Nokia's N810 Linux WiMAX terminal, released in 2008. A real bet on WiMAX as the next generation mobile technology or just an experiment while they are waiting for LTE to be ready?

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WIMAX vs. LTE
The role of the financial crisis

In the midst of the global financial crisis, everyone has to evaluate their strategies and change their plans and targets accordingly. This goes for most business areas including the mobile and wireless industry. One of the big questions that remains unsolved with the advent of the crisis is the battle between WiMAX and LTE to become the next mobile broadband data standard.

A BRIEF TECHNOLOGY OVERVIEW

Mobile WiMAX is hereby defined as the IEEE standard 802.16e and the WiMAX Forum was first out with its proposal based on the OFDMA (Orthogonal Frequency-Division Multiple Access) technology. In principle, it is a completely new type of a mobile data transmission. There is no longer a distinction between voice and data – all is IP – and with a rude approximation one could call WiMAX a 'cellular WiFi network', accessible via base stations like a traditional cellular mobile telephony system. It is possible to move outside the limited area of coverage of WiFi and be connected to the network while moving over distance, e.g. by train or car. The WiMAX standard is consistently being developed and, at the time of writing, the 802.16m is awaiting its rectification. This new update includes MiMo capability, minimum 2x2 downlink, and 1x2 uplink. Target data rates are not yet released.

As an alternative to WiMAX, the mobile standardisation organisation 3GPP is finalising an overlay to their 3G WCDMA technologies – LTE, an abbreviation for Long Term Evolution. 3GPP calls it a 3.9G technology, and for sure not a 4G technology, as they don't want to draw the attention of the authorities, politicians and regulators, who are waiting on the side of the arena to sell new licenses for the space just as they did when 3G was knocking on the door. The result of that exercise was - as many will recall – that the 3G deployments were delayed by 3-5 years, as the mobile operators were drowning in tremendous license fees. From a technical

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point of view, LTE is a sort of WiMAX for 3G operators: The technology behind LTE is like WiMAX based on OFDMA, at least in the downlink (LTE is using SC-FDMA technology in the uplink), and it certainly looks very much like WiMAX in the specifications. Most of the current operating 3G networks can be upgraded to LTE networks, at least if they carry one of the traditional 3G WCDMA brand names, like Ericsson, Nokia Siemens or Nortel.

The two systems are both meant to enhance the transmission velocity of current mobile data network by far. The WCDMA 3G standard deployed in Western Europe and Japan has a peak data rate at approximately 1Mbps and the enhancements implemented so far – HSPA and HSPA Evolution – accelerate the performance to approximately 10Mbps. Mobile WiMAX easily beats these current data rates with a peak performance at 40 Mbps. However, one can expect approximately 15 Mbps with a cell radius of 3 kilometres. This will be the performance in rural areas with lower base station density, but in cities the actual rate will be closer to the theoretical maximum. The 802.16m MiMo version is expected to deliver significantly faster data rates than this. LTE is on paper a much faster technology than 802.16e with its estimated peak performance of 100 Mbps in the downlink and approximately half in the uplink. Again, this is a theoretical maximum, and in practice the expectations are much lower when a lower than optimal base station density is used, and the fading profiles of the cities' tall buildings apply, etc. In this paper, the theoretical and academic differences between the WiMAX and LTE technology choices will not be further dealt with. It is simply concluded that LTE might be somewhat faster, but also ready for deployment later, probably publicly available around year 2011 or 2012.

IS BEING FIRST CRUCIAL FOR SUCCESS?

With the current documented data rates of WiMAX, and the estimated rates for LTE, the battle between the two systems is likely not to be on raw performance or network efficiency. Many other factors will determine what network will be most successfully deployed in a global context.

The fact that WiMAX has been the first new mobile data technology compared to LTE, which is still not finalised in standardisation yet, has so far been a big advantage. If the market pull is there and the operators are willing to invest at a big scale in a new mobile broadband network, then it's just about time to get started. However, with the experience of 3G in the back of the head, most operators in the world have until now been hesitating and held back the billions of dollars it will cost to deploy a full region-wide or countrywide WiMAX network. This is not a strange decision: Who wants to build a network in that price range, when the amount of terminals that can connect to it is extremely limited? And, this is part of the problem: Who wants to spend large amounts of money developing WiMAX based laptops, PDAs and Smartphones, when there is no network to connect to? Here we have a real 'chicken-and-egg' problem. By experience from 2G and more outspokenly in 3G, exactly this problem holds back the velocity of deployment.

