

WIRELESS WATCH

In-depth analysis of Wlan, cellular and broadband wireless markets

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Intel prepares for the spectre of a mobile internet world without WiMAX

- **Intel's chief WiMAX cheerleader joins call for unification with LTE**
- **Chip giant recognizes that 802.16e cannot go it alone in mobile broadband**
- **But it still has to face mighty challenge of re-entering handset market with Atom**

Intel has for many years been far more than the leading chip-maker. It is also a company that creates markets and sets trends, in order to seed its own future revenue streams. In wireless, examples have been Wi-Fi, WiMedia and of course WiMAX, as Intel looks to supply the silicon for the mobile internet devices – from phones to mini-notebooks to consumer electronics – that it believes will become almost ubiquitous. Its support for these three ‘Wi’ technologies has been partly, of course, enforced by its significant disadvantage in the chip platforms that may, in the end, dominate that mobile internet revolution – the cellphone architectures favored by Qualcomm, Texas Instruments and others.

By contrast, the Intel-backed systems come from a PC/IP heritage and, if they can become universal, the x86 giant is in pole position to lead the market as it shifts towards 4G. However, if the customers resist their charms, Intel will not remain religiously faithful to its chosen platforms for longer than makes commercial sense, and the past week has brought two sets of comments from senior executives that suggest the chipmaker's old dream of making WiMAX the backbone of the mobile internet has faded, and it is gearing up to embrace a world where LTE will take the leading role.

Harmony with LTE?

The first came from Sean Maloney, Intel's always outspoken head of sales and marketing, who has been WiMAX' greatest cheerleader. With the WiMAX/Wi-Fi ‘Centrino 2’ chipset about to debut, Maloney repeated his usual mantras about WiMAX and powerful new processors bringing the true mobile internet to life at last. However, he deviated from his usual theme that WiMAX would be the lead network in this trend – because of its headstart on LTE and its position in notebooks, traditionally the first platform for new connections. Instead, he echoed the sentiments of Vodafone and other operators, that the industry should unify its OFDMA/IP/MIMO efforts, which will evolve one day into 4G,

and bring Mobile WiMAX within the 3GPP LTE standards family (we believe that, should this happen, there will still be a separate standards activity geared to fixed/nomadic WiMAX and emerging market models). Vodafone's outgoing CEO Arun Sarin was the first publicly to call for WiMAX to be harmonized with LTE, perhaps by being adopted as the TDD portion of the standard (something that could be blocked by Ericsson and China, which are cooperating on their own TDD LTE specifications, which do not use OFDMA in the uplink, among other differences, and are largely based on Chinese developments).

As well as these parties, Intel has also been perceived as a political block to harmonization, despite periodic talks between the WiMAX Forum and 3GPP, because submerging 802.16e into the larger effort could dilute its influence. However, Maloney knows that, with LTE gaining momentum, partly on the back of disappointment with 802.16e wave two certification's progress, WiMAX' best hope of success among the established mobile and converged operators may well lie with closer ties with LTE.

"In our view they ought to be harmonized," Maloney told a press conference. The technologies are "broadly similar ... about 80% similar. The main difference is that WiMAX is a couple of years ahead," he added, clearly making the case for 802.16e to take a major role in LTE, but admitting that operators would be "confused" by having two similar platforms, and claiming Intel was "actively looking at harmonization".

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Sean Maloney, Intel

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Can Intel succeed in mobile chips?

Of course, in the end all Intel's politicking and financial investments must lead to chip sales, and it has to be sufficiently agile to change track in pursuit of sales. It has dumped standards before that it had previously supported avidly – Bluetooth comes to mind – and it is even showing signs of wavering in its single-minded backing for WiMedia as the personal area networking standard of choice (*see separate item*). Before it embraces LTE, it will need to be confident it can play in that market in terms of chip sales, and here it will come up against its traditional problem, its shortage of experience, track record, channels and customers in cellular chips.

With Qualcomm storming into Intel's notebook heartland with the 3G Gobi, the larger company is on the defensive and keen to con-

vince the market that, whichever way mobile standards go, it can create a strong revenue stream from them.

Maloney stressed that the Wi-Fi/WiMAX Centrino 2 could be adapted for LTE, though he stressed this was not on the agenda yet but “would certainly be a nice long term goal”. More immediately, Intel is repeatedly making the case that its Atom mobile internet device chip will provide it with a genuine route into the mainstream mobile market – out of which it bowed out when it sold its XScale mobile processor unit to Marvell, and with that, its remaining ARM-based activities, leaving it with the challenge of making x86 a dominant architecture in the mobile world as well as the PC. Intel CEO Paul Otellini, as well as predicting sales of 10m WiMAX devices by the end of 2008 (and “hundreds of millions” by the next decade), told the London *Financial Times* that, with mobile devices running PC-like applications, the time was right for Intel’s smartphone comeback. “If you accept that the value proposition of the high end of the mobile phone market is full internet access that happens to have voice, my view is that it’s easier to add voice to a small computer than vice versa,” he said in the interview.

The low power MID chips, Atom, will see a mobile version, code-named Pineview, in late 2009, which will represent Intel’s real challenge to TI and Qualcomm and is likely to run 3G and/or LTE standards. While it remains to be seen whether Pineview will fare better than XScale in the cellular heartlands - and whether Centrino 2 can fend off Gobi in the notebook in the meantime – the presence of the mobile Atom on the roadmap makes one clear statement. Intel has to succeed in the mobile internet devices market, and it is already adapting its hard line position on WiMAX to prepare for the eventuality that WiMAX may not have a dominant role in that world.

Qualcomm takes on Nokia in mobile web services stand-off

- **Brew takes on a heavy mantle as basis of Qualcomm's web services strategy**
- **Plaza widgets platform and embedded Flash set CDMA giant against Nokia**
- **Qualcomm will differentiate approach by staying close to operator needs**

Qualcomm is unusual among chip companies in the depth of its collaborations with operators, and it intends to leverage these to gain a strong position in the mobile internet services market, once again raising the challenge to Nokia and Google. At the eighth annual developer conference for Qualcomm's Brew content and software delivery system, it announced a widgets-based web services initiative called Plaza, as well as a deal with Adobe to integrate Flash in the new Brew Mobile Platform.

Brew's leading role:

Brew has taken an increasingly strategic role within Qualcomm over the past few years, evolving from an operator friendly content delivery platform to increase the appeal of CDMA technology, to the basis of a wide ranging software roadmap that aims to reduce the chip company's dependence on CDMA, help it penetrate new markets like Europe, and diversify its revenue streams. Various important functions have been added, including the UIone mobile user interface personalization system, acquired with Trigenix, which gained Qualcomm a breakthrough European cellco deal with O2.

Now the burden placed on the software platform's shoulders has got even heavier, as it becomes the foundation for Qualcomm's bid to grasp the mobile internet rudder and gain an influence akin to that of Nokia with Series 60, Ovi and Widsets; or Google with Android; or Yahoo Mobile. As with the acquisition of UIone and other Brew enhancements, Qualcomm is focusing heavily on operator, rather than end user requirements, recognizing that it can be the carriers' friend, in a world where the cellcos' traditional ways are being challenged by open internet models and the shift of companies like Nokia towards direct-to-consumer services. Among the key operator requirements is personalization, and this also drove UIone, and will now be a fundamental focus of Plaza.

Bob Briggs, general manager of Brew and VP at Qualcomm Internet Services, said the company is adopting a more open and flexible approach in order to drive growth throughout the mobile value chain – in software not just chips, and in data not just voice, for operators as well as Qualcomm itself. This message was driven home by CEO Paul Jacobs, in a strong, conscious or unconscious, echo of Nokia’s own move to shift from hardware to being an internet services company.

Plaza:

Plaza is a mobile internet widget framework, geared to enabling operators to develop and deploy personalized access services and content rapidly across a variety of mobile platforms. The product also features an integrated advertising delivery mechanism, and is based on open APIs so that end users and third party developers can independently create their own widgets. Most importantly, Plaza aims to help operators personalize their subscribers' mobile internet experiences and so drive additional revenue, differentiation and customer retention.

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We believe that providing end users with an easy way to extend their online lives to their mobile devices will help drive the uptake of data services

Andrew Gilbert, Qualcomm

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Qualcomm said it was working with operators to streamline Plaza prior to commercialization. “Plaza will provide a widget ecosystem that leverages Qualcomm's expertise and success from the proven Brew ecosystem, giving publishers, developers and operators the ability to open up the mobile internet to subscribers and monetize it for operators and content providers alike,” said Qualcomm Internet Services president Andrew Gilbert. “We believe that providing end users with an easy way to extend their online lives to their mobile devices will help drive the uptake of data services.”

Gilbert argues that a strong catalog of personalized widgets will be important in enabling operators to create and enhance their brand, in an open internet, flat rate world where gaining brand recognition will be increasingly difficult, but also increasingly important to attract and keep customers.

