requirements it has not been possible to achieve for the majority so far, but we are talking about a marketplace of potentially billions of dollars, and this is a major step on the way to delivering that marketplace.

"Products that work together give consumers better purchasing value and encourage manufacturers to develop products with a wider range of customer use and value. This integration will drive down the cost of devices and applications and will increase the scope for new products."

Existing technologies work on four basic principles of interoperability, but to support products developed from now on the team has established three further levels for 'open' interoperability:

**Manual installation**, where a specialist interface is provided that enables a trained installer to integrate functionality, e.g. a home lighting control system is added to an existing security system so existing motion monitoring devices could also turn lights off when nobody is in a room.

**Plug and Play**, where a new product can quickly be installed in an operational system by the owner, rather than a trained installer.

**Remote configuration**, where different applications and associated products are configured remotely by a third party, e.g. a local service provider takes over the configuration, monitoring and running of the installation and adds additional functionality to provide an integrated telecare function (telecare being services provided through telecommunications technology).

Professor Moore concluded: "Users, especially consumers, expect products that implement these standards to coexist and interoperate and that expectation has not so far been met.

"The diversity of products and potential for even greater problems will increase in the future as further applications, technologies and communication media are developed.

"Without commonly understood interoperability requirements, these issues could have been significant barriers to the future home but this framework will give developers and consumers reassurance that devices can work in harmony."

*CENELEC is a European Standards body for electronic systems. The standard is called "An interoperability framework requirements specification for services to the home" – CWA 50560 : 2010IFRS.*

# low energy wireless news



## GSS shows EnOcean-enabled wireless CO2 sensor

Gas Sensing Solutions (GSS) showcased what it claims is the world's lowest power CO2 gas sensor at ISH 2011 – the trade fair for bathroom design, energy efficient heating and air-conditioning technology and renewable energies – that took place in Frankfurt during March.

GSS has been working with the EnOcean Alliance and its other member companies to integrate the EnOcean Standard in its product portfolio. The CO2IR CO2 sensor works without batteries and is maintenance-free. It also has very low power consumption and a fast warm-up time of less than two seconds, making it, suggests GSS, ideal for applications such as Indoor Air Quality (IAQ) monitoring, Heating, Ventilation and Air Conditioning (HVAC) systems, Horticultural and Building Control.

CO2IR utilises EnOcean's energy harvesting technology in which the sensor draws ambient energy from motion, light or temperature differences in its surroundings. Using available room light to power the CO2 sensor, three readings are taken every 10 minutes and the values are sent wirelessly to a receiver, which sets an alarm to open a ventilation system, for example. When no room light is available the sensor operates on stored energy in energy storage mode, taking fewer measurements or only sending signals when critical values are measured.

The CO2IR CO2 sensor incorporates a non-dispersive infra-red (NDIR) configuration based on GSS technology, combined with low loss compact injection moulded optics and low noise electronics. It consumes only 3.3mW in continuous operation, with two CO2 measurements per second, which is typically 50 times lower power than standard NDIR sensors. The sensor is



available in three ranges: 0 to 2000ppm, 0-1 percent or 0-2 percent.

## TI edges out Freescale and NXP in 802.15.4 IC vendor ranking

Texas Instruments has been ranked at the top of the latest Vendor Matrix released by ABI Research. Freescale Semiconductor and NXP Semiconductors claimed the second and third spots in the company's most recent evaluation of worldwide IEEE 802.15.4 integrated circuit vendors.

The Vendor Matrix is an analytical tool developed by ABI to provide an understanding of vendors' positions in specific markets. Vendors are assessed on the parameters of "innovation" and "implementation" across several criteria unique to each vendor matrix.

"Texas Instruments held onto the top spot in the IEEE 802.15.4 Vendor Matrix this year by benefiting from a strong combination of innovation and implementation across its range of its 802.15.4 IC offerings," principal analyst Jonathan Collins told Incisor. "Freescale, in second place overall, did gain the top spot within the Implementation category. NXP's third place ranking is courtesy of its Jennic acquisition, but it's too early to tell whether NXP's backing will have a significant impact on Jennic's marketplace standing."

For this particular matrix, under "innovation," ABI Research examined the vendors' product feature sets, their device power consumption, their Rx sensitivity, memory sizes offered, if any, and Microcontroller Units (MCUs) offered, if any. Form factor integration and variety were also assessed, as well as protocol stack availability.

Under "implementation," ABI Research scrutinized vendors' overall market



positions, their vertical market focus, and their levels of customer support.

