WHITE PAPER

Mobile Broadband: The Shift from Detachable to Embedded Solutions

Sponsored