Emerging Wireless Technologies – Which one is going to be the winner for voice ?

Jeeps Rekhi, 25th February 2006

Introduction

This article is a brief analysis of the main emerging wireless technologies, and some conclusions that can be drawn on the front-runners in the race to be the dominant technology for voice. The implications of which technology is the winner are wide-ranging because certain industry sectors will be favoured over others due to a better positioning in the ability to deploy in the field and to sell to customers.

This article is not an in-depth analysis, because that is a much greater undertaking requiring lengthy research into different markets globally, a keen understanding of all the technology issues, an assessment of the success of current partnerships, and an insight into future customers requirements. That aside, this analysis is based on facts and opinions from experts, added to the author's experience of emerging technology markets.

It should be noted at this point that some of the technologies in this article are optimised for voice, and some for data. For the purposes of this article it is assumed that the data networks are as good for voice as the voice networks. From a technologist's standpoint this may seem a preposterous notion, however the rapid advance in VoIP applications does suggest that it would not take long to remedy any specific issues a new technology threw up. In addition, it is almost certain that in the future (10+ years) the vast majority of consumers will want a mix of voice and data, so voice optimisation may not be a great advantage for the voice market anyway !! Telelgraphy states that there were 1.3 million VoIP users at the beginning of 2005, and predicts that VoIP will add 3 million users per year over the next three or four years. This analysis has been based on data from Vonage and Time Warner's cable division, but if wireless access were possible, then this could open the floodgates – especially with free city-wide access.

The Candidates

Here are a few of the wireless technologies vying for success. (I have not tried to explain what they are since this information can easily be obtained and the intended audience for this article will already be familiar with most, if not all, of

these technologies.) There are many more technologies than just these, but this list gives a flavour of the different possibilities:

- **3G** - an expensive technology to deploy (both the network and the handsets) with luke warm interest from customers in the advanced services. But, there are 75 million 3G subscribers worldwide with an estimated 10 million more per quarter (Source: Physorg.com, Feb 2006). Though Instat puts the figure at 203 million subscribers. Some research companies (e.g. ABI Research) are also saying that 2006 may be the year that 3G sees widespread take-up. Juniper Research reckons that there will be 300 million 3G subscribers by 2010, which is a lot of customers for any technology
- **Wi-Fi** (Wireless LAN). Is becoming ubiquitous in homes and offices, and soon metropolitan areas as many cities are already deploying pilot projects. It is easy to use, though most Wi-Fi ready appliances are still laptops. It operates in an unlicensed part of the spectrum. The technology components are much cheaper than 3G, and the barriers to entry are minimal compared to becoming a network operator. However, it was always designed for indoor, short-range use rather than the greater distances required for ubiquitous coverage. There are currently 82,000 hotspots worldwide (Source: Instat, 2006). WiFi revenue increased by 14% year-on-year in Q3 2005, but this includes the consumer market which confuses the picture for commercial voice services
- **WiMAX** is a new standard which has just been ratified in December 2005. It promises greater transmission distances and bandwidths, though the exact numbers will depend on the precise situation. It has received an incredible amount of press and vendor endorsement
- **Mesh networks** are rapidly gaining traction because they do not require the same centralised investment as the other technologies in this list. The advantages of working peer-to-peer in terms of power requirements, resilience of the network, and potentially much lower cost, does make them an attractive long-term bet as a technical architecture. Meanwhile there are issues on how to build a profitable market from this technology
- **Ultra-wideband** is an innovative method of transmission, but is at a less sophisticated stage than mesh networks in terms of deployment to customers
- **Bluetooth** is a short-range technology which can support voice technologies. However, even though many companies have experimented with Bluetooth hotspots, it has not emerged as a realistic competitor but rather a complementary technology to other voice technologies
- **Satellite broadband** is still a possibility, and may prove a profitable method of transmission to very rural customers. However, at this stage there is no indication that a voice package will explicitly be offered

There are also innovations within technologies that improve the performance in terms of bandwidth, e.g. smart antennas (which direct signals in specific directions) and MIMO (which uses multiple channels). Of course, there are enhancements to current technologies, such as:

- HSPDA for UMTS 3G which 3gnewsroom.com claims can reach 14 Mbps
- 802.11n for Wireless LAN, with which chip makers such as Atheros are already selling products with over 150 Mbps transfer rates

Metrics For Success

Of course, success in the world of business has always been much more than just the technology itself. The primary factors for success in emerging technology markets tend to be:

- Low barriers to entry (which principally is switching costs in this case)
- Establishing partnerships (for example with technology vendors or network operators)
- Satisfying customer needs (which are often poorly predicted)

In judging which of the above technologies will win, there are some key metrics (in no particular order) which could shed some light:

- Revenue model for all market participants – whereas NTT DoCoMo took only 9% of revenues from content services for Japanese wireless internet users, European operators have taken 80% or more of the revenues from SMS texts from consumers to content providers, which has stymied the creativity in the market by reducing the number of content providers able to make enough profit
- Device support for the technology – a major hold-up for 3G take up was and is that there are not many desirable handsets compared to 2.5G and 2G. Without a device, there is no product
- Ease of use of the technology – the user interface in utilising the technology must be comparatively simple or much of the value proposition may be lost. Video recorders were notoriously difficult to programme when they first came out, which hindered the valuable ability to record programmes when not at home
- Ability to enter the market and bypass incumbents if necessary. Wi-Fi is a great example of how anybody can offer wireless voice services and have a business model without any involvement from network operators
- Switching costs for consumers including ease of billing relationship. Some new technologies assume that consumers will want to replace all their current equipment – which though possible is not a good selling point. In voice services, a current example is that until recently there were no VoIP