Also vital to any mobile internet activity outside the Apple world these days is a partnership with Adobe Flash, and Qualcomm obliged, offering developers a Brew Mobile Platform upgrade with the technology embedded. It also provides a new set of APIs and enhancements to support access to device databases, connec-

tivity support, touchscreen user interface development and other functions that will be important to cutting edge mobile web products, and Qualcomm is particularly focusing on driving advanced multimedia web features down the value chain into midmarket handsets rather than just high end smartphones. Verizon Wireless was the first US carrier to embrace Flash and is also the largest US customer for Brew.

Other Brew announcements:

- Brew user US Cellular said it would allow content company JumpTap access to its customers, allowing subscribers one-click access to the web and search results that will pull relevant results based on the carrier's data and usage patterns. The deal will also cover targeted advertising. Through the deal, US Cellular customers will gain access to news, sports, flight updates, white pages, chat services, maps and directions via JumpTap's categories. Local and national content publishers and advertisers will have the opportunity to bid on search queries to reach their targeted markets.
- Nuance Communications demonstrated its Mobile Speech Platform 2.5 at the conference, highlighting new developer tools. The application includes speech recognition, open ended dictation and text-to-speech features as well as pre-built components for local search, mobile navigation, content search and mobile web search.
- Ontela has introduced its cameraphone sharing service to the Brew platform through N-Telos Holding of Virginia, the fourth carrier to launch an Ontela-based service. The company's PhotoCopter services will be brought to N-Telos' Brew Consumer Portal. The service costs \$3 a month for unlimited photo transfers.
- Qualcomm said Universal Music Group will use its BrandXtend technology, part of the Brew family, to offer content directly to consumers through its artist web and WAP sites, CD packaging and its GetMusic.com portal. "
- Qualcomm also announced a 'Cryptographic Extension' for its Brew application download service. The company said the technology will provide enhanced security for Brew developers' wireless applications aimed at government users.

Vodafone Italy and Huawei point new way to fixed-mobile convergence

- **Operators move beyond Wi-Fi and towards femtocells for fixed-mobile convergence**
- **Huawei devises halfway solution for Vodafone, adding HSPA to ADSL router**
- **Femtocells themselves move further down standards track**

Fixed-mobile convergence has been the centerpiece of major carriers' growth strategies in the developed telecoms markets for some years, but the approaches, in terms of consumer devices, are various and, in all cases, immature. With Wi-Fi systems showing mixed results and femtocells still over the horizon, Vodafone Italy may be showing off an interim solution that will be of interest to many other providers. This is the Vodafone Station, a Huawei-supplied combination of DSL and Wi-Fi switch/router and 3G USB key, which delivers some of the hoped-for benefits of the indoor 3G base station or femtocell.

Wi-Fi/DSL, united by UMA (Unlicensed Mobile Access), was the first option available for fixed-mobile convergence, though it required dual-mode handsets for hand-off to the wide area network. Its flagship user has been T-Mobile USA, which recently added VoIP to the service to promise a full quad play convergence offering. Other adopters, like BT, have seen less good results, with the UK operator putting its Fusion dual-mode service on the back burner earlier this year. Many operators are now looking to 3G or even 4G femtocells to achieve their business goals, improving indoor penetration and broadband applications support, and backhauling a cellular access point with the user's DSL line. However, although many cellcos are now trialling femtocells, these devices will not be in the commercial mainstream – with the low pricing that demands – until 2010 or so. In the mean time, then, hybrid solutions like Huawei's for Vodafone may well gain some short term ground and allow providers to start to experiment with true convergence bundles.

Vodafone's FMC strategy:

Vodafone, which once crowed over its lack of a wireline legacy to weigh down its growth, now needs convergence and has been partnering with fixed line telcos, such as BT, and buying up fixed broadband companies around Europe (it is widely expected to mount a formal bid for Italian broadband group Tiscali this week).

Now its Italian unit is the first to introduce the Vodafone Station, designed to turn the acquisition of fixed lines into a differentiated commercial service. The product will be rolled out across Vodafone's European broadband footprint (and possibly with fixed line partners in the region too) over the coming one to two years, though the company is also setting high store by femtocells, with its Spanish outfit leading the trials.

The new device, designed specifically for the giant cellco by its increasingly favored Chinese supplier, is basically a switch/router for ADSL2+ that can be shared via fixed Ethernet or Wi-Fi around the home. It also has a removable USB key that adds HSPA service to the box. When turned on, the Station uses HSPA to connect to the Vodafone network and allows seamless switching to the mobile service.

En route to femtocells:

This is not quite a femtocell solution but does bring HSPA into the home, even if this is mainly as a fixed broadband enabler, at this stage at least. Like T-Mobile USA's VoIP offering, it piggybacks on an existing DSL line to support new services and revenue streams – taking pressure off the wireless backhaul, and at the same time, fending off the challenge from low cost VoIP. Also, where the mobile operator also provides the DSL line, it can ensure better control of the account and its entire telecoms, broadband and home media networking spend.

This last is an important goal for cellcos that are aiming to be the primary account controller in the residential market, depriving dedicated fixed line, ISP or VoIP providers. Orange has been particularly aggressive, trialling femtocells, rolling out picocells and dual-mode systems, and working with Thomson and Sagem on would-be operator-managed standards for home media networks.

Initially, mobile operators like Verizon were suspicious of devices that enabled 3G connections to be shared around the home, and frequently barred the use of early products in this area. But, as in Wi-Fi, the carriers quickly realized they could not kill open, shared technologies, but could seek to control them and adapt them for their own business purposes, as Vodafone is now doing.

Femtocells themselves are gaining commercial momentum, and there are some optimistic forecasts around, even while some big names remain cautious – Qualcomm seems to be waiting for LTE, TI is hesitant, most base station makers are wary of cannibalizing their macro cell business. However, operator demand is impossible to ignore, and most mobile equipment makers have at least a partnership to deliver femtocells, with the home networking giants perhaps the most unambivalently enthusiastic. ABI Research, which has been in the forefront of femtocell forecasting, predicts compound annual growth of over 300% between now and 2013, with the market worth \$1.8bn at that date.

Meanwhile, Forward Concepts believes femtocell vendors will see global revenues growing at a compound annual rate of 126% between 2008 and 2012, reaching \$4.9bn at that point, consigning Wi-Fi/UMA to oblivion in the FMC market as early as 2010. The two CAGR figures clearly show the squeeze on prices and margins that will be necessary to get femtocells into the mainstream, and which may require tough adjustments by suppliers and chip-

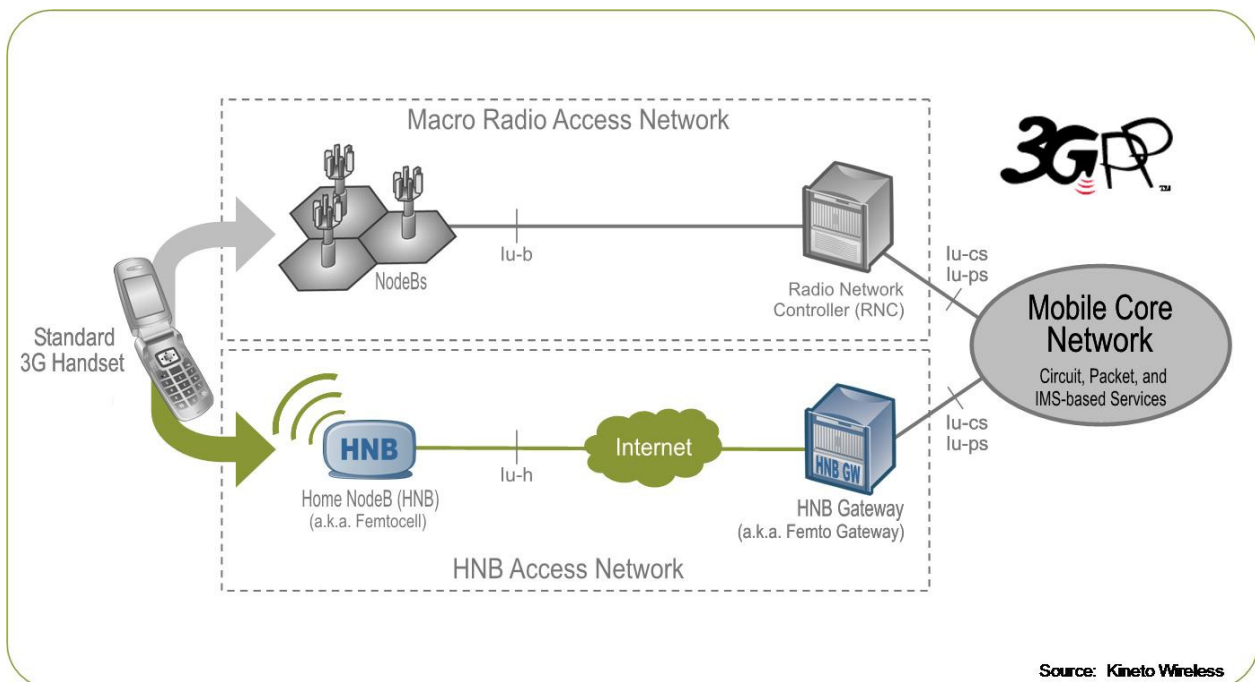
Femtocell standards update:

Industry association Femto Forum announced last week that it had almost finished specifications for a standard interface to link femtocells to the core – something that is currently done using many variations, some proprietary (*see Wireless Watch May 28 2008*). The so-called Fa interface will be submitted to the 3GPP and is expected to be ratified as a standard under that body's auspices by the end of the year.

