



MOBILE INSIGHTS: ANALYSIS OF EMERGING TRENDS IN WIRELESS

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Mobile Infrastructure

Analyst Insights



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Our Future Networks Will Be Greener, Smaller and Smarter

At the Mobile World Congress (MWC) in Barcelona last month, there were a lot of buzz words that were working their way into conversations, including LTE, Femtos and the new addition for 2008, Green.

Green is a very powerful marketing tool and it can also be a very appealing word for journalists and investors, but what vendors aim to do is keep a premium price and avoid commoditization of RAN equipment. The main infrastructure vendors, including key players Ericsson, Nokia Siemens and Huawei, have recently announced green solutions. Ericsson, in particular, is very aggressive in targeting the market and in showing operators the savings associated with its solution. These products are called green because of their reduced power consumption, which still represents one of the main invoices in operators' OPEX. There is, however, a main issue that is stopping operators from embracing this wave of green technology. These new products are, generally, significantly more expensive. Although the reduction in operating costs associated with these solutions are clear, operators are always very reluctant in choosing solutions with a higher CAPEX.

Cost has always been a critical part of the infrastructure discussion. At the MWC, many new infrastructure products and solutions were shown and explained to the public and one way or the other, every discussion was on the same topic, reducing OPEX and, if possible, CAPEX.

However, Green was not the only theme for the show – smaller sizes was another. One thing that was striking when looking at the new products showcased: the sizes of the new RAN equipment coming to the market.

Several of these new base stations could easily fit in a van and installing them could be done in as short a period as a couple of hours if everything else is in place. Operators are looking with great interest to these new solutions as a way to cut their OPEX on both their existing and new/expanding networks.

New infrastructure equipment is also significantly smaller than legacy solutions, from the base station server, to the radios and the antennas. This comes with a faster deployment of the base station and cheaper site rentals, but still represents a significant investment in time and money for operators, even in developed countries. Furthermore, the availability of smaller and lighter equipment means fewer constraints in finding suitable sites for the deployment of base stations. This has a huge impact on the design, implementation, and optimization of networks. Remote Radio Heads (RRHs) and femto/pico base stations on these lines further simplify these tasks. RRHs are quickly becoming a standard choice for the rapid deployment of new networks, and for a cheap expansion of old ones. Femtos continue to be a very hot topic at the MWC and their popularity is putting the spotlight on picos, for more business solutions. Both RRHs and femtos can be considered "Green", especially from an operator point of view. RRH have reduced power consumptions and femtos/picos' power bills and backhaul will be paid directly by the end user, making them a very attractive solution for the operators.

New antenna technologies are also making networks smarter. The new solutions, such as Ubifyne's uB Micro-Radio architecture, incorporate the RRH functionality into the antenna housing with the Integrated Radio Unit (IRU). In these solutions the radio unit and the antenna are integrated into one single unit, eliminating the need for additional antenna solutions and making it easier to software upgrade them (remotely), when new technologies are deployed (i.e. LTE). The software switching functionality also means that operators will be able to trade between coverage and capacity.

IMS Research's recent report "The Worldwide Market for Cellular Infrastructure, 2008 Edition" discusses the fact that a combination of these solutions (RRF, Femtos, new antenna technologies, etc.) is necessary for a successful (and profitable) uptake of Next Generation technologies, which will be deployed in the 2GHz, and over, range; and which also offer coverage and indoor penetration solutions.

North America United States
TMT Wireless Equipment

27 April 2008

Signals to Noise (S2N)

S2N #274 - Q1 Earnings

Review

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S2N#274 - A weak quarter for handsets

In this week's S2N we reprint our earnings notes for Qualcomm, Motorola, SiRF and Skyworks. We also take a look at handset volumes now that the big 5 have all reported.