phones on the market for connecting to Wi-Fi, so consumers had to use a computer

- Ability to provide new features and functions better than substitute technologies and which consumers actually want. Some technologies think that using a new technology to perform the same functions as a current products will garner market share. Using wireless Internet to access "Joke of the day" is unnecessary if a SMS subscription and delivery service is easier for the consumer and cheaper to deploy
- Support for other technologies in these devices – this does not limit users to only your technology. The strategy of technology lock-in is becoming a less effective strategy nowadays due to increased technical sophistication of users (especially early adopters) amongst other things. It is even becoming an impediment in some cases, e.g. Sony modified their poor-selling MP3 player to support open standards and not just their proprietary ATAC standard
- Ability to deploy the technology to customers with minimal errors. The company "3" had substantial problems with deploying their first mover 3G network, which was a barrier to people joining them since they had become accustomed to not having their calls "dropped"

The Heavyweights

In terms of the potential for voice services in the near future, there are only two principal technologies which are the most likely to succeed in the mass market - 3G and Wi-Fi.

For those amongst you who may believe that WiMAX will eclipse all imminently, here are some instructive comments:

1. The standard has only just been ratified, which means around 1-2 years until all equipment is interoperable between different manufacturers
2. WiMAX will need to prove itself before mobile's big players are going to invest in widespread deployment, according to Analysys
3. There seems to be very little hard data on the capabilities of WiMAX, which does not indicate a well-understood technology
4. Some vendors were labelling their products WiMAX before the standard was ratified, which some "WiMAX" products are not actually using WiMAX
5. Some vendors have already commented clearly on WiMAX, e.g. "We don't think voice is mainstream for WiMAX" said Dr Klaus Kohrt, senior VP at Siemens

For the next few years, WiMAX will need to be nurtured to become a mass market technology for voice services.

In the table below is a short summary of the key points for and against 3G and WiMAX in the future voice services market. I have also provided further information on those that may be perceived as controversial statements in the table.

Technology	Positive	Negative
3G	1. Significant level of investment by operators and device manufacturers 2. Has ubiquitous coverage through 2/2.5G services 3. Easy to connect to since using the same mobile network everywhere	4. Costly to deploy for service providers and for users 5. Market need for advanced services not clear 6. Disruptive threat from VoIP
Wi-Fi	7. Low barriers to entry 8. Cheap to use and deploy 9. The same all over the world	10. No clear revenue model 11. Still a fragmented market for users 12. Largely unknown in large scale deployments

3. With Wi-Fi, you currently need to connect to a different Wi-Fi spot each time, and also different payment mechanisms if applicable. With 3G you can just make a call
5. It is not clear that consumers want advanced, rich media services, or are willing to pay much for them if they do
6. Most 3G devices are advanced enough to run VoIP applications, which could completely disrupt the network operators' business model
7. Wi-Fi being an open standard has enabled any company to enter the market without being forced to pay patent royalties etc. for the basic technology. This has created a massive market of interoperable, off-the-shelf components and products
9. Wi-Fi has not been modified between different countries, like 3G (which has three agreed standards, as well as another standard that the Chinese are creating). That removes some of the problems for users, as well as creates a more competitive market
10. With so many Wi-Fi spots being free (e.g. municipal city-wide networks, consumers' home networks), it does seem that offering Wi-Fi access may become free or certainly not a premium service. For example, the City of London will

charge a fee for accessing the Wi-Fi service, whereas a few miles north in the London borough of Islington the a different Wi-Fi access is free
11. There are large Wi-Fi service providers who are aggregators of different hotspots (e.g. Boingo, The Cloud) but they do no yet cover a large enough proportion of th hotspots which people might use. Until that happens, Wi-Fi will not be as convenient as using a mobile phone
12. Wi-Fi has guaranteed coverage for a few hundred metres (though it can be much further depending on the geography and there are plenty of ways to extend the coverage). For example, if you have a building which is 15 storeys, you may need a lot of hotspots

Conclusion

In summary, Wi-Fi could have the lead over the next few years because of its low cost, and because 3G's business model for revenue from consumers purchasing data-intensive services may be flawed. But 3G does have widespread acceptance and Wi-Fi still has the issues with no ubiquitous coverage, fragmented service providers and a lack of handsets available.

Mesh networks and ultra-wideband offer completely different market structures to network operators. They will become far more prominent in the telematics, remote sensing etc. etc. market, but will be restricted in voice services due to a lack of customer understanding and ease of use.

However, 2G and 2.5G are doing well enough and will continue to flourish in the developed world and developing world for the next few years.

My Two Cents

I think that multiple technologies for voice services will co-exist. Each of these technologies has their advantages and disadvantages, and the future is hopefully in "multi-connectible devices" which can capitalise on the advantages of each of these technologies. These devices will be able to use Wi-Fi in a hotspot, but switch to 3G when outside a hotspot but in a metropolitan area. It will use 2.5G when in rural areas. An early stage example is the converged offering of mobile phone calls switching to cheaper calls via the fixed line internet when at home, e.g. BT Fusion.

I believe that 3G will triumph for the next few years at least because it is so convenient, and can eventually be much cheaper (once investment costs are paid off though I guess !!)

I believe that Wi-Fi will be a proving ground in terms of market structures and revenue models for providing voice services. After that, WiMAX or 802.11n will then be able to supercede Wi-Fi, and may well prevail over 3G or its descendants.

Don't forget there are always discoveries that can completely undermine current future predictions. For example, MIT has reported on researchers in India that have developed a communications protocol which using off-the-shelf Wi-Fi can set up a mesh network with each node a least 7km apart and can achieve transmission speeds over 20 times higher than Wi-Fi normally.