Steve Shaw, head of marketing at Kineto Wireless, points out that the proposed standard is similar to UMA (Unlicensed Mobile Access), also a 3GPP standard and one method of linking femtocells to the core, though it has to date been used mainly for fixed-mobile convergence using dual-mode Wi-Fi/3G. Kineto, which was the driving force behind UMA, was one of the companies responsible for the specifications now being considered by the 3GPP, working with Alcatel-Lucent, NEC and Motorola. Shaw says the end result, the basis of the 3GPP reference architecture for femtocells (or Home Node Bs as the standards organization calls them) blends UMA with elements of an original proposal from Alcatel-Lucent.

Shaw says: "The 3GPP HNB architecture follows an access network-based approach which leverages the existing Iu-cs and Iu-ps interfaces into an operator's core service network. The architecture defines two new network elements, the HNB and the HNB Gateway. Between these elements is the new Iu-h interface." The HNB Gateway aggregates traffic from the femtocells back into an existing core service network through the standard Iu-cs and Iu-ps interfaces.

makers. Stuart Carlaw, an analyst at ABI, commented recently: "In order to meet those price declines there is actually a paradoxical need to invest huge sums in designing optimized and dedicated silicon for the femtocell market. Questions of technology, air interface, semiconductor approach, multimodality, integration, route to market, business model, and more all remain unresolved."



Femtocells within the 3GPP scenario
 Source: Kineto

Intel latest to distance itself from WiMedia, as wireless HD market heats up

- **Intel backs Wi-Fi initiative for Bluetooth's PAN space**
- **Like TI, seems to be accepting UltraWideBand is not a short term option**
- **Pulse~Link, WirelessHD and WHDI all seek to fill WiMedia breach**

An Intel-backed start-up, Ozmo, is the latest to throw the cat among the pigeons in the personal area networking (PAN) market, pushing Wi-Fi into applications traditionally dominated by Bluetooth. And while Intel has been the greatest advocate of basing next generation PANs on UltraWideBand, and particularly the WiMedia standard it supports, it now seems likely that it will put this platform on the back burner, at least for now, as its partner Texas Instruments has already done.

While Wi-Fi is seeking to eclipse Bluetooth in short range applications like PC-peripheral connect, its major focus is on high speed home media networking, a market also targeted by WiMedia. In this sector of the PAN market, where the holy grail is a wireless equivalent of HDMI, there are several contenders emerging, including WiMedia, other UWB systems like Pulse~Link's C-Wave, the 60GHz WirelessHD, and Wireless High Definition Interface (WHDI) running in 5GHz spectrum like Wi-Fi.

Backing away from WiMedia:

The problem for WiMedia - which is based on the Multiband OFDM technology originally backed by Intel and TI, and has received significant input from Sony and Philips - is that so far it has failed to live up to its performance promises. While it has been adopted as the basis for the next generation Wireless USB system, in the home media networking sector it is not supporting the speeds that HDTV and other applications demand. Hopes that WiMedia would be a common physical network underpinning a wide range of short range wireless standard protocols have been dashed by the lacklustre results of early trials. The Bluetooth SIG changed plans to base the next iteration of its standard on Wi-Fi 802.11n rather than WiMedia, and recently TI itself said the UWB technology, in which it owns significant IPR, would not make an impact on its key mobile device market for at least three years, and put it on the back burner in favor of 802.11n (*see Wireless Watch May 7 2008*).

Now it seems that Intel may be the latest UWB cheerleader to bring 11n to the forefront and put WiMedia product plans on hold, at least for the time being. It has revealed details of a development program focused on putting Wi-Fi into mobile devices and PANs where Bluetooth lives now, and where WiMedia had expected to fit. It has been working in this roadmap with Ozmo, which will this week unveil its chip and software. These promise to support wireless peripherals and short range connections with more bandwidth and lower power for less cost than Bluetooth.

Ozmo and Intel's Wi-Fi program:

Ozmo takes advantage of the incorporation of standard Wi-Fi into many mobile devices from notebooks to media players and handsets, and promises peripheral makers a stripped-down, dual-band 802.11 chip with a 10-meter range that costs about the same as a Bluetooth chip, and will communicate with any of these devices. The 130nm Ozmo chip measures 6mm x 6mm and features a simplified receiver that does not require support for roaming or scanning to link to an access point. The chip uses Wi-Fi Protected Set-up to establish a 9Mbps link over 2.4GHz or 5GHz bands to any client running the Ozmo Wi-Fi driver software. This fits into existing Wi-Fi and USB software stacks as an additional driver layer. Battery life is two to three times that of Bluetooth – up to nine months for a mouse, or 20 hours' talk time (compared to four months, or six hours, with Bluetooth).

Ozmo does not yet have any announced customers though Belkin is testing its products and, of course, it is working with Intel – as part of the chip giant's Cliffside research program, described at the Intel Developer Forum in April. This aims to use standard Wi-Fi protocols to handle PAN tasks such as syncing notebooks with MP3 players, digital cameras and projectors. Intel claims its technology can connect up to eight Wi-Fi devices to a notebook on a PAN while the computer is on a Wi-Fi Lan. This could improve the quality of media streamed between a computer and a TV, because it eliminates the latency of going through an access point. Cliffside should result in a commercial chip - a modified Intel Wi-Fi chip with additional buffers to switch between PAN and Lan modes – within a year, and will be available on Centrino.

As well as pushing into ultra-low power markets, Wi-Fi's credentials are increasingly being established in high speed media net-

works, as the 100Mbps-plus 802.11n nears finalization, and as vendors, even at the draft standard stage, start to slash prices of consumer and embedded gear.

Battle for HD home network:

But the home high definition network will be a toughly fought battle, and TI summed up the dilemma of many consumer electronics chip and equipment makers, saying: “In home networking we have to decide if we are using Wireless USB, 1394 Firewire, or DLNA-on-IP over UWB, Wi-Fi or Bluetooth, before we can make any headway.” Demand for wireless connections between HDTVs and audio-visual or PC equipment is rising, and will be driven further by the recent emergence of TV designs that separate the monitor from the tuner, enabling very flat screens (Hitachi and Sharp already have screens 1.37-inches thick with external wireless adapters).



In home networking we have to decide if we are using Wireless USB, 1394 Firewire, or DLNA-on-IP over UWB, Wi-Fi or Bluetooth, before we can make any headway
Texas Instruments

Along with Wi-Fi and WiMedia, the more cutting edge contenders to carry any of the high speed wireless PAN protocols are starting to show their colors, all claiming to deliver the magic hat trick – high transmission speed (at least 80Mbps for compressed video, up to 3Gbps for uncompressed 60 frames/sec video at 1080p resolution); low latency (supporting channel change at less than 100ms); and high image quality, even with the interference and obstacles common in a home environment.



Pulse~Link’s implementation of UWB, which uses a traditional pulse-based approach rather than OFDM carriers like WiMedia, has performed far better than its better supported rival in early trials, and also runs over coax cable and powerline as well as wireless (*see later section*).

WirelessHD and WHDI:

Meanwhile, WirelessHD is the main group of vendors looking to use the license-exempt 60GHz spectrum, which supports very short range but very high speeds (up to 4Gbps, not far off the 4.95Gbps typical of cable HDMI 1.2 connections). The lead technology developer is SiBeam, and the would-be standard is backed by Intel, LG, Panasonic, NEC, Samsung, Sony and Toshiba.

The other major contender – though commercially proven products, as for WirelessHD, lie 2-3 years in the future at best – is WHDI, whose lead developer is Israeli company Amimon. This technology has reportedly achieved data rates of 3Gbps.

WirelessHD addresses concerns over signal robustness in high frequencies by using two channels – a high rate PHY to transmit an HD image at high data speed, and a low rate PHY to handle control signals between transmitters and receivers, and manage the antenna’s directionality, optimizing signal-to-noise ratio for the high rate channel and adapting to any changes phased-array beamforming technology.

At the Consumer Electronics Show earlier this year, Panasonic and Toshiba demonstrated WirelessHD systems, and the WirelessHD Consortium will conduct protocol certification and interconnectivity tests from this summer. So far, Toshiba, Hitachi, Fujitsu and Sharp have initiated R&D on chips for the platform, though Si-Beam and NEC remain in the forefront, and like IBM, have succeeded in addressing a major cost obstacle of 60GHz integrated circuits by implementing them in CMOS rather than gallium arsenide or BiCMOS. NEC will commercialize its CMOS RF transceiver chip for WirelessHD in 2010 and is also working on a base-band/MAC embedded digital IC.

