EZURiO

Wireless Connectivity out of the box

The Marvellous World of Wireless Microdata

With the announcement that Wibree has been adopted by the Bluetooth SIG, the foundations are in place for a new generation of wireless devices.

From personal healthcare devices, to local messaging and remote control, Wibree will change the way that consumer products are designed and used. Its symbiotic relationship with the silicon inside mobile phones opens up a potential market of tens of billions of devices.

Becoming part of the highly successful Bluetooth® standard signals the start of this growth. This White Paper explains what it means.

Nick Hunn
CTO - EZURiO Ltd

EZURiO Ltd
Saturn House
Mercury Park
Wycombe Lane
Wooburn Green
Bucks HP10 0HH
United Kingdom

Tel: +44 1628 858 940
Email : info@ezurio.com
Web: www.ezurio.com

Wibree – the marvellous world of wireless microdata

The announcement by the Bluetooth SIG that they are embracing Wibree as an additional strand of the Bluetooth family of wireless specifications is a major step in its evolution. At its announcement, some commentators asked why we needed yet another wireless standard, particularly as its key feature is low power? The argument being that we already have low power radio standards, such as 802.15.4, ZigBee and Z-Wave.

This misses the point. Wibree offers low power – as low as any of the other contenders, but it does it in a way that sets itself apart from them. Its unique feature is that it cohabits with a Bluetooth radio in a new generation of wireless chips. To reduce cost it uses the same radio circuitry that's already there for Bluetooth and squeezes in a small, complementary protocol stack. These dual mode chips will cost at most a few cents more than today's Bluetooth only chips. That means Wibree will quickly achieve a high penetration in mobile phones because it is riding on the back of an established technology. Thee are two important things to realise about that symbiosis: firstly, Wibree deployment will happen quickly and happen in volume. Secondly, it means that every Wibree enabled mobile phone becomes a ready built, wide area gateway capable of transferring data from a peripheral Wibree device to a remote network or service.

The sheer speed and scale of Wibree deployment in mobile phones in the next few years is the first step to its goal. It will provide the critical mass that product designers need to justify incorporating wireless connectivity into a new generation of products. Low cost, Wibree only chips will find their way into a whole new range of accessories, such as watches and lifestyle devices. Dual-mode Wibree + Bluetooth chips will give added functionality to the phones themselves, which will become usable for location specific data searching and remote control. Most importantly, Wibree opens up a raft of new opportunities for mobile network operators. As each Wibree equipped handset is a mobile gateway for Wibree devices, operators will be able to offer new services, such as health monitoring. Such services provide a route to new revenue streams, as well as being a powerful tool for operators to increase customer loyalty and reduce churn.

The important point to understand about Wibree is that it is going to build upon the volumes of mobile phones. Unlike other low power standards it's not starting from scratch, but will ride on an industry that already sells a billion devices every year. Wibree has the goal of enabling a multitude of products to connect to each and every one of these handsets. That adds up to a potential that is an order of magnitude greater than mobile phone sales. Unlike other short range standards, Wibree's goal is not to ship mere millions, but tens of billions.
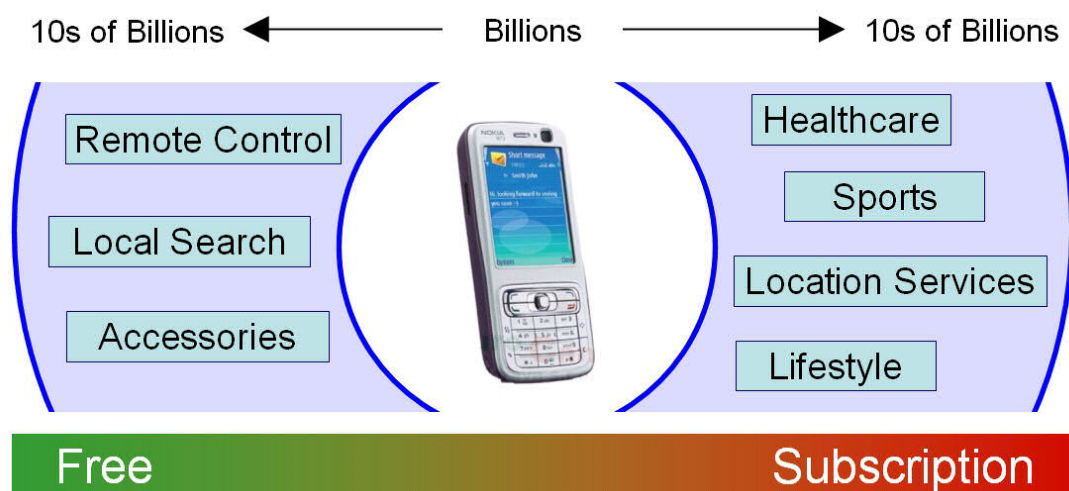
The virtuous circle of Wibree applications – an order of magnitude greater than phones.

