Title: The Wireless Industry: Entering a State of Confusion and Chaos

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Abstract

The wireless industry is entering into an extremely volatile period of technological uncertainty. Mobile phones celebrated its 20th birthday in 2007. Over the next 18-24 months, there are several new and potentially viable wireless technologies which will emerge to varying degrees of success such as Evolved EDGE, EVDO Rev. B, WiMAX, and LTE. With so many new technologies on the horizon that are being launched, this paper analyzes the potential impact of these standards on the overall industry.

INTRODUCTION

The wireless industry has quickly transitioned from one of voice/SMS (short messaging service) to extolling the virtues of data, high speed data and the experience of the internet on the mobile device. Each successive generation of wireless technology offers more and more bandwidth and higher data rates, with the GERAN path the most predominant across the world. This is better known as GSM.

With 2G networks across the world now upgraded to 2.5/2.75G capabilities, the focus during the past few years has been the initial network launches of 3G technology (WCDMA) in the United States, across Europe and in Asia.

We define 4G technology as those utilizing OFDM, of which both WiMAX and LTE qualify. As we look to 2008, the first large scale mobile WiMAX network in the Unites States is slated to become active. Furthermore, European deployments of LTE are now scheduled for late 2009/early 2010.

2G TECHNOLOGY – GSM IS NOT DEAD, YET.

Voice has been and will remain the most widely used application for the mobile handset and the wireless industry. With over 3 billion subscribers now connected via mobile handset technology, the industry is still looking ahead to the remaining 3 billion inhabitants of Planet Earth. Verbal communications will be a primary goal for the next 3 billion subscribers. Many in the industry have been predicting the demise of GSM technology due to the advent of 3G and 4G standards, yet we believe that GSM and its successors will remain a significant industry force for decades to come.

We can count on billions of GSM mobile handsets to ship over the next decade due to the fact that single mode WCDMA handsets remain virtually unmarketable in today's environment.

From a technology standpoint, GSM continues to evolve. Beginning with the original data rate of 9.8kbps on GSM< GPRS increased this to 60-80kbps or effectively "dial up" connection speeds. EDGE further increased this 178-237 kbps or entry level DSL service speeds.

Next on the horizon within the GSM world is Evolved EDGE or EDGE II. With peak data rates of up to 1Mbps, Evolved EDGE can be considered a 3G technology but can leverage the existing spectrum currently allocated for GSM globally at 850/900MHz and 1800/1900MHz.

We believe that initial contracts and deployments may occur in 2010 for this technology.

3G TECHNOLOGY – WE BUILT IT. ARE THEY COMING?

As of January 2008, mobile subscribers for all 3G technologies reached over 300 million with approximately 200 million being WCDMA technology based. In addition, over 165 networks globally have been upgraded to various speeds of HSPA technology. We believe that a vast majority of WCDMA/HSPA networks have been already upgraded to 3.6Mbps downlink speeds by the end of 2007 and would anticipate that future upgrades to 7.2Mbps and 14.4Mbps downlink speeds occur by 2010.

With 10% penetration of 3G subscribers, the market continues to lag behind earlier projections. Much of the delay in subscriber growth can be attributed to a few issues: handset battery life and unlimited data tariffs. Current mobile handsets running in 3G mode continue to perform poorly in the market relative to GSM mode and many so called 3G subscribers own a 3G handset but use it in 2G mode. We question the validity and the definition of a 3G subscriber today as one who uses and owns a 3G handset. The definition should be narrowed to subscriber who uses 3G mode and services over 50% of the time on a month basis.

PC data card users for 3G are even less with a penetration of closer to 1-2% of the globally mobile population. This is the primary target market for HSPA technology, providing broadband connection to a PC laptop. Penetration is much higher within the United States market among enterprise users for EVDO Rev. 0 and Rev. A technologies and HSDPA from AT&T. We believe that operator tariffs need to reach a flat rate pricing, similar to what happened in Japan with NTT DoCoMo, in order to drive rapid adoption and create higher data revenues for mobile operators.

The $100 BOM for a WCDMA handset is right around the corner. Low cost entry level 3G handsets will soon be available for the mass market. While these products may find there way into the emerging markets, we continue to believe that handset BOM cost is not the gating factor for 3G handset adoption but battery life remains the primary problem.

Should the industry solve the battery life issue and offer flat rate unlimited data plans, the subscribers will come. One unknown factor is the Apple iPhone. The introduction of this handset has caused data usage to soar. T-Mobile Germany has reported that data usage among iPhone subscribers is approximately 10x that of traditional mobile subscribers. Other copycat devices to the iPhone may spur a change in mobile behavior that would lead to more data usage on mobile networks.