Wireless standards compared

Source: *EETimes*

Wireless transmission protocols for A/V equipment
 The assumption is that the protocols will provide image quality equivalent to that achieved using HDMI cable

	Wireless HD	WHDI (Wireless High Definition Interface)	UWB (Ultrawideband)
Developer	Wireless HD Consortium	Proprietary ¹	WiMedia
Frequency band	60 GHz	5 GHz	4.2 to 4.8 GHz
Bandwidth	7 GHz	40 MHz	—
Maximum data transmission speed	4 Gbits/s	3 Gbits/s	480 Mbits/s
Image compression	Uncompressed	Uncompressed	JPEG 2000
Latency	<2 ms	Approx. 1 ms	10 to 70 ms
Transmission range	10 meters	30 meters	5 to 20 meters ²
Technologies	Beam forming	MIMO/JSCC (Joint source channel coding)/UEP (Unequal error protection).	MIMO
Market adoption status	Toshiba and Panasonic held demos at CES 2008; both companies plan to launch products in 2009	Sharp may use this technology in its wireless connection adapter. Sanyo is developing a projector prototype. Funai Corp. plans to implement equipment for HDTV and Blu-ray recorders.	Hitachi produced a wireless connection adapter using Tzero Technologies’ chip set.

1: Developed by Amimon (Israel)
 2: Based on information from Tzero Technologies

WHDI is even further down the track, as so far only Amimon can make the technology, and is just now forming an industry consortium, preparing to share its technology with partners. The system works in 40MHz channels in 5GHz and can transmit and uncompressed 1080p HD image, as it reaches a peak data rate of 3Gbps. It uses 4x5 MIMO antenna schemes combined with a modulation approach devised by the inventor. This combines Amimon's own single-level modulation with an existing signal processing technology called joint source channel coding, which applies various levels of error correction, which vary in intensity depending on how recognizable the errors are to the human eye (down to no correction if the errors are not deemed to be detectable). WHDI does not guarantee complete transmission of data, as WirelessHD does, but claims there is no difference between HD image quality using HDMI cables or WHDI.

Sharp is the first vendor publicly to adopt the Amimon chipset, and audio-visual products from Funai and others will debut this summer, but several vendors are said to be planning to join the consortium, spurred by the promise of Amimon licensing its systems for larger companies to design their own chips. Interested parties reportedly include several Japanese, two South Korean and at least one US equipment manufacturer.

	Ozmo devices	Bluetooth	Std. Wi-Fi
Performance			
Battery life (mouse)	9+ months	3 to 4 months	<1 week
Talk time, hours (voice headset)	15 to 20	4 to 6	2 to 7
Latency, ms	<10	<10	100+
Data rate, Mbits/s	9	1 to 3	54
Connection time	<1 second	3 to 5 seconds	Unpredictable
Wi-Fi coexistence?	Yes	Performance impact	Yes
Features			
Applications	Supports HID, voice, MP3, uncompressed audio	OK for voice, marginal for audio	Networking
Security	802.11(i)-compliant	Limited	802.11(i)-compliant
Np. of peripherals per host	Dozens	7 (if bandwidth allows)	N/A
ASP	— same —		3 to 4x higher
Additional radio or dongle required?	No	Yes	No

systems for larger companies to design their own chips. Interested parties reportedly include several Japanese, two South Korean and at least one US equipment manufacturer.

Ozmo's performance claims

Source: Ozmo and Intel

Pulse~Link:

For almost eight years now Pulse~Link has had the technology wherewithal to send massive amounts of video from one device to another around the home, either wirelessly or over a wire. If the chips were made in serious volume, they could cost as little as a few dollars (currently between \$10 and \$20 depending on order volumes) and create a genuine digital home. But its pulse-based UltraWideBand has gained less political clout than rivals such as WiMedia, MoCa, HPNA and simple Ethernet.

Companies like Samsung and Sony and Panasonic, plus all the major pay TV operators like Comcast and DirecTV, as well as companies like Apple, have the need for such a technology, but there have been no major design wins forthcoming, just some smaller ones with Westinghouse Digital and Geffen.

There are two major use cases for such a technology. One is that High Definition TV signals need to travel around a home in the cheapest way possible, from set-top or Blu-Ray player to a TV screen or a PC. The other is simplified rapid handset sideloads of video files from a home network. One requires high bandwidth due to the requirements of the application; the other needs it to allow sideloads to be automatic or last minute (and copying a one-hour TV program to a handset will need 1Gb in SD, and 250Mb in QVGA, which might need to transfer in the time it takes to put on your coat and shoes on in the morning).

Other technologies don't look like achieving this duo in the near future. Wi-Fi can send video files around a home, and even through a wall, but not every time and not HD files. Ruckus Wireless has improved this to the point where HD files are supposed to be able to be streamed around a home, but that takes the price of each device into the multiple hundreds of dollars, when the price point for putting this in every device needs to be around \$2 each.

It may be possible for Wi-Fi to have a more sophisticated quality of service software layer - in fact we know some proprietary Wi-Fi that uses the WiMAX QoS schema - and it may be possible eventually to take the MIMO antenna and the packet resend software and drop them into a cheap SoC. But that isn't today and given all the interference from which 2.4GHz suffers, there hardly seems any point.

The core complaint from Pulse~Link founder and CTO John Santhoff is that many of his rivals use a contention-based protocol, in that they support CSMA/CD, which is part of the Ethernet. This was designed for a data bus that allows anything attached to it to begin sending at random, stop if it collides with other sends, and then wait a random period before sending again. Contention-based protocols are fine when they are operating at the low end of their capacity, but up at the high end, performance can become unpredictable, which is why today the Ethernet world has shifted to Gigabit, so that it has plenty of capacity.

Santhoff has issues with his other rivals too. “HPNA and powerline use 30MHz of spectrum or less on the cable, and to carry more data they would have to use more power, which would push out more emissions, which would break the rules of the FCC spectral mask.” The issue here is that the home is a hotbed of signals, and that any radio signal can interfere with any neighboring signal if it is too powerful.

Which is the beauty of using a pulse of radio energy across a very wide spectrum. The FCC defines UWB (ultra wide band) as anything which is spread across 500MHz or more. It can be arranged as multiple carrier waves spread in this way, using Fast Fourier transforms to disentangle them, just as OFDM does. This is the direction the WiMedia Alliance took when it defined its version of UWB, based on Multiband OFDM.

Pulse~Link instead puts a single pulse across an entire 1.35GHz of spectrum, sending on all the wavelength at once. The duration of the pulse is around 23 centimeters long, which at the speed of radio (light) is exceptionally short, coded in simple BPSK. The signal can be sent more than once, which improves robustness and distance, but in essence because the data can be picked up from anywhere across the spectrum, if there is any fade or interference, it can be ignored. Sending once gives a native data rate of around 1.35Gbps, sending twice halves that.

The UWB of the WiMedia Alliance suffers from the fact that, because it is arranged in a series of separate carriers, to increase capacity requires modulating them at higher frequencies, and that means increasing total power use, and that means breaking the FCC emissions rules. To Santhoff it’s just obvious and incontrovertible.

On WirelessHD, he says: “It uses 36 different antenna arrays, which means that there are 36 individual receivers and 36 analog to digital converters. That’s going to take a long time to integrate and get right, and it will cost a lot, but it’s the only way that this line of sight technology can get around obstacles.”

“UPA Powerline from DS2 is about the most honest effort out there and we have tested its performance at around 68Mbps in real world conditions, which is 10% to 12% better than any of the other technologies. But it uses QAM 1024 as a modulation which means it has to use a very robust FEC scheme.”

Inventing its own way of transmitting radio hasn’t made Pulse~Link popular but over the course of eight years, the company has convinced a number of eminent people that it is on the right track. The company recruited the top engineers from Freescale’s effort in UWB, Xtreme-Spectrum, once that was closed down, and it has employed Henning Harmuth, one of the pioneers of modern UWB and the CDMA Walsh codes, as well as the founder of a number of the WiMedia UWB companies and even a WiMedia board member.

While technologists from the WiMedia camp may be open to accepting the pulse-based view, in the short term, politically, they need to continue to stand apart. This is partly because Wi-Fi

has a grip in the home already, with over 100m Wi-Fi-enabled notebook shipping annually, and forecasters saying that around 240m Wi-Fi-enabled consumer electronics devices will ship in 2011. So Wi-Fi is protecting its base, even though it cannot send multiple HD streams around the home in its current iteration (802.11n).

But the replacement of communications chips inside 1.25bn TV sets, and in around 400m set-tops, and a similar number of DVD players, is a market that Wi-Fi can only dream of. Never mind the three billion handsets that would be brought to bear if instantaneous video sideloading could be made possible. With his eye on these sectors too, Santhoff insists that Wi-Fi just can't go any faster.

All this has shaped Pulse~Link's recent strategy. It no longer expects many people to use its radio technology, but the same CWave chips can now be used with cables, pretty much any kind of cables, but certainly coax and potentially power cables. "Our approach now is to be able to deliver HDMI, 1394 (Firewire) and Ethernet over coax on top of our signal, and for that signal to coexist on the same cable with MoCA or a satellite signal," said Santhoff. This works for the same reasons that the radio works – it's the same wide pulse approach as basic signaling, and then capturing pure HDMI, 1394 or Ethernet bit streams and mapping them across the pulsed network.