Wibree applications – small scale, big opportunity

Wibree is all about small data transfers. These are the applications that send small amounts of information occasionally. That might be a TV remote control, a glucose monitor, flight information at an airport or a room thermostat. All in all, each application may only transfer a few tens or hundreds of bytes of data each day. It's what I've termed microdata. It's not a new concept, but prior to Wibree nothing has had the architecture to make it simple or the critical mass to make it happen. Instead most wireless technologies have been bogged down in complexity by trying to be good at the difficult things, such as meshes or video streaming or concurrent audio and data. Wibree is all about doing the little things simply. Looking at it anthropomorphically, Wibree's not the technology for long term wireless relationships between devices, but rather the everyday "hellos" "how are you"s, "how much is that" and "I'll have two of those, please". In terms of the wireless day, Bluetooth and Wi-Fi will cover the deep, meaningful conversations between loved devices; Wibree will be all of those other snippets of conversation that oil our everyday existence.

Understanding the playing field

There are advantages in arriving late, at least as far as a wireless technology is concerned. It means that it can see what its prospective environment looks like and thus be designed to cope with the increasingly noisy and congested spectrum at 2.4GHz. The Wibree specification makes sure that it can cope with interference with a simple frequency agile approach that doesn't demand the precision clocks of Bluetooth. It uses advertising channels to ensure it's not inadvertently jammed by Wi-Fi or other transmitters in the band – a low cost but efficient solution. To attain extended battery life, it implements a data transfer scheme that lets it rapidly wake up from deep sleep when it has something to say and then fall back asleep again. It's a well thought through, pragmatic specification based on experience and thought. It covers its target market requirements at its inception, meaning it is unlikely that the specification will need to updated after a year, which helps provide robustness as well as keeping the cost of the technology low.

At the interoperability level, the standard defines a number of basic profiles that concentrate on efficiently sending attributes or values between devices. These allow a Wibree device to send status information, such as ON or OFF, and values such as room temperature. They also allow simple transmission of information that needs to be displayed, such as text strings. Most of the time these transfers will be infrequent; sometimes they may be the starting point for another wireless technology to take over – such as setting up higher speed Bluetooth or Wi-Fi connections. It's all part of Wibree's job of providing the glue to hold our wireless day together.

The long and short of it

Don't make the mistake of thinking that low power and long battery life mean that Wibree will be limited to short range applications. Wibree can transmit at powers up to 100mW. In mobile phones, where it shares the same transmitter and receiver with the Bluetooth chip it reside in, Wibree will typically transmit at around 2mW with a receive sensitivity of better than -86dBm. If the RF circuitry is well designed, that will give it an open field range in excess of 100 metres with very low battery consumption. Sensor applications that add a power amplifier ought to be able to exceed 1 km of open field range. While many Wibree applications will extend no further than the range of personal transactions within a room, there will be numerous applications that need to cover the house or office. The ability to deliver that range will help Wibree enable a very wide range of applications.

What's microdata all about?

The best way to understand its versatility is to look at some applications that Wibree can enable. The first of these to come to market will almost certainly be phone-centric, not

least because Wibree is being championed by Nokia and other phone vendors. These headline applications include sending caller information to your watch display and collecting data from health and lifestyle sensors. They'll start to deliver the first stage of that promise of tens of billions of devices.

An important part of the design of the Wibree standard has been in making it inexpensive to manufacture and integrate – potentially half the cost of Bluetooth for a stand-alone Wibree chip. That low cost opens up a whole raft of opportunities. It only needs a little thought to see how wide the potential from wireless microdata can be.

Microdata means Location

How many times have you gone somewhere and wanted some basic piece of information? It might be the time and gate for your flight, where the goat's cheese is in the supermarket, or where to find your mummy at the British Museum. Some of these can be answered by search engines and a mobile data subscription. Wibree enables the concept of free local searches.

The way it works is to install Wibree "servers" at each relevant location, with a simple information database in each. That database is typically going to be small and local as it only concerns itself with information about its search location. At the train station it will be the times and platforms of trains for that station and their destinations. In the supermarket it will be the aisle in which goods are located. At the museum it will be details of where the exhibits are on display.

Each Wibree location server will broadcast its presence, and any Wibree device with a suitable search application can choose to show all of the servers within range. It's never likely to be a big list, but it will be information relevant to where you are. Select the one you want, enter your query and back comes the result:

The process doesn't touch the mobile network, so there's no charge. The phone only needs to accept minimal data and display downloaded text, so it's fast. The database in the server is small and simple to structure as it only has limited, local information. Adding GPS for location based services to a handset adds $10 to the manufacturing cost. The incremental cost of adding Wibree will be around $0.10 – one hundredth of the cost of adding GPS. So the opportunity for location based searches and services is vastly more likely using Wibree, as its negligible additional cost means it will penetrate a far wider range of handsets.

