

# Changes Coming for Embedded 3G in Notebooks

Gartner RAS Core Research Note G00156891, Ken Dulaney, Leslie Fiering, 28 April 2008, R2729 08142008

**Embedded 3G capability for laptops has been difficult to justify because of upfront purchase costs, monthly costs and asset protection. New pricing plans and technology evolution will force changes in strategy.**

## Key Findings

- 3G service offerings are becoming sufficiently stable to enable an embedded notebook solution to last three years without an upgrade.
- Mobile operators will be providing daily pay-as-you-go plans that don't require a monthly commitment.
- Internal 3G modules will perform significantly better than external solutions for signal strength.

## Recommendations

- Continue to use external, wireless 3G cards until 2009, when embedded cards with a full three-year life are expected.
- Explore pay-as-you-go plans, optional extensions to 3G wireless handheld plans and bundled existing data plans as strategies to lower monthly service cost options.
- Remember to include alternative communications costs, such as daily Wi-Fi and Ethernet charges, in any return on investment (ROI) justification.

## WHAT YOU NEED TO KNOW

Various influencing factors are transitioning to a point where embedded wireless broadband (3G) will become superior from a cost perspective compared with previously used alternatives, such as Wi-Fi "hot spots" and hotel broadband for wide-area use. When these factors meet the criteria explained in this research, enterprises should consider wireless broadband technology in new notebook purchases for moderate to extensive travelers.

## ANALYSIS

This document was revised on 7 May 2008. For more information, see the [Corrections](#) page on gartner.com.

## Why Gartner Has Not Recommend Embedded WWAN Cards in Notebooks

Our standing recommendation against embedding wireless WAN (WWAN) cards in notebooks (except for applications with a clear ROI justification) has been based on lack of global coverage, high costs and poor asset protection.

Historically, embedded WWANs have been tied to specific technologies and service providers. This has created several problems:

- The cards were not field-upgradable, so a user could not swap the card out. If the user moved to an area not covered by the carrier, then the card was no longer useful. Similarly, it was possible for a traveler to visit multiple geographies not covered by the embedded WWAN card's provider, causing the user to incur additional costs for access.
- Ongoing service costs at an average estimate of \$600 per year were difficult to justify on a broad scale, and roaming charges could drive the communication costs even higher. For users with known WWAN requirements, as with vertical applications, there could be an ROI justification, but for day extenders or casual travelers, the additional cost might never be recovered.
- There has been tremendous technology churn in WWAN technologies and frequencies that could make an embedded WWAN card obsolete within two years inside a notebook with a three-year expected life.

### What Is Different Now

New technologies and pricing plans due by YE08 have the potential to eliminate the historical problems of embedded, wireless 3G notebook purchases. Chipsets that combine multiple technologies and frequencies can provide nearly universal geographic coverage and asset protection by promising a three-year useful life. At the same time, carriers are beginning to recognize the value of going beyond two-year contracts to include daily and monthly rates, as well as plans for letting travelers use local rates.

These changes can provide better economic justification and asset protection for embedding wireless 3G technologies in notebooks by the end of 2008, but they also may help justify wider deployments of cards in the interim.

### Asset Protection

Notebooks are considered a three-year asset in most organizations. Most organizations have also learned that it is more cost-effective to make the initial purchase with sufficient features and processing power to last three years without having to be returned for costly upgrades.

The inclusion of embedded wireless broadband has been problematic for notebook asset protection because of the rapid pace of change in the available technologies. In code division multiple access (CDMA), we have moved quickly from Evolution-Data Optimized (EV-DO) to EVDO-Rev A, and are expected to change yet again within the three-year life of a notebook purchased today. Similarly, we are moving through generations of Global System for Mobile (GSM) just as rapidly. In "Think Twice Before Buying Laptops With Built-In 3G Features," we cited this factor as a key reason to use external cards or handsets for 3G access.

GSM and CDMA road maps show that network coverage transitions to new technology modes will moderate and slow, and that multimode radio modules supporting EDGE, GPRS, HSDPA, HSUPA and EVDO-Rev A (such as Qualcomm's Gobi – expected in 2008) will survive the three-year life span of a notebook (see Figures 1 and 2).

The figures illustrate this point by estimating when 50% of carrier network coverage for a particular new technology will be achieved. The 50% penetration level for a new technology mode is the transition point at which the new mode has been deployed by carriers in 50% of the locations a user might travel with a notebook, thus making it desirable to have the newer, higher-speed mode available in the notebook – forcing an upgrade. These figures are backed by equivalent Gartner analysis and are, therefore, considered objective. The CDMA road map also supports a three-year life for wireless broadband modules containing EVDO-Rev A.