"Back in 2002 we started looking at all home network technology and none of them have a silver bullet, and we decided that what was needed was a hybrid which combines two or three media types. Today we have HDMI in and HDMI out, we have 1394 in and 1394 out, the same with Ethernet. But in our labs we have 1394 in and Ethernet out or any other combination and that's useful if you have a TV output in HDMI and you want to send it to a PC which is used to Ethernet – so that's where we are headed with this."

In the end, how can this tiny company (that has soaked up over \$80m in VC funding so far) convince the market politically that its approach is right and that, of itself, it's not a threat to established giants. In our view it only takes one giant. This could be a Sony, to say that it wants a networking system to join up its PS3, its PSP, its Bravia TV sets (with set-tops embedded) and its high speed video cameras and its Vaio PCs - then it has to think about HDMI, Ethernet and 1394, at video copying speeds. Or it could be an Apple, if the iPhone maker wants to fight mobile TV, by offering iTunes sideloading onto handsets for files that are gigabyte class. Apple virtually invented Firewire and could virtually guarantee itself supremacy in copying TV or DVR held content to an iPhone to view on the go, by adopting a wireless or coax connector that can copy the film you recorded last night in under 10 seconds.

Comment:

Cisco seeks control of mobile enterprise through ‘open’ platform

Cisco has always been expert at using its market dominance to establish ‘open platforms’ that link third party products to its key networks, in effect setting up de facto standards that smaller vendors cannot ignore. It took this approach to enterprise networked security, Wi-Fi devices and other markets, often pre-empting true industry standards. Its latest bid to make itself indispensable and firmly in control, under the guise of openness in the enterprise network, is spearheaded by its new 3300 Series Mobility Services Engine (MSE), which the giant claims brings the open platform concept of the consumer mobile world to the large corporation.

The 3300, which ships this month, combines the engine appliance with a suite of applications that supports services on wired or wireless networks. The device will incorporate four new software modules, including context-aware software capable of recognizing what device a user has; wireless intrusion prevention capabilities; Cisco's Secure Client Manager; and intelligent switching between mobile and fixed devices.

Together, these form a mobile services platform that is open to third party developers, and which promises to allow enterprises to integrate different networks, devices and applications, over Wi-Fi, WiMAX or cellular systems, and with links to the wireline networks too. The MSE “sits between the network and the application and glues the two together,” said the Cisco statement, retrieving the information that the app requires from the networks and devices, in order to support an advanced service. “The MSE hides the complexity of the network from the device, allowing any network application to run on it, all with a single point of management,” said Jonathan Hindle, head of service provider marketing. It also enables users to secure and centralize device provisioning and management.

As with all open application platforms, Cisco’s aim is to place itself at the heart of the enterprise network developer community, and to encourage rapid creation of new services, which will in turn drive enterprise uptake and spending on wireless. The MSE is part of the ‘Cisco Motion’ vision for business mobility. This is firmly the ‘vision’ of a single vendor, but many observers believe that a vendor-defined open apps programming interface (API) is a major improvement on the current fragmented enterprise wireless situation. This is often Cisco’s ploy – to spot an area where users and developers want standard APIs, but where the industry bodies have failed to deliver one they find credible, and then fill the gap itself. Enterprises have been calling for years, for instance, for a standard wireless API to allow mobile networks to transmit data to upstream applications. This has usually been done on an ad hoc basis, through individual vendors partnering and exposing their own APIs to one another.

Moves like Cisco’s hold out the promise of linking ‘islands of convergence’ such as unified messaging, VoIP and roaming, which tend to exist in different servers and networks across a large corporation, and often cannot take account of now-common behavior like users bringing devices in from home, or accessing enterprise services from outside the office. “It's really

about delivering an architecture that's device independent, network independent, which gives users business critical apps 'on tap'," said Cisco's unified communications senior marketing manager Tim Stone. The next step will be to try to create a strong ecosystem around the MSE and Mobility Vision, with Cisco already hinting that Nokia could be key to this.

Nvidia takes major gamble in targeting Intel Atom

Graphics processor specialist Nvidia has worked with Intel in the past, but is now taking on the giant head-on with a mobile internet device 'computer on a chip', targeted at Intel's Atom. Nvidia's family of processors is called Tegra, and the smallest version, the 650 series, consumes less than one watt of power, and measures 144 millimeters square. The smaller company has been seeking to broaden its reach out of its graphics niche and harness that expertise to gain a foothold in the market for applications processors, used in high end smartphones. However, while devices like the iPhone have raised hopes that these processors will gain greatly in volume, many analysts expect there to be at least a temporary dip in enthusiasm for the products, which may toughen Nvidia's challenge, especially if it also attracts the wrath of Intel.

Tegra incorporates an 800MHz ARM 11 processor, an Nvidia GeForce graphics processing unit, an image processor and a high definition video processor. It can also support hard disk drives, mouse and other peripherals. Michael Rayfield, the general manager of Nvidia's mobile business, said that he expected Tegra to enable MIDs that cost between \$200 and \$250, with the first devices appearing by the end of this year, only months after the initial Atom-based products. Intel CEO Paul Otellini said last week that he expected the market for the Atom family - including the imminent Diamondville version for low cost notebooks, and the mobile iteration Pineview, scheduled for 2009 - to be worth \$40bn in 2-3 years' time.

The main obstacle in the path of those sales targets will be competition from other architectures with a cellphone pedigree - such as those from Qualcomm and Nokia/TI/STMicro - which will also aim to set the pace for mobile internet products (though we still cannot rule out an eventual détente between Intel and Nokia to ensure they dominate this sector. The giants already collaborate on Nokia's planned WiMAX/Linux internet tablets.) However, even in its own heartland, Intel will face competition from ARM-based devices like Nvidia's.

Nvidia expects its OEMs to target the midrange market for smartphone/PC hybrids, and to come up with products with displays of between four and 12 inches, using small keypads and/or touchscreens, and featuring a broadband wireless connection with Wi-Fi, WiMAX and/or 3G. Rayfield is looking to the enterprise user base first, and Tegra will support Microsoft Windows CE as well as mobile operating systems such as Windows Mobile and Linux. Eventually, Nvidia is planning a Tegra iteration running at less than 100 milliwatts. The current platform should provide 130 hours of audio playback and 30 hours of high definition video playback, and Rayfield is promising devices with better graphics, video and user interface than the cur-

rent iPhone, which in the public (and Wall Street) mind has set the benchmark for mobile internet products, despite being outperformed by many alternatives from LG and others.

Nvidia initially showed its hand in the smartphone market at the Mobile World Congress in February, saying it believed the mobile application processor sector would be worth \$6bn by 2012. There, it unveiled its first bid to broaden its revenue streams, the APX 2500 apps processor, geared to 3D user interfaces and high definition video, with an ecosystem of partners and a touchscreen reference platform. This appeared to go head-to-head with Texas Instruments' OMAP 3 architecture (*see Wireless Watch February 19 2008*). It claims its ultralow power GeForce core, which can handle both OpenGL ES 2.0 and Microsoft Direct3D standards for 3D graphics, has the lowest power of any 3D hardware available.

At the Barcelona event, Rayfield said he believed the future of Nvidia's mobile business depended on single processors to run smartphones with sophisticated graphics, and revealed that he had gambled on ending development of graphics chips for mass market cellphones. "I think there's been a dramatic shift in what's needed in the market," he said.

He told news agency Reuters that he was "the happiest man in the world that wasn't in the iPhone", because of the impact the Apple handset was having in stimulating the overall market for devices that are strong on 3D graphics and video. However, other observers believe Nvidia's all-out bet on the high end smartphone could prove hasty, with the mobile internet device market still immature and with some analysts predicting a downturn in the use of dedicated apps processors in smartphones. One of these is Portelligent, which said in a report last week that the short term market for mobile apps processors and media accelerators was on the decline, and that the use of a secondary processor in smartphones could fall to just 20% of new designs by 2010. In 2005, up to 80% of cameraphones and smartphones used a secondary processor alongside the baseband.

"Right now, there's not a feature hanging out there that will drive a new wave of applications processors," report author Jeff Brown told *EETimes*. Between 2003 and 2007 cameraphones saw dramatically increased use of mobile graphics and imaging, with average resolution rising from VGA to 2megapixels. But in 2007-2011, Brown thinks the average resolution will increase to just 2.5megapixels, a processing load that the new generation of cellular baseband chips can handle without extra help. Additionally, he predicts that phones with 5-10megapixels resolution will remain a niche, as the cost/benefit of the additional quality is not perceived by most users, and that mobile TV phones will also be slow to go mainstream.