The design of the Wibree protocol stack means there's no need for TCP/IP stacks, web browsers or anything else in the display device. It's trivial for something as powerful as a mobile phone to run, but it also means that it's easy to implement at very low cost. So it could be put onto your shopping trolley with nothing more complex than a 8-bit

microprocessor and a display – all of which can be part of a single Wibree chip. It's a good example of how Wibree makes interoperability and wireless functionality cheap.

Microdata means Health - The Ubiquitous Gateway

Caring for an ageing population with an increasing incidence of long-term, chronic health issues is a problem facing most countries. There is a clear perception that electronic monitoring of health is a key part of any solution. That's been recognised within the industry with the formation of specialist groups such as the Bluetooth Medical Devices Group, the Continua Alliance and the IEEE 11073 standards group.

Wibree is widely seen as a key enabler for these services. Where it scores over any other low power radio is in its unique ability to use the mobile phone as a gateway that can pass data from a personal medical device to a service provider.

Some of the first Wibree devices being talked about are sports accessories, such as simple pedometers built into sports footwear. The technology will quickly migrate to personal health monitors, including weighing scales, blood pressure monitors and glucosimeters. These aren't devices that need to send large amounts of data, but their usage model requires low power so that they can be small, battery powered and wearable.

The prospect of offering health related services is an exciting prospect for network operators. It's one of the reasons that the GSM Association is welcoming Wibree as an evolution of the existing Bluetooth standard. It's not yet clear where the services will reside – with mobile networks, insurers, national healthcare services, gyms or private medical companies.   What is clear is that Wibree provides a wireless implementation with the accessibility that will enable a large-scale deployment of eHealth devices.

Microdata means Control

The concept of Home Automation has been around for over sixty years, yet still has not taken off. There are many reasons for that, including proprietary systems that won't work with each other, cost and the fact that most of them are too complicated to set up. There's more than a grain of truth in the joke of "How many laptops does it take to change a wireless light-bulb?"

With Wibree, things have the chance to change – particularly the problem of configuration. Every enabled mobile phone can be used to set up Wibree devices around the house. Like the example of local searching above, they don't need special applications – they just display data sent from the host device and map button presses. It gives a simplicity of operation that means that Wibree can be used as a truly universal remote control.   Any optional, additional complexity is handled in the device that is being controlled

As Wibree appears in these devices, the scope for remote control of other devices will appear. Gateway devices will also open up the possibility of remote access. Whether a large number of people will ever want to control their heating or white goods remotely is open to debate, but Wibree will be sneaking into the infrastructure of household goods for other reasons.   Increasing concerns about energy and resource usage will require smarter washing machines and dishwashers that can talk to each other about how and when they're working. The driver is likely to be flexible tariffs and government legislation, rather than consumer demand for the automated home. The day is coming when your utility company will decide when you can do your washing.

Ubiquitous microdata

There are places Wibree won't go. It won't go into light bulbs, but it's debatable if wireless ever will. It will go into things that can talk to or be monitored via mobile networks, so will almost certainly become the choice for most consumer medical monitoring and lifestyle devices. By the same token and because of the simplicity of making basic control and

display devices it will probably dominate the home automation market. Where interoperability or promiscuity aren't required then applications will stick with proprietary wireless chips, but even these will change if the production volumes of Wibree drive it to be cheaper. It won't go into mesh networks, but by taking the consumer applications away mesh will probably remain a niche market. Wibree certainly won't kill other standards like ZigBee, but it will kill many of their wider ambitions.

Wibree allows us to stop having to go and change things, ask things or look at things. And the scope for that is many times the market for short range wireless today. It's an incredibly powerful tool to create a whole new world of wireless applications.

Because of the volume it will achieve on the back of mobile phones, Wibree will become endemic. That means it is very well placed to be the wireless technology of choice to support any legislative initiative. Up until now, remote monitoring of devices has largely been ruled by the simple economics of justifying automation. The growing concerns about global warming and the need for better policing of domestic energy usage are already changing that equation. Governments with environmental targets to meet are mandating technology to provide more precise measurements of energy. Wireless Automated Meter Reading (AMR) is moving from trials to deployment after years of feasibility testing. It won't be alone. Smart homes, smart transport, smart technology is becoming the mantra of the day, with wireless connectivity to ensure the timely arrival of data.

Hundreds of millions of deployed Wibree devices and gateways in the form of mobile phones is hard to argue against as the obvious enabler for these initiatives. The virtuous circle of specification and volume will ensure that Wibree becomes the pre-eminent wireless standard. As most of those devices will depend on the Wibree link for their operation it's also likely to become the most used wireless standard. And that usage will drive its cost down until it becomes inconceivable not to add it to a new product.

Nick Hunn

EZURiO Ltd
June 2007