## Electricity, water and gas consumption at a glance

With its Energy Display, GreenWave Reality tells Incisor that it has benefited both utilities and consumers; utilities enhance their relationship with consumers and can better balance energy on the grid, while consumers can conserve energy with a minimal impact to their lifestyle by easily monitoring and controlling their appliances. To allow incorporation of the solution into a wireless home network, GreenWave Reality has integrated Z-Wave technology into the Energy Display, which is used in conjunction with its Gateway product.

The GreenWave Reality Energy Display gives users access to electricity, gas and water consumption data as well as electric vehicle charging and time of day pricing. In addition to its device monitoring function, the GreenWave Reality platform can be extended to control other Z-Wave compatible devices in a home energy management network. Customizable energy profiles can also be configured to control electricity and heating so they are used only when needed. The solution can be connected to existing smart meters so consumers also benefit from increased visibility and control of their overall energy consumption.

The Energy Display can be utilized outside of the GreenWave Reality home energy management platform, as it is suitable for use with Z-Wave compatible solutions from third parties.

The Z-Wave Alliance web site reveals that the global portfolio of home control devices currently equipped with the Z-Wave wireless standard has grown in recent months to include approximately 450 products from more than 170 manufacturers located around the world.

# low energy wireless news



## Things get seedy over Blackberry intentions for NFC payments

There's word on the jungle drums that a row is brewing between Research in Motion (RIM) and US network operators over the way that mobile payment credentials will be stored on its devices.

With NFC due to be implemented in Blackberry handsets during 2011, normally operator-friendly RIM has revealed that, rather than store a customer's credentials on the SIM card, it will instead hold this information in a ring-fenced location on the Blackberry itself, thereby locking the customer into the Blackberry platform and controlling revenue and applications that grow out of mobile payments. Understandably, the carriers aren't happy about this, especially as RIM has previously been very supportive of them, taking steps such as holding back the pre-load of its own App Store while some of the carriers took the opportunity to push their own app shops.

RIM is thought to be doing what it can to establish an early lead in this tussle. Incisor understands that the company is already talking to companies such as Mastercard and Bank of America about trial programmes that will allow Blackberry users to make payments with their handsets. This is happening at the same time that some of the carriers that RIM's spat is developing with, namely AT&T, Verizon Wireless and T-Mobile USA, are also putting their toes in the water with a mobile payments project called ISIS. Even that is not enjoying calm waters, as the carriers are struggling for control of mobile payment revenues with the credit card companies.

Sadly, this all means that the road to widespread NFC implementation, and

mobile payment nirvana, will continue to be a rocky one. Which is such a shame – this is one app that really does make a lot of sense and which consumers would surely embrace.

Come on guys, get sensible – a rising tide floats many boats, you know

## BSC Computer becomes EnOcean Alliance promoter

EnOcean LAN infrastructure provider BSC Computer GmbH has been announced as a promoter of the EnOcean Alliance. A member of the Alliance since its formation, BSC Computer integrates the energy harvesting technology in its infrastructure solutions for building management.

BSC integrates EnOcean's wireless technology in its BSC-BoSe embedded intelligence system. This building management system is set up on TCP/IP to enable the use of internet connectivity plus maintenance-free EnOcean technology. This means all internet- and network-enabled end devices – such as PCs or smart phones – can be used to control building automation. Matching Apps are available for both iPhone and Android. Visualisation of readings – electricity, water and gas for instance – additionally allows the user to monitor specific conditions and consumption in a building, and immediately recognise energy-saving potential. The BSC system is suitable for smart metering and smart grid purposes in both private households and public, commercial or industrial buildings.

"We recognised the enormous prospects for EnOcean's batteryless wireless technology early on", Jörg Hofmann, managing director of BSC Computer told

Incisor, "and successfully integrated it in our embedded intelligence system. But we haven't tapped its full potential by any means. For this reason, we are taking a more active participation in the EnOcean Alliance, cooperating with other members to promote integration of the technology in TCP/IP communication systems."

# high speed wireless news



## AT&T dares cable cos. to cut cable with Wi-Fi STB

The Cisco ISB7005 for AT&T U-Verse cleared the FCC, IMS Research tells Incisor. This is, says IMS, the first set-top box that is designed to receive pay-TV over a Wi-Fi interface that it has observed, other than those from the Turkish company AirTies.