The main hope for secondary mobile processors, of course, rests with mobile internet devices, especially when driven by faster LTE or WiMAX connections. Apple, as Rayfield pointed out, gave new profile to apps processors by using one in the iPhone to drive a well differentiated graphics experience. iPhone challengers from Samsung, LG and others use a dedicated processor, but the baseband chipmakers are also making major strides in the functionality their products can support. In the vanguard of the single-chip high end smartphone is Qualcomm, whose

single-chip architecture is used by one of the key iPhone copycats, the latest HTC Touch models. So far, it remains unclear how far the processing power required by LTE will increase the burden on the baseband and so drive a return to apps processors, but this market will not gain volume until 2011 or beyond. Brown, then, is pessimistic about Rayfield's strategy for the mobile part of Nvidia, a judgement that also extends to AMD, with its purchase of graphics specialist ATI, and even baseband makers like TI that have also relied heavily on apps processors. "You need the baseband side of the equation to follow through to the integrated part of the cycle or you may be gone," Brown said.

Infineon unveils low power 3G but delays on GSM chips for Nokia

German chipmaker Infineon is certainly on a rollercoaster. Demonstrating some real promise in the mobile world, it has unveiled its 3G architecture, hard on the heels of a deal with Samsung to provide an alternative to Qualcomm, and expectation that it will supply Apple's 3G iPhone; only to warn of delays to its single-chip GSM platform, as adopted by Nokia. Meanwhile, it has lost its CEO and is being run by a management committee; is suffering mounting losses, mainly from its DRAM business; has been excluded from the STMicro-NXP wireless powerhouse; and is promising radical cost cuts to restore financial health and (probably) attract a private equity deal. Amidst all that turmoil, it may find an unlikely ally in Freescale, another silicon spin-off from a major vendor, which fell into private hands last year.

Infineon has scored two major wireless victories in the past year or so – being selected as a second source for GSM baseband chips by Nokia, and then as a second supplier for 3G, alongside Qualcomm, by Samsung (*see Wireless Watch May 28 2008*). Gaining partnerships with the world's top two handset makers is no mean feat for a company with Infineon's operational challenges and broad range of products, but neither phonemaker has guaranteed it particular volumes (or any purchases at all) and in both cases, if it does not deliver exceptional price/performance, it may find it is being used mainly as a ploy for Nokia to beat down its incumbent supplier, TI, on pricing, and for Samsung to do the same at Qualcomm.

In this context, delays to Infineon's GSM single-chip product are bad news, though Nokia shrugged them off on Thursday, with the ominous (to Infineon) words: "We have multiple suppliers. We don't expect an impact". According to Nokia statements, the company's single-chip project for GSM was still on track, though of course Infineon delays will make it more dependent on its usual alter ego, TI. Nokia is keen to move to a low cost, low power, single-chip design to expand its presence in developing economies and Infineon has been hoping for a large share of that business. But last week, the chip company warned that it anticipated a larger operating loss and flat sales for its communication chips unit this quarter, citing delays in shipping the product for Nokia's ultra-low end handsets. This came only a month after Infineon had stated the deal was on track, and shares fell 7.8% on the news.

On the 3G front, Infineon had better news this week, claiming its low power platform is now ready. While any inroad into Nokia is important for credibility and potentially for volume, the Samsung deal is even more significant, provided it translates into meaningful sales. Low power, low footprint 3G designs are in high demand from phonemakers as they see W-CDMA and CDMA2000 starting to penetrate developing economies and low income regions, moving beyond the smartphones.

Infineon, it seems, has applied some of its expertise in this area to 3G, challenging the major progress made by Qualcomm and TI, and helping reverse its reputation for being mainly good for high volume but low margin GSM chips.

The new Infineon platform claims a number of breakthroughs that will be vital to low cost, low power 3G devices. These include reduction of the number of devices in the chipset from three to two; reduction of the component count by about 50%; the industry's smallest printed circuit board footprint, allowing for space reduction of up to 40%; and power standby cut by up to 30% compared with existing HSDPA solutions. The platform supports 7.2Mbps HSDPA and 2.9Mbps HSUPA and boasts an integrated high end video accelerator and support for up to 5megapixel cameras.

Meanwhile, Freescale has emerged as potential buyer for Infineon's bruised but promising wireless activities. Since STMicro's CEO, Carlo Bozotti, said last month that Infineon would not be welcome in his company's joint venture with NXP, the Germany firm is said to be looking for alternative partners in wireless. This would be especially necessary if it were to try to combine its automotive business with that of NXP – a venture that would compete with Freescale and STMicro. Clearly, an NXP automotive deal would be complicated by Infineon's wireless unit.

AirPort highlights Apple strengths, though more quietly than iPhone

Few would argue that the iPhone has been a phenomenal success by most standards of measurement – an achievement all the more astounding considering that a year ago, Apple enjoyed a handset market share of zero. Twelve months later, consumers are now waiting for the iPhone 2.0 with bated breath - a level of interest so intense that apparently, queues have reportedly been forming outside certain Apple stores even though there has been no confirmation that the 3G version of the phone even exists, let alone when it might be coming to market. What is most impressive – and the envy of all Apple's competitors - is that all this hype and frenzied anticipation has been carefully orchestrated by Apple without spending a single marketing dollar.

Apple's manoeuvrings in wireless have understandably been focused on the iPhone. However, the company has been racking up another wireless success outside the handset arena which underpins Apple's strategy to become a dominant force across the consumer electronics market

by creating a virtuous circle of products – from computers to phones and media centres to music players - which lock consumers into the Apple experience by exploiting the company's strengths in branding, style and retail.

Earlier this month, market research firm NPD Group reported that Apple's AirPort Extreme has become the top-selling 802.11n wireless router in the US market, trumping established networking brands like Linksys (Cisco), D-Link and NETGEAR. Combined with sales of the Apple's AirPort Express – a Wi-Fi access point - Apple took fourth place in overall 802.11n base station sales. This is a significant achievement in its own right, but the most important take-away is this: while Apple holds about 6% of the US computer market (its global market share is far lower, at around 3%), it presently controls 11% of the 802.11n base station market, indicating that many sales of these wireless networking products are going to non-Mac users – ie PC users.

The 802.11 protocol is an IEEE standard so access points will be compatible with any computer, regardless of whether it's a Mac or PC. This begs the questions: why would a PC user want an Apple access point when there are a variety of devices from a host of established PC networking brands to choose from? One reason is effectively summarised by the images below, which show an 802.11n router from Linksys alongside the AirPort Extreme.

Whatever creature designed the Linksys device, it certainly wasn't human. Sure, 802.11n supports multiple antenna technology, but do we really want to see all of them? There are not many consumers who want to erect something resembling a miniature air traffic control tower in their living room.

Apple, on the other hand, intuitively understands aesthetics. The company continues to exploit design and styling, turning technology products into desirable appliances which users, far from wanting to hide them within the recesses of their homes, positively want to show them off.

Aesthetics, combined with the strength of the Apple brand, are two reasons the company is able to sell wireless equipment to non-Mac owners. A third and equally important factor is the retail experience. Anyone who's ever walked into an Apple store knows that it triggers several emotions, but technology overload is not one of them. For the majority of consumers who know what they want to do, but have a limited understanding of the device or technology that will help them do it, the Apple store is a friendly oasis which does not intimidate. According to NPD Group's analyst, Stephen Baker, Apple's retail and online stores are driving the sales of the AirPort products. "This stuff is just flying off the shelf in the Apple stores. They don't get nearly enough credit for the value proposition that the stores bring," Baker told *Macworld*.

There are routers and access points available with equivalent specifications to the AirPort range but at substantially lower price points. By delivering on the brand, styling and retail experience Apple is able to command a significant premium. More importantly, however, once a consumer has been 'touched' by the Apple experience, regardless of the product, there is a

likelihood that they will look to Apple when purchasing their next technology item. The sale of a \$200 wireless router may at some point convert into the purchase of a \$2,000 Macbook.

This is the cornerstone of Apple's ambitions in the handset market. Owing to its ubiquity, the mobile phone represents a volume of touch points that no other device category can match. Even if only a fraction of iPhone owners convert to Apple in other product areas, the reward is considerable.

This analysis was contributed by Matt Lewis of ArcChart. See www.arcchart.com for more of his BluePrint analyses of wireless issues, and information on ArcChart research services.

Huawei sets up standalone OSS/BSS operation

The market for operator support systems (OSS/BSS) and service delivery platforms is booming as carriers look to implement new networks with complex sets of IP applications. The wireless vendors are stepping up their efforts to keep control of this business, despite inroads by enterprise software firms like Oracle and Microsoft, and consolidation among specialists like Amdocs. Now Huawei has entered the fray, setting up Huawei Software Technologies as an independent business unit.

The big three wireless suppliers – Ericsson, Alcatel-Lucent and Nokia Siemens – all recently announced enhanced OSS/BSS offerings and roadmaps, as they aim to counter falling hardware margins and growth by building up their services and integration revenues. According to analysts at OSS Observer, the telco software market will grow in value from \$17.1bn in 2007 to \$25bn in 2011.