THE ROLE OF THE FINANCIAL CRISIS

Presently, WiMAX 802.16e networks are deployed and operated in larger cities in South Korea and India and are under construction in larger cities in Asia, Africa and South America. But as has been the case at times in world history, everybody is waiting for somebody to set up a nationwide network in the United States. WiMAX is considered an American technology standard, mainly due to its relationship to IEEE, and if a business case can't hold water in the US, where can it? A consortium consisting of Sprint and Clearwire, apparently with huge investments from prominent partners as Intel, Google, Time Warner Cable Inc. and others, announced in the summer of 2008 that they finally had assembled enough financial means – approximately 12 billion USD – to deploy exactly such a nationwide WiMAX network. The 'WiMAX people' and most of the American wireless industry yelled 'Hurray', but what happened then? The financial crisis spread from the East coast to the West coast in the USA and further on to the rest of the

world, preaching cost consciousness and investment holdbacks all over. What will happen now? Will Sprint and Clearwire continue as if nothing has happened or will the investors' loss in their core businesses force them to pull out of their billion dollar promise?

The longer we wait for WiMAX, the more interesting LTE appears to be.

The longer we wait for WiMAX, the more interesting LTE appears to be. Two facts are important: LTE doesn't seem to be such a radical step for the operators, as it is advertised as the 'natural upgrade for your WCDMA system'. This argument is sweet music in the ears of struggling operators in times with limited good news from the financial sector. However, even though it is called an upgrade it might be costly, as the technology behind LTE is radically different from the current WCDMA systems. Secondly, the faster data rates provided by LTE might look more attractive as time goes by, especially if WiMAX is not taking off before LTE is available. If you can choose, why go for the lower performance? This argument is only valid, however, if LTE is available before WiMAX is out there and if LTE can provide something close to its promised, but theoretical, maximum data rate of 100 Mbps. At present, very few applications will need this bandwidth anyway.

Already, the two American telecommunication giants Verizon and AT&T have announced that they will go for LTE. Every single day that WiMAX is not available, LTE becomes more attractive. If the financial crisis lasts as long as is predicted in the worst case scenarios, WiMAX will be known as an old technology that never really made it and someone will argue that LTE is the 'new kid on the block', forgetting that the WiMAX Forum has just been more successful in finalising their standard in due time. Maybe the financial crisis will hide these facts. With the US presidential election behind us, it is time for the markets to make their technology elections. What will it be? WiMAX or LTE? Probably both systems will develop and live next to each other for a long time with WiMAX to dominate the American and some Asian markets and LTE to win the home field game in Europe and Japan. From the seat in the commuter train, where most of this paper has been written, one looks forward just to one of the systems and to have real broadband on-the-road, or should one say, on-the-rail.

NOKIA'S SWING DOOR APPROACH TO WIMAX

The leading manufacturer of 2G and 3G mobile handsets, Finnish based Nokia, is a good example of a company, which has changed its strategy in relation to WiMAX more than once. Nokia started out as a member of the WiMAX Forum. However, as 3GPP intensified the standardisation of LTE, Nokia pulled out of WiMAX development and terminated its membership. This is not an unexpected move from a company, which is one of the main pillars of the 3GPP consortium and the world largest provider of handsets within the 3GPP standards. Also, Nokia's network division – Nokia Networks (later Nokia Siemens Networks) – is the second largest provider of WCDMA networks, with a customer base mainly interested in the 'upgrade-to-LTE' solution rather than the 'buy-a-complete-new-network' approach of WiMAX.

Everybody believes that Nokia's primary strategy is targeting LTE. However, as nobody knows the end of the race, two horses are better than one.

Suddenly in 2005, Nokia reapplied for membership of the WiMAX Forum and joined the standardisation work in early 2006. Finally, in 2008, Nokia revealed its N810 PDA-like terminal, a Linux based WiMAX product. With the launch of the N810, Nokia brings itself in the forefront of the WiMAX handset market and, at the same time, proves that in the mobile space, manufacturers need to take risks and play on multiple horses to lead the race. Everybody believes that Nokia's primary strategy is targeting LTE. However, as nobody knows the end of the race, two horses are better than one. ●

LINKS:

www.3gpp.org/

www.wimaxforum.org/

www.litepoint.com

www.nokia.com

http://maemo.org/