Demand for 3G mobile handsets and infrastructure equipment should continue to grow but at more linear rates and not exponentially over the next five years.

4G TECHNOLOGY - WIMAX VS. LTE

OFDM technology is the heart of all 4G wireless architectures being proposed and developed. Within 4G, there are currently two competing mobile standards, mobile WiMAX 802.16e and LTE. Sprint Nextel has been the only major mobile operator globally to endorse and embrace WiMAX and is now certainly regretting this decision. Virtually every other major mobile operator around the world is choosing the LTE path including CDMA players within the United States such as Verizon Wireless. It is pretty clear that CDMA2000 technology is loosing ground and we expect virtually all CDMA operators will choose to implement LTE after upgrading to EVDO Rev. A or Rev. B.

While the world is going the path of LTE, Intel will continue to march in multiple directions including WiMAX but also LTE. Where does this leave the WiMAX industry and supply base? We believe that a few will survive and continue to supply both CPE and infrastructure equipment and that some mobile networks will be deployed but the majority of the networks will be for a fixed broadband application with India being the primary market for such equipment and services. We also believe that unit volumes will grow but again in a more linear trajectory as the market waits for subscribers to join the networks.

We believe that LTE technology will control the majority of all 4G OFDM shipments and expect initial network deployments in late 2009/early 2010. However, we remain cautious on the long term business model for 4G, its target market and the adoption of the technology in various regions around the world. We anticipate a significant lag between Phase 1 deployments and Phase 2 capacity upgrades for infrastructure equipment and believe that unit volume growth of handheld and embedded PC devices will be limited in the first 2-3 years of the initial deployment of the technology.

IMPACT OF MERGERS/ACQUISITIONS ON INDUSTRY

Ericsson and Marconi. Nokia and Siemens. Alcatel and Lucent. RF Microdevices and Sirenza Microdevices. Motorola’s handset group and ??? The world of wireless continues to evolve and shrink as vendors fight for their survival.

The creation of super OEMs makes it that much more difficult for vendors within the supply chain to find sockets for their products and makes the risk significantly higher for any failures.

We believe that continued consolidation across the entire wireless industry supply chain from substrate and epi vendors to semiconductors to subsystems and OEMs will occur and reshape the landscape. For some OEMs, we believe that now is the time to rethink their strategy in wireless, specifically the OEMs who have chosen a very aggressive stance on WiMAX technology, such as Motorola and Nortel. Other smaller startups are also in the potential wake of reality Tsunami that may wipe out many companies.

We currently believe that both the wireless infrastructure businesses of Motorola and Nortel are in jeopardy of becoming non-competitive within the industry. Each has already jettisoned its 3G focus in hopes of regaining a foothold with 4G WiMAX. It has become pretty clear and obvious that the world is choosing LTE and not WiMAX. Both of these divisions are at risk of becoming worthless from a financial perspective if the companies do not act quickly to either sell of its assets or try to merge with another stronger player.

CONCLUSIONS

Higher and higher bandwidth and data rate technologies for wireless will become reality over the next five years. Without a significant social behavior change such as the one being generated by the Apple iPhone, the current business models are not driving consumers towards 3G services and may not drive them towards 4G.

We anticipate another round of consolidation for both handset and infrastructure OEMs over the next 12-18 months as margin pressure continues to claim victims. The era for the Chinese OEMs is upon the industry and may indicate a changing of the guard for the traditional OEM suppliers.

ACRONYMS

CDMA – Code Division Multiple Access
CPE – Customer Premise Equipment
EDGE – Enhanced Data Rates for GSM Evolution
Evolved EDGE/EDGE II – High Data Rate EDGE
EVDO – CDMA2000 Evolution Data Only
GERAN – GSM EDGE Radio Access Network
GPRS – General Packet Radio Service
HSDPA – High Speed Downlink Packet Access
HSPA – High Speed Packet Access
HSUPA – High Speed Uplink Packet Access
GSM – Global System for Mobile Communications
LTE – Long Term Evolution
OEM – Original Equipment Manufacturer
OFDM – Orthogonal Frequency Division Multiplexing
SMS – Short Messaging Service
UMTS – Universal Mobile Telecommunications System
UTRAN – UMTS Terrestrial Radio Access Network
WCDMA – Wideband Code Division Multiple Access
WiMAX – Worldwide Interoperability for Microwave Access