Huawei is following a familiar pattern of spinning out certain activities into standalone units to boost growth and focus. The new division is based on what was the Chinese giant's Application and Software Product Line. In an interview with Ovum, Huawei Software's head, Dr Che Haiping, said the unit had been designed "with a relatively independent and flexible business operation approach" and that the main focuses would be on R&D "in the areas of value added services and operation support systems".

The company insists that its software is interoperable with equipment from many vendors and it has announced a series of software partnerships, including alliances with Convergys, IBM and Hewlett Packard, to fill gaps in its own range. One customer driving Huawei's move will be China Mobile, which has been particularly aggressive in its value added services strategy, a trend that Huawei says is echoed at other large operators like Vodafone and Telefonica. These two European carriers are "keen to introduce into Europe the VASs that are common in the Asia-Pacific region, as European VAS revenues still constitute a small percentage of total income," added Haiping.

The new offshoot can also go after larger integration deals by collaborating with its sister unit Huawei Technical Service, though this remains a field where the Chinese company is perceived to be somewhat behind its larger competitors.

Analysis:

Apple must untether iPhone to reap rewards throughout digital media chain

Forrester Research has always been quick off the mark in explaining the rules which define a new era for technology. It was one of the leaders in explaining the ecosystem for the dotcom revolution, how to build web sites, how to create ecommerce and drive traffic. Now it thinks that it can define another new era by defining Apple, and has come up with a report that offers guidance for product strategists of rival companies – the message is that if you want to stay in the digital home, you must be aware of what Apple will do in this market.

The truth is that Steve Jobs is pretty predictable, if you happen to be as smart as he is, and what his company has done is fairly easily defined, although it's not easy to execute on. Apple takes what is currently just about ready to become possible in any given product genre, and delivers it early using standard off the shelf components before anyone else actually gets to market. And it does it with style and often ties up huge amounts of the component market exclusively.

We can hear everyone indignantly saying: 'So how did Apple able to create such a breakthrough product with the iPhone?' and 'how come it was so different from all the product offerings out there?'. The answer is, it didn't. Inertial sensors, used to tell an application which way round the screen is being used, and touchscreens, had both had a decade-long march to the point where they could be integrated into handsets - Samsung had already put inertial sensors in handsets and Sony had them in portable video players, and LG had already announced plans to put a touchscreen in a handset when Apple launched the iPhone. In essence, none of the technology was new and none of it was Apple's. Only the extent to which the new facilities were used to stretch the functions was new – call it the style factor.

It was automatic that once you have a touchscreen, you need far fewer buttons on the actual device, the screen can be far bigger, and more features can be added without clogging up the menus. But you have to give yourself up wholeheartedly to the concept, and go for broke, which Apple did, and not only that, you have to be so sure that this is the 'right' direction that you can convince an AT&T or someone similar.

Nokia cannot convince AT&T of anything, but it could have and would have eventually delivered an iPhone class product, in 3G and cheaper than the iPhone. But Nokia can convince many operators outside the US to take such gambles, and in that it remains a more powerful force for transformation of the handset, than Apple, when things are considered globally.

But Forrester, despite being global in reach, is a US research house, and as such it sees more influence in Apple's demesne than is really there. Apple finds it hard to stimulate new product genres, but it finds it fairly easy to make a stylish, far reaching implementation of an existing genre.

Take iTunes, the download manager that was around for over three years before the iPod took off. There were plenty of other download managers with the same function, some were even free, and one or two were already used to manage pirated music. The iPod too was not a huge hit, not in its first two years. The stroke of genius which triggered the take-off was not even that. It was obvious to anyone that studied the market that flat rate single tracks at 99 cents would create an avalanche from a music service, but it took the personality and gall of Jobs to convince the record labels to give it a try. Not only that, he also had the gall to tie up the majority of micro disk drives being built all over the world, so that initially at least, no-one else could follow Apple in this strategy. Apple's execution and single-mindedness also helped.

When we first suggested that Apple could become a CE play in April 2004 (long before the Video iPod launch) the Apple share price was under \$14 with a market capitalization of around \$12bn. Today the Apple share price is \$181 and its value close to \$160bn. That said, let's look at the Forrester thought process. It says that four existing products, the Mac, Apple TV, iTunes and the company's retail stores, will form the initial basis of its digital home dominance, and that with the addition of four new product ideas - home servers, a universal music controller, network enabled gadgets such as digital photo frames or alarm clocks, and in-home installation services – it will become the hub of the digital home by 2013.

Apple's four new opportunities:

Going back to what Apple has done well in the past – spotted technology steps in advance of them being implemented by market incumbents, getting devices to market first, using a proprietary service lock-in, plus great design for consumer appeal – just how would those strengths apply to these areas? The Apple Mac is really basking in glory reflected from the iPod and iTunes; Apple TV is in its second generation and is not a breakthrough, has equivalent rivals and the chipsets that it's based upon are now commodity; iTunes already has dominance; AirPort is flourishing though its importance is underrated (*see separate item*).

So what about the new product areas? An Apple Home server, more like a DVR, has been predicted for around two years now, but there already exists an Apple back-up or home server which attaches to Apple's AirPort Extreme range of Wi-Fi routers for all services. A universal controller has been in the DLNA (Digital Living Network Alliance) roadmap for four years, and device manufacturers are well on the way with these, for both TV and music, with an underlying control architecture that sets the rules for what remote device calls are allowed to do through the controller - so there's no real edge here for Apple, although an Apple version would probably sell far more than any other similar controller. That leaves us gadgets and in-home installation services.

These may be straight from the Apple product roadmap via the Forrester analysts, but just because Apple says that it will make money here, it doesn't mean that there's another iTunes pincer movement – services and locked-in hardware – on the horizon. The only way items like digital photo frames and network connected alarm clocks make sense is in a pure Wi-Fi world, which is open. Do they need Fairplay DRM control (so that no-one can change the pictures on your wall or your alarm setting without your say so) ? No, they may need a simple password protection, but that's all. That leaves us with in-home installation services – one of the lowest margin businesses on the planet, better suited to a cable operator or a telco.

The importance of iTunes and Fairplay:

The truth is that all of these additions relate to iTunes. They each feed off its continued acceptance, building it an extended ecosystem. The online home server for device back-ups and cross-copying of content and Fairplay license issuing, the MAC for creation and editing of user generated content; remote controls for moving iTunes content around and showing preview clips of video content; gadgets for playing iTunes content and as new destinations for such content. The key one in this last category is the iPhone. What Apple needs to do is be the first to offering rapid wireless syncing and sideloading of TV and downloaded content onto the handset. At present it is cumbersome and technical to sideload TV programming.

All of this means that Fairplay, Apple's REAL top product, because it cements the iTunes content onto Apple blessed devices, can extend its reach around the home, and that's key. The margin on Apple devices only remains high because other devices cannot play Fairplay content, but to have a real impact such devices also have to be ubiquitous (Apple TV may make it to that level yet – remember the iPod was also a slow starter).

The biggest issue that Apple has to overcome is extending this hegemony out of the home onto the personal device. It took Sony Ericsson around five years to build a noticeably market share with its handsets which are now typified by its Walkman designs. Last quarter it shipped 22m handsets, even in a cautious down quarter, with a run rate heading inexorably towards 100m devices compared to Apple's 10m.

The way for Apple to repeat this achievement with its own iPhone range, preferably more quickly, is to increasingly offer its devices untethered (so that ALL operators in a territory can offer them) once exclusive deals have run their course, and to solve the problems of DVR storage and rapid sideloading using Firewireless or Wireless USB.

But insofar as Apple's core achievement is as a low priced music and video operator, it is a portal business. So in the same way that Google is chasing that market with Android, and Nokia with Ovi, this is where Apple needs to innovate, but starting with the fact that iTunes has already delivered much of the online digital music content that's out there and protected today. Gradually it must extend this to video and here it will never embrace a DRM-free model, and it must create more service offerings that begin with the iTunes store.

So it needs a social network element built into its devices and their browsers, which share playlists and video lists and offer place-shifting and sideload syncing from iTunes servers at home, across flat rate broadband wireless networks. If it can, Apple should copy the Kindle breakthrough and cut deals with wireless operators for flat rate services where content arrives at devices magically through the air, with no extra fee (Kindle offers ebook updates across cellular data services with this being paid for out of the device purchase price and appearing free to customers).

The future of the iPhone:

Steve Jobs and his team have the imagination to see how best to give his second and third generation iPhones an edge over accepted favorites like Nokia and Sony Ericsson by cutting deals which make Apple devices more popular with consumers and therefore cellular operators. Almost seven years after the launch of the iPod, no devices are making inroads into its market share lead, unless it's the iPhone. Jobs now needs to leverage the iTunes store to repeat this achievement and create a credible home/mobile challenge, where the advantages of the music dominance extend to the handset. The only place where Apple can continue to get the type of margin it wants for its products is out there in mobile land.

If it would do him any good, Jobs would buy all or part of Motorola, for the R&D and advanced engineering, but he knows that this is a company that has tried to initiate core new technologies, the same way Apple used to years ago, and it is not the type of move that would drive his share price. Instead he needs to replace Motorola in the hearts and minds of Americans with the iPhone, by extending it, taking Fairplay controlled content into everyone's pockets. And to do that Apple needs to embrace all the waves washing over cellular, touchscreen, GPS and location services, mobile advertising and mobile search, mobile TV and the handset as a DVR.