Emerging Trends in Wireless

Last week, we attended the NGN (Next Generation Networks) Conference in Bath, England. This is an annual four day industry event attracting carriers, vendors and consultants to discuss emerging trends in mobile networks. Topics of discussion included 3G and 4G technologies, Femtocells, backhaul issues, USB dongles and emerging FEM and antenna technologies.

Handset volumes look mixed

With all five of the largest handset vendors having now reported we take a look at the aggregate data. Unit volumes among the big 5 were down 13% sequentially, worse than many had originally expected earlier in the year. Only the Koreans LG and Samsung stood out, everyone else saw steep seasonal declines and share loss. It also appears that the big five again lost share.

QCOM: Solid quarter in a difficult industry and macro environment

Seen in the light of a difficult economic environment, QCOM reported good results. Fundamental trends remain strong. Demand for mobile data is growing. They also continue to pull ahead on the competitive front gaining share amidst disarray among some of their competitors. Their scale also allows them to keep investing in key R&D initiatives such as HSPA+, LTE, etc.

MOT: Awaiting signs of handset recovery; other businesses remain strong

We continue to await signs of recovery or stability at the mobile devices unit. One encouraging sign, our outside checks indicate that Motorola should begin shipping WCDMA phones with Qualcomm basebands this year, which should help MOT regain share in Europe. Mobile Devices recovery, however, will take some time.

SiRF: Deteriorating fundamentals

SiRF's fundamentals continue to decline. They are suffering from a triple threat of competitive pricing, declining share in PNDs, and a significant deceleration in the PND market itself. The company does not have the cost structure to compete with low-cost new entrants. We think SiRF should consider a sale.

SWKS: Good execution; industry outlook remains challenged

SWKS continues to deliver gradual improvements to its operations. On the cellular front, the company continues to gain share. They claim, and we believe they are right, that they are the only PA/FEM vendor present in volume designs at all five of the largest handset vendors. They benefited this quarter from LG's strength as well as share gains for Skyworks' products within Nokia. We remain cautious about the overall global demand for mobile handsets. On the linear front, the company continues to expand its offerings, gain design wins and customers.

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Signals to Investors

Looking Into the Future

Last week, we attended the NGN (Next Generation Networks) Conference in Bath, England. This is an annual four-day industry event attracting carriers, vendors and consultants to discuss emerging trends in mobile networks. Topics of discussion included 3G and 4G technologies, Femtocells, backhaul issues, USB dongles and emerging FEM and antenna technologies.

HSPA Evolution, LTE and Wimax received significant attention with a general view that HSPA has significant leverage remaining and will dominate the market for the next several years, LTE has significant development work remaining and would not likely see broad deployment for several years and Wimax having to prove it can scale to compete with widely deployed mobile broadband systems.

Femtocells were also a popular topic amongst the presenters. Operators expressed significant interest in the technology as a method to help reduce backhaul costs while improving the user experience, reducing churn and, perhaps, enabling new services. Issues around CPE cost, network management, rollout, synchronization and radio planning/interference mitigation remain as significant gating factors to broad deployment. Femtocell CPE and chip providers, such as Ubiquisys and Picochip, are moving aggressively to resolve these issues. Still, we continue to have a view of potential broad deployments not occurring until 2010, though operators, such as Softbank in Japan, could be early movers.

Backhaul was another topic of high interest/concern amongst operators. This issue is only likely to grow in importance over time as base station capacity grows exponentially with HSUPA, HSPA+ and LTE taking data rates from 10's of Mbps to 100's of Mbps per site. Metro Ethernet, Microwave Point to Point and Point to Multipoint (Cambridge Broadband) are technologies that can help to address this growing need, though Metro Ethernet requires a significant investment in fiber deployments. One operator suggested that Microwave Mesh could be an interesting alternative over time as bandwidth needs grow.