**Figure 1. GSM/High-Speed Packet Access (HSPA) Network Coverage Estimates vs. Time**

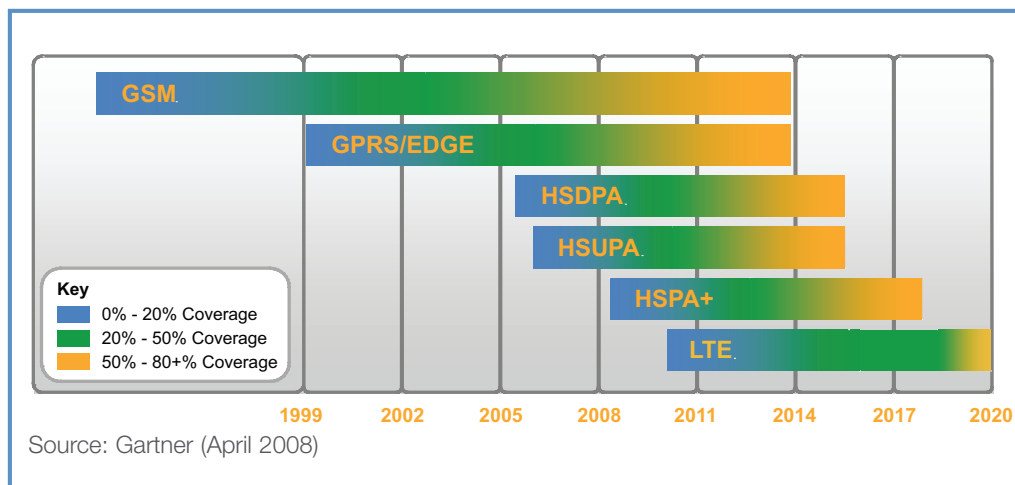
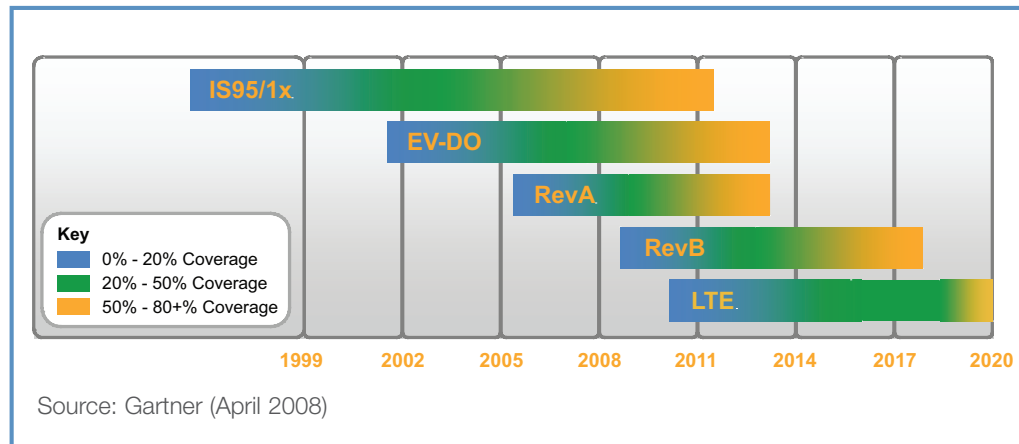


Figure 2. CDMA/EVDO Network Coverage Estimates vs. Time



The multimode chips that will make asset protection a nonissue will not be in wide deployment until early 2009. In the interim, if the ongoing cost issue favors wider deployment, then such deployments should be accomplished with external cards.

### Ongoing Service Costs

Among worldwide mobile workers, few members travel frequently enough to afford the typical \$50 monthly fee charged for the use of wireless broadband. For example, a typical worker may travel only a few times a year to a training course, conference, site visit or other task-specific function. A WWAN broadband card to serve these purposes at \$600 per year for service costs has few opportunities for payback for anyone except the heavy traveler or the worker who has daily need (such as a salesperson).

Alternative connectivity charges, such as Wi-Fi hot spots or Ethernet in a hotel, can range from \$10 to \$20 per day, depending on the venue. Users may find that if they travel from city to city, then they have to pay multiple fees in a single day. If we say the average cost of these services is \$15 per day for a user, then it would take 40 days of travel (\$600 ÷ \$15) to cost-justify paying for a wireless 3G service by avoiding other ad hoc service options. This does not take into account the benefit derived from connecting in any place that offers 3G service beyond Wi-Fi hot spots and hotel broadband. Users with international roaming needs would also benefit because they would only pay locally instead of through the local carrier's portal.

Workers who carry a wireless e-mail device with an unlimited data plan can often extend such plans to cover wireless broadband for notebook computers. Prices usually hover around \$15 per month (or \$180 per year). In this case, the break-even would drop to 12 days per year (one day per month).