The one lesson that Jobs has given time and time again, is that it all starts with absolute control of the music, and in one or two more year's time Apple will control such a huge chunk of portable music that not one record label will be able to break free. Each step is bigger than you realize, and music has not run out of steam for Apple. Not all iTunes customers have thrown away their CD players, few of them take their iPod and plug it into their car stereos – there's plenty more left in the digital music revolution before Jobs starts accelerating the digital video revolution.

But that won't be easy, and in the wings wait Microsoft which wants to offer PlayReady as a way for companies like Nokia to fight back or for it to create its own Zune phone, and companies like Sony have moved their Walkman franchise to the cellular world and will follow up with its Cybershot camera and video camera franchises and eventually it promises a Play-Station phone.

The iPhone took 28% of what the US defines as the smartphone market, which compares with 41% by Research in Motion with its Blackberry range, now aimed at the iPhone. As the service components of mobile strategies unravel, Nokia and Microsoft, Sony Ericsson and Google and RIM will all stand shoulder to shoulder facing Apple. But if it does not continue to make broad brush strokes in the mobile market, it will lose the surprise of the iPhone attack and shrink back to being an MP3 player supplier.

This analysis was originally published in Faultline, Wireless Watch's sister title, which offers weekly insights into the digital media markets and the economics of the quad play. Please contact Peter White on peter@rethinkresearch.biz for more details.

Mobile Internet Watch:

Google shows off Android at last

Google for the first time unveiled what could be a nearly completed version of its Android operating system, which includes a touchscreen and tools that look a lot like Apple's iPhone.

During its developer conference in San Francisco last week, Google demonstrated an Android home screen user interface with iPhone-like icons and finger swipes used for interacting with applications. The Android applications were running on a prototype W-CDMA device from an unknown vendor operating over an HSDPA broadband connection.

The applications and features demonstrated included a Google Maps street map view that included an interactive compass that responded to the phones movements for navigation; the ability to make shortcuts to web sites on the home screen; a home screen status bar for managing emails, appointments and phone calls; a zoom-in tool for viewing web content ;and a Pacman type of video game.

Unlike the iPhone, the demonstration was touchscreen based, not multitouch. Google, however, said the issue had to do with hardware and that Android is made to be compatible with a multitouch hardware sensor as well as with phones equipped with trackballs and other navigation tools.

3G+ Watch:

Chinese telco reorganization should be clean sweep for LTE

The restructuring of Chinese telcos looks set to score another victory for LTE in the battle to dominate next generation wireless. China Telecom, the fixed line operator which is acquiring cellco China Unicom's CDMA operations. Although it says it plans to deploy CDMA2000 EV-DO Rev A as its initial 3G option, in two to three years' time it will move to LTE. China Mobile, which will go with the Chinese TD-SCDMA standard for 3G, also plans to move to LTE at an early stage, and is working on trials with Verizon Wireless and Vodafone.

China Telecom joins Verizon, KDDI and other major CDMA carriers in abandoning the product roadmap at the 4G stage, effectively sounding the deathknell for Qualcomm's own next generation, OFDMA-based system, UltraMobile Broadband. LTE is also likely to be the 4G choice for China Netcom, which is to acquire Unicom's GSM activities and is tipped to deploy either TD-SCDMA or W-CDMA once it gets 3G licenses, now expected to happen once the reorganization is completed, probably around the turn of the year.

As details of the restructuring, outlined a week ago, emerged, it seems that Telecom will pay about US\$16bn for Unicom's CDMA business, creating one of the world's largest operators with more than 43m CDMA customers and more than 216.3m fixed line subscribers, including 38.4m broadband. Telecom's parent company will pay 65% of the cost of the takeover, while the operator's listed unit will fund the rest. Meanwhile, Netcom's takeover of the Unicom GSM division is valued at \$56.3bn and will take the form of a share swap. Netcom will be de-listed and become a wholly owned unit of the remaining Unicom.

Analysts have questioned the price of both deals, since the Netcom transaction is priced at almost twice the company's market value, while the price tag for Unicom's CDMA business is also high – the CDMA portion is only one-third of the size of the GSM business and, according to the Reuters news agency, only broke even in 2006 after years of losses.

Shares in China Unicom, Netcom and Telecom have been suspended since May 23, following the announcement of the restructuring plan, which will also see China Mobile acquire smaller fixed line player China Railcom.

China Mobile has launched a second round of tenders for handsets and datacards based on China's TD-SCDMA 3G standard. The operator said in a statement that it was preparing to purchase 100,000 devices, a significant increase on the 30,000 devices it procured in its first round of tenders in January this year. China Mobile has a special 3G license that will enable it to have a network running in time for the Beijing Olympic Games in August. This mandates the use of the Chinese 3G technology. In its statement, the cellco said that bidders for the tenders will need to have TD-SCDMA handset production licenses issued by China's Industry and Information Ministry. More than 30 device manufacturers have been issued with such licenses

to date, including China's own Lenovo, ZTE, Guangzhou New Postcom and Hisense Electric; Korea's LG and Samsung; and a range of international vendors including Nokia and Motorola.

Vodafone set to gain greater share in Vodacom

South African telcos are in flux, with MTN considering merger first with India's Bharti and now with the same country's Reliance. Meanwhile, incumbent Telkom is set to sign two deals, one to sell part of its stake in cellco Vodacom to joint venture partner Vodafone. Vodafone's outgoing CEO Arun Sarin announced his departure with pledges that the giant operator would continue its recent strategy of making acquisitions in high growth markets, and boosting minority stakes to gain greater control.

Vodafone, which holds a 50% stake in Vodacom, is reportedly offering Rand18.75bn (\$2.45bn) for another 12.5%, with Telkom's remaining 37.5% stake likely to be spun off to its existing shareholders. Telkom will also plan to see its fixed line operations to a private consortium consisting of local investment firm Mvelaphanda Holdings, New York private equity firm Och-Ziff Capital Management Group, and other strategic investors. Telkom's largest shareholder is the South Africa government, which owns 38.9% directly and 15.3% through the Public Investment Corp.

The private takeover of Telkom's "entire issued share capital" is dependent on certain conditions being met including, including the unbundling of Telkom's entire 50% stake in Vodacom. Vodacom had 33.9m mobile subscribers at the end of March in five countries - South Africa, Democratic Republic of Congo, Lesotho, Mozambique and Tanzania. Vodafone has been looking to increase its holding for some time. Telkom was in talks with Vodafone and MTN late last year, and also turned down a bid from Saudi Arabia's Oger Telecom in March. Separately, Vodacom is in the process of selling off a 7.5% stake to South African firms under a black economic empowerment (BEE) initiative.

Meanwhile, MTN is pursuing its deal with Reliance. Its suggested merger with the larger Bharti stalled, partly on the likelihood that MTN's brand would be submerged, but a potential Reliance transaction would probably give the South African operator a 51% stake and preserve its brand. Bharti took the initiative on the merger proposal and drove the talks, but while MTN must have known that its own investors would back the idea that South Africa should have a global champion, it also knew they would never back a deal whereby it became a vassal of a late to market cellular player from India.

WiMAX and broadband wireless:

Mobility to be allowed in 3.5GHz band across EU by 2012

The European Commission has struck a major positive blow for WiMAX by adopting a decision aimed to permit mobile support in the 3.4GHz-3.8GHz band throughout the region. With the future of WiMAX in the 2.5GHz spectrum in Europe still uncertain, the 3.5GHz band is increasingly important to the technology's near term success (*see Wireless Watch May 22 2008*). But while technology advances have made the high frequencies increasingly viable to support a wide range of wireless services, including mobility, operators have been limited by the refusal of many regulators to allow mobility in the band.

In the face of opposition from 3G carriers, some regulators have given mobile rights to 3.5GHz operators, such as the UK's PCCW-owned UK Broadband. But this has been ad hoc and piecemeal, whereas an EU-wide policy should have far more profound impact, putting into concrete effect last year's inclusion of 3.4GHz-3.8GHz in the list of official ITU bands for IMT technologies – 3G and 4G, which are inherently mobile.

The Commission's Decision says, in Article 3, that European Union member states must allow this spectrum range to be used for "fixed, nomadic and mobile electronic communications networks" by January 2012. The designation of the band "is an important element addressing the convergence of the mobile, fixed and broadcasting sectors and reflecting technical innovation," the Commission said in a statement, and forecast that the use of mobility – and therefore the need for roaming – would drive further harmonization, "in the sense that users of such electronic communications service in one Member State could also gain access to equivalent services in any other Member State".

The Decision document cited the recent report by the European standards body CEPT on broadband wireless access, which concluded that "the deployment of fixed, nomadic and mobile networks is technically feasible within the 3400-3800MHz frequency band under the technical conditions described in the Electronic Communications Committee's Decision ECC/DEC/(07)02 and Recommendation ECC/REC/(04)05."

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