Stephen Froehlich, a senior analyst with IMS Research's Consumer Electronics group told Incisor, "AT&T appears to be using the extreme compression of their video as a competitive advantage. U-Verse's comparatively low HD video bitrates are allowing them to use a relatively inexpensive 2x2 dual-band 802.11n Wi-Fi radio based on the BRCM4717 for this application. Our preliminary analysis is that AT&T can use such a simple design because its HD video is encoded at approximately 5 Mbps compared to 5-8 Mbps for HDTV over satellite and 16 Mbps for HDTV over cable. This means that the satellite and especially the cable providers will need far more elaborate wireless solutions to enable them to stream video over a wireless network."

The Cisco ISB7005 also includes the Ethernet and HomePNA wired networking interfaces found on other U-Verse STBs and DVRs.

Froehlich added, "It is not yet clear if the ISB7005 is intended to be the primary client STB for U-Verse, or whether it is meant instead to be used only to save installers from the most time consuming of wire runs. It is important to note that this is a client STB for U-Verse and we have not yet seen a multi-room DVR server with Wi-Fi. The interior photos also reveal that the Wi-Fi in the ISB7005 is on a daughter card that can easily be installed or removed by an AT&T technician."

## Display apps to drive 50M unit wireless video market

Avid consumer electronics users like to "cut the cord" wherever possible, according to ABI Research, and video/television is no exception. However, wireless video distribution in the home presents unique challenges.

In what is still a young market, several technologies are vying for supremacy, but according to ABI the market will most likely favour hybrid solutions. In fact, many companies are already laying the foundation with standards such as P1905.1, and products featuring tri-band solutions are in the works. ABI expects that just over 50 million wireless video devices (targeting wireless display applications) will ship into consumer markets in 2015.

According to industry analyst Michael Inouye, "Each of the wireless video technologies targeting this facet of the wireless market – Wi-Fi (802.11n and 802.11ac) + video compression, UWB + video compression, WHDI, and 60 GHz (WirelessHD and WiGig/WGA) – has strengths and weaknesses. Hybrid solutions can complement one technology's weaknesses with another's strengths."

One obstacle to market growth has been the lack of standardization and interoperability. While standard products are starting to arrive, their benefits will take time to realize. Range is another problem: some of the technologies only perform optimally with "line of sight" between devices. Cost is always a factor, and with the growing numbers of connected (and Wi-Fi-enabled) devices there may be less need to stream content between devices.

Sounds like ABI is saying the wireless video market is still a mess. We already knew that.

## Hotspot program to ease subscriber connectivity in Service Provider Wi-Fi hotspots

The Wi-Fi Alliance has told Incisor that an initiative to transform the user experience in hotspots is underway. Service providers and device manufacturers in the organization have formalized a set of industry market requirements that will lay the foundation for a new Wi-Fi Certified testing program that addresses authentication and provision of service for public Wi-Fi networks.

"Ensuring end users can easily access hotspot networks from various providers is a win for subscribers, service providers and device makers alike," Kelly Davis-Felner, marketing director of the Wi-Fi Alliance, told Incisor. "We envision an automated, cellular-like experience for Wi-Fi users around the world in security-protected service provider hotspots."

The Wi-Fi Alliance hotspot program is also aiming for seamless handoff of cellular traffic from data-hungry smartphones, tablets and other portable electronics to Wi-Fi, helping service providers manage demands on constrained licensed spectrum. Research company Informa is forecasting that data volume over cellular networks is forecast to nearly double from 2011 to 2012, reaching 4.56 million terabytes. In an effort to address this trend, many service providers have recently announced expanded Wi-Fi hotspot deployment plans. As a result, the number of hotspots worldwide is expected to more than double by 2014, from the current estimate of 750,000.

The key benefits of the hotspot program include network discovery and selection, streamlined network access, immediate account provisioning and WPA2 security. The launch of the Wi-Fi Certified hotspot certification program is targeted for the first half of 2012.

# 4G/LTE/WiMAX news



## Huawei and ZTE lead PC modem market, but court action heats up

ABI Research has been looking at the markets for broadband cellular modems, and says there are signs of maturity, and that the USB segment in particular is starting to become commoditized as Chinese suppliers Huawei and ZTE capture growing market shares at the expense of their competitors.

“One can tell a maturing market by the displacement of new product innovation by litigation,” ABI senior practice director Jeff Orr told Incisor. “This was certainly the case in the mobile broadband modem market as vendors engaged legal teams to enforce patent and IPR ownership. In December, for instance, Novatel Wireless filed a patent infringement lawsuit against Franklin Wireless and ZTE.”

In another case, OPTION of Belgium asked the European Community (EC) to investigate modem dumping by Chinese suppliers in member states. That request was dropped after Huawei agreed to buy OPTION's RF business in Germany and license OPTION's connection management software.