For workers who travel even less frequently, new pay-as-you-go plans are available. A recent conversation with Verizon Wireless in the U.S. revealed a pay-as-you-go plan for \$15, with no monthly commitment (not to be confused with Verizon plans by this name for voice). Although not advertised or known to many users, a plan like this is an excellent substitute for Wi-Fi because it is a fixed price per day, regardless of location within a country. The downside is that a card or internal module purchased without a two-year contract is unsubsidized and raises the price from approximately \$50 to \$170. Nonetheless, the payback could come quickly to users who travel through multiple cities in one day, because they would only pay one fee rather than a separate connection fee for different Wi-Fi and Ethernet providers in different venues.

There is also the advantage of being able to connect anywhere there is 3G service, even in the absence of a hot spot. If we take the highest cost for a card (\$170), then payback days per year could be assessed by calculating the annual cost of the hardware card during a three-year period, which is \$57. Although single access per day would not yield any savings (\$15 vs. \$15), we believe that users will be able to avoid a number of excess charges required for any particular trip to include the aforementioned multiple service provider hot spot and hotel broadband charges. If we use an average charge of \$15, then a user would only need to avoid four of these charges per year to pay back the cost of the card.

Many sources estimate the cost of an internal module at \$100 or less by the beginning of 2009. This would reduce the annual cost to \$33 per year instead of \$59, further reducing the payback period.

The pay-as-you-go plan would also make sense for international travelers to avoid international roaming charges once it is as widely available as it is for Wi-Fi hot spots. We estimate this to occur within the next three years.

By the end of 2008, these plans and costs should be available. At that time, the financial case for embedded WWAN for equipping notebooks for workers who travel at least once a month will be clear.

## Global Coverage

The inclusion of multiple technologies and frequency in upcoming 3G wireless chipsets will provide coverage throughout most of the world.

## Performance vs. Alternatives

Users have three choices: employ embedded wireless broadband, use an external wireless broadband card or use a handset (with simultaneous voice/data so that calls can be received while transmitting data).

- **Embedded modules** – Perform the best because notebook manufacturers have taken great care to design antenna systems that provide superior signal propagation over the alternatives. In many cases, notebooks have multiple antennas, whereas other solutions may only have a single antenna. The systems are frequency-tuned and power-managed to ensure the best notebook battery life. Better coverage will result. (Note: According to several notebook OEMs, they have seen up to a 15% increase in signal strength using an embedded module over a PC Card; battery life consumption differences are affected by many variables and are difficult to calculate, but they can be seen as essentially the same.)
- **External cards** – Can be easily exchanged without returning the notebook. However, the benefits of external cards are compromised by the fact that the notebook interferes with transmission when the notebook is between the card and the cell tower. Power consumption is higher, and external cards are susceptible to breakage and loss.
- **Handsets** – Used as wireless modems is the easiest option, but they suffer from performance and battery life issues if not plugged in during use.

## Other Concerns

A number of other concerns regarding embedded wireless broadband have been removed as barriers.

There is the fear that mobile operators will attempt to make notebooks controlled devices, like cell phones. In some European countries, mobile operators have tried to use the subsidized cell phone model to sell notebooks, but success has been minimal because the operators are not often seen as a trusted source for PC support. We do not see any attempt to control notebooks as

viable because these products are already designed to bypass operator control, whereas cell phones were evolved via a different model. That said, future efforts for consumers could see advertising funding of broadband costs, and this approach might become more viable. If virtualization predictions come true, thus leading to scenarios where employers expect users to bring in their own notebooks, then operator-supplied products could become more commonplace.

Some organizations have valued the ability to have a pool of external cards that could be used as needed. Although this can reduce costs overall, the arguments in the first section overcome this issue.

Buyers don't want to be locked into one carrier during the life of a notebook. With the new chipsets supporting an array of wireless frequencies and technologies, movement among carriers is only limited by the contract terms entered into by the buyer.

International roaming charges can be extremely expensive. Although we have seen some movement to flat-rate or fixed-price-per-megabyte charges for roaming, the high rates when traveling internationally could be an inhibitor, thus making public Wi-Fi and Ethernet the best option. However, as mentioned earlier, if domestic travel reaches \$70 per year, then the justification remains and IT organizations can continue to negotiate with mobile operators, knowing the technology is installed and ready to use when the roaming issue is resolved.

Windows software has been cited as difficult to use when roaming among various network locations. This can be overcome by employing one of the software products supplied by the carrier or the notebook manufacturer (such as Lenovo's Access Connections or iPass). If during the life of the notebook technologies offered by the carrier or carriers are changed, then drivers and other software may have to be updated. To avoid this cost and other charges incurred for software maintenance, it is important that all notebooks be under an IT management system, such as Microsoft's System Management Server (SMS).

3G use will demand more battery power than Wi-Fi.

## Tactical Guidelines

By YE08, IT organizations will be able to consider the inclusion of embedded 3G wireless broadband on new notebooks where the user incurs at least \$57 a year of excess broadband charges while traveling.