Analysis - ARPU Déjà Vu

By Keith Mallinson Friday, August 1, 2008

As mobile data ARPU increases, look for similar demands on networks as voice presented in the 1990s

The long-awaited "hockey stick" growth effect on mobile data is finally happening. The demands on carrier infrastructure will be profound with major increases in the number of radio carriers, towers, additional cell sites and backhaul.

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Voice demand potential is finite; there's a limit to the number of minutes a day you can talk on the phone. With average annual subscriber growth of 13% this decade, total minutes have increased by 22% per year to 2.1 trillion, according to the CTIA.

This trend will continue for a few years with subscriber penetration increasing from about 84% and unlimited voice plans increasing minutes of use from current averages of 700-800 to 1,500-2,000 already achieved by Leap Wireless and Metro PCS. All told, this could account for tripling of voice traffic over the next 10 years.

Mobile data is nothing new. However, it was a veritable trickle – even in comparison to voice – until the arrival of 3G services. Wireless carriers have made good business with data services rising to about 20% of average revenue per user (ARPU) in the United States.

Most of the ARPU is derived from profitable SMS – a service running on the signaling channel that is much more frugal in its use of bandwidth than even voice. SMS uses less than 1% the network capacity of voice. With about 1 billion messages per day in the United States, all of this traffic could be carried coast-to-coast by just a few 45 Mbps DS3 (T3) circuits for less than $10,000 per month.

COMPARATIVE GROWTH

However, voice and SMS growth rates will pale in comparison to overall mobile data. Network traffic for the legacy services will be dwarfed by the upcoming flood of demand for mobile data in the next 10 years.

Look at what happened on the fixed networks where until 10 years ago voice used to be the predominant traffic. Today, data swamps voice by orders of magnitude. Exponential increases in fixed network demand have been satisfied by major network investments including fiber, DSL and cable modem deployments. Among other innovations, a revolution in optical transmission technology delivered increasing bandwidth per unit cost that even exceeded the doubling every 18 months observed in Moore's Law with silicon technologies.

According to Telegeography, lit international submarine fiber capacity for voice and data grew at an average of 50% per year between 1999 and 2006. Meanwhile, international voice grew at just 15% per annum. National U.S. fixed network growth also has greatly exceeded voice growth in United States due to the additional demand for data with the rise of the Internet.

Whereas technologies such as GPRS, EDGE, W-CDMA and CDMA2000 1X stimulated moderate increases in data growth rates, enhanced 3G technologies including HSDPA and EV-DO are encouraging more dramatic usage changes.

When a cellular modem can deliver similar speeds to Wi-Fi with DSL or a cable modem connection, it can change

the pattern of PC usage entirely. Just as many subscribers began depending on cellular for most voice calling at home, in the office, in hotels and coffee shops, ubiquitous broadband cellular will have the same effect on many laptop users.

DEVICE IMPACT

The mobile growth effect also will extend to smaller devices. The iPhone and the newly introduced HSDPA iPhone 3G are already driving more usage than other smartphones. Ralph de la Vega, who heads AT&T Mobility, said that 95% of iPhone users regularly surf the Internet with their phones. He also said 51% of iPhone users watch videos on YouTube.

To what extent can innovation and capital investment increase supply of wireless network capacity to support growing demand for mobile data at the rates observed on the fixed networks? Radio modulation improvements and additional spectrum availability will not go anywhere near far enough.

Spectrum efficiency has improved enormously in the last 25 years with the latest digital systems carrying nearly 20 times as much voice or data traffic per unit of spectrum as the 1G analog systems, but most of these benefits already have been reaped.

We are well along the diminishing returns curve. A similar-sized increase in capacity is occurring through availability of additional spectrum. New spectrum for cellular includes what was sold in the AWS and 700MHz auctions and the 2.5GHz spectrum being deployed for WiMAX use by Clearwire. There is precious little more spectrum that will become available in the prime bands below 2.5GHz that can provide broad coverage and mobility with in-building penetration on the existing cell site grid.

It will be innovations and investments that improve spatial efficiency that provide most of the additional capacity required. Power levels are one-tenth what they were as cells have gotten smaller with the number of cell sites increasing 100-fold since the 1980s.

New technologies including multiple adaptive antennas systems with beam forming will help. However, in the macrocellular environment – essential for transportation-based users – there will be increased demand for new and existing towers that are on average at only half their lease-up capacity. These will each need hundreds of megabits per second for backhaul. There were 214,000 U.S. cell sites at the end of 2007 – 10 times more than in 1995. This number will increase by a further order of magnitude in the coming decade with additional deployments including femtocell base stations in the home, dorm and office.

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