USB-format modems continue to make up the lion's share of this market with nearly 125 million shipments forecast for 2013; but shipments of embedded modem modules slowed in 2010 compared to the previous year.

If there is hope for the embedded modem module market, it may lie with media tablets. Apple makes its own embedded modem module for the iPad, and, says Orr, “The intense interest in media tablet devices has increased hopes that embedded modules will have a higher or more significant attach rate than for other system types.”

## ST-Ericsson's Thor modem to provide '4G' performance in T-Mobile Sidekick. Yeh, right.....

A thin modem from ST-Ericsson's Thor family will power network connectivity for the new T-Mobile Sidekick 4G smartphone from Samsung. Expected to be available later this spring, the Sidekick 4G utilizes ST-Ericsson's Thor M5720 modem that is claimed to be capable of delivering theoretical peak download speeds of up to 21Mbps to connect to the Internet.

Now, Incisor is very skeptical about US net op and handset manufacturer's claims that they are supplying 4G solutions to their customers. As Dean Gratton's article '4G or not 4G: busting the myth' in the [February issue of Incisor](#) explains, these are not real 4G products.

Having established that, and knowing that neither the operators nor the handset companies are going to let reality get in the way of a sale, let's get on with the story.

"T-Mobile USA and ST-Ericsson are working together to bring even higher data rates to market including 42 and 84Mbps for future devices on Thor platforms, enabling T-Mobile to fully harness the step change in capacity and performance made possible by next generation mobile networks." Jörgen Lantto, Executive Vice President, Chief Technology Officer of ST-Ericsson, told Incisor.

OK, guys. What is a fact is that these products are delivering better data rates than 3G products out there in the field (though this also relies on there being '4G' network support, so the provisos continue), so the poor, misled user will at least be happy.

## The rewards of dual-platform 4G

There's no question that in the long term LTE will become the mainstay 4G network technology, says ABI Research, although its universal use is still in the future. Until then, some service providers will benefit from a dual-platform strategy based on both LTE and WiMAX.

Research director Philip Solis told Incisor, “Intel and others are pushing the idea of heterogeneous networks. This is not to deny LTE's long-term position as the leading 4G platform, but to recognize that a small part of the ecosystem will still be characterized by diversity for some time.”

### Who stands to benefit?

Some operators, such as Sprint and Clearwire, KDDI and UQ Communications, and KT, will use both technologies for some time. Says Solis, “By using both standards, they'll have access to more spectrum, which helps with capacity issues.”

Multi-standard base stations now being deployed support several generations of technologies as well as both 4G standards. Alvarion, Huawei, NEC, NSN, Samsung, and ZTE are some vendors supporting both technologies in the same flexible base station.

There will also be multimode 4G chipsets in devices. Prior to its acquisition by Broadcom, Beceem was already planning such chipsets. Chipmaker Sequans recently announced a similar product initiative it calls 4Sight, with software allowing for handoffs between multiple networks if carriers choose to implement it. According to Solis, these solutions “provide the ecosystem with the flexibility it needs.”

Intel already has WiMAX/Wi-Fi chipsets and in the near future it will focus designs on HSPA+/LTE.

## events



2011

DATE	EVENT	LOCATION	NOTES	LINK
April 11 - 14 2011	Bluetooth SIG All Hands Meeting	Intercontinental Hotel, Budapest, Hungary	Annual meeting for all Bluetooth SIG members	<a href="http://www.bluetooth.org">http://www.bluetooth.org</a> (requires member log-in)
May 17 - 18 2011	In Building Wireless Access & Offload Symposium	Paris, France	-	<a href="http://imsformation.com/?CategoryID=276&amp;ArticleID=22">http://imsformation.com/?CategoryID=276&amp;ArticleID=22</a>
May 18 - 19 2011	European ZigBee Developers Conference	Munich, Germany	-	<a href="http://www.zigbee-devcon-europe.de/">http://www.zigbee-devcon-europe.de/</a>
Sept 18 - 21 2011	CTO Telecom Summit	Scottsdale, AZ, USA	-	<a href="http://www.ctotelecomsummit.com/">http://www.ctotelecomsummit.com/</a>
Jan 9 - 12 2012	Consumer Electronics Show (CES)	Las Vegas, Nevada, USA	-	<a href="http://www.cesweb.org">http://www.cesweb.org</a>
Feb 21 - March 1 2012	Mobile World Congress 2012	Barcelona, Spain	-	<a href="http://www.mobileworldcongress.com">www.mobileworldcongress.com</a>

2012

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