As uplink speeds kick-up significantly, starting with HSUPA at 5.8 Mbps, the industry will likely revisit an old issue of networks becoming uplink limited. In early networks this issue was a result of base stations being able to cover large areas, while handsets had power limitations resulting in situations where the network could see the device, but the device could not talk back to the network (the signal was too weak to reach the base station). With high speed uplink networks coming on line, this issue is reappearing as devices lack the link budget to transmit at the higher data rates becoming available to them. Two ways of attacking this problem are in the device with new, more efficient/sensitive FEM's potentially enabled by new supply voltage and feedback loop techniques that drive more efficient power amplification and improved linearity being developed by Nujira and Quantance. These techniques could improve battery life and data rates by improving uplink performance up to 3 dBm.

Another method of improving uplink performance is via putting better transmit/receive capabilities into the base station antennas via active antenna arrays. While previous active antenna solutions have seen limited success (anyone that was an investor in Metawave can vouch for this), Ubidyne, with its unique antenna embedded radio design, can improve a base station's link budget (in one example, for a 900 Mhz UMTS base station application versus an RRH, by 4 dB), thus improving uplink performance.



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As operators begin deploying next-generation networks many of them will benefit from using remote radio heads (RRH's). The overall concept is very simple. The radio unit of the base station is located as close as possible to the antenna while the baseband functionality is located in a different location. Although the concept is simple, the technical complexities are a bit more challenging. Until recently, equipment suppliers were unable to design high efficiency power amplifiers, which from a practical perspective pretty much negated any advantage that the RRH concept offered.

Now that the technical issues have been addressed, operators from Vodafone to AT&T stand ready to benefit. Lower capital expenditures, reduced operating expenses and greater flexibility in deploying cell sites top the list. Further, we believe that the market opportunity is very robust and that it will be the de facto approach for all new network deployments.

Two competing industry initiatives are also helping to promote the use of remote radio heads. Major OEM's and subsystem suppliers are using the OBSAI and CPRI specifications to accelerate the introduction of RRH's that support new technologies and/or operate in new frequency bands. These specifications, however, are not a panacea as close interaction with the OEM is still required in order to ensure compatibility and interoperability.

In recent weeks, there has been a flurry of rumors and/or announcements involving the deployment of Mobile WiMAX in North America and none of the announcements have been very encouraging. Despite our misgivings when Sprint Nextel announced its Mobile WiMAX strategy, we argue that the operator should remain committed to the technology and its 2.5GHz spectrum.

Remote Radio Heads – the long arm of the law

After what has been anything but a vacation we are finally back in the saddle with a new *Signals Ahead* issue. For the last couple of months we have been frantically putting together our upcoming next-generation wireless economics study and it is proving to be far more work than we first envisioned. When it is finally pub-

lished we believe that it will provide immense value to those organizations that purchase one of the licenses that we are offering.

We will be making the complete table of contents and list of figures available to interested parties and it will also be posted to our new website, which is still going through some

RRH concept since antennas are typically located on the roofs of buildings. This means that co-locating the antenna and the RRH is far less risky since there is easy access to the roof.

Ubidyne is taking a somewhat different approach with its solution, which it calls a micro radio. While a typical RRH solution uses a single radio and power amplifier, the Ubidyne solution combines together a large number of micro radios, with each radio only capable of supporting 1.25 watts of power (going to 3 watts). The company claims that its micro radio solution can run cooler than a typical radio while its dependence on multiple radios means that there isn't a single point of failure. For example, one or even several micro radios could fail, yet the overall radio system would still function. This means that an operator wouldn't have to immediately have to climb the tower if it experienced a problem with the solution. Ubidyne is working with two of the leading antenna providers to integrate their micro radio with an antenna solution with the end goal being a more compact RRH solution than exists today.

TD-SCDMA in China represents another opportunity for remote radio heads. TD-SCDMA uses smart antenna technologies with 8 antenna elements per sector. This means 24 coax cables running up the tower plus an additional cable for calibration purposes. Figure 3 illustrates an earlier generation TD-SCDMA base station that we viewed during last year's visit to Baoding, China. TD-Tech is now in the process of optimizing its solution. The coax cables are being replaced with a single fiber optic cable (1 per sector) and the two remote radio heads (4 antenna elements per box) currently used in each sector will be replaced with a single remote radio head (6 antenna elements).

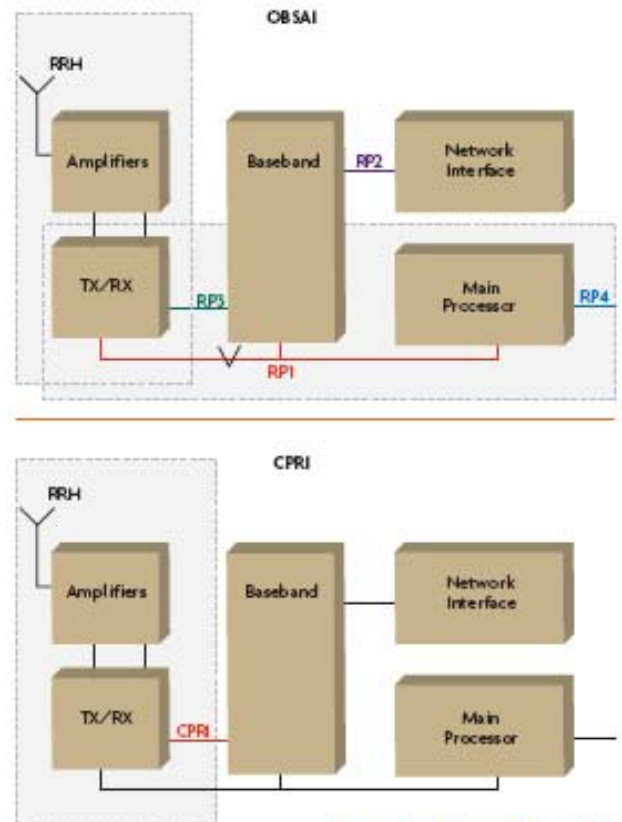
Mobile WiMAX is another area where there is a lot of activity surrounding the use of remote radio heads. Many of the infrastructure suppliers are introducing remote radio heads and this is playing a role in making the technology more attractive to deploy. Alcatel Lucent, for example, is introducing its first Mobile WiMAX RRH solution in 2008, which includes support for MIMO.

Interestingly, it is our understanding that Sprint Nextel is shying away from using remote radio heads although we believe that they will use the approach in certain markets – much depends on the vendor assigned to the market.

CPRI and OBSAI bring it together

Although not directly related to RRH's per se, it is important to understand some of the underlying considerations which allow remote radio heads and the radio servers to interact. As it turns out there are actually two "open specifications" in place which define this interface and it is these specifications which

Figure 4 – The OBSAI and CPRI Specifications



Source: Signals Research Group, LLC

help drive the overall market opportunity for the remote radio heads.

In September 2002, Nokia Networks, along with Hyundai, LGE, Samsung and ZTE, launched an initiative to define an open base station architecture. This initiative, called OBSAI (Open Base Station Architecture Initiative), segregates a base station's principle functions into a number of discrete modules with four standardized interfaces which connects the modules together. Shortly thereafter in June 2003, Ericsson, along with Huawei, Nortel, NEC, and Siemens launched their own initiative, called CPRI (Common Public Radio Interface), which had similar objectives but a different means of achieving those objectives. Alcatel Lucent is also supporting CPRI with its first UMTS RRH now available, while subsystem suppliers include Powerwave, TelASIC and Ubidyne. There are also a large number of WiMAX vendors that support OBSAI, including Airspan, Motorola, Redline Communications and Soma Networks. From a subsystem perspective, Andrew and Powerwave are also OBSAI members.

A somewhat cynical view of the two competing organizations is that OBSAI is nothing more than Nokia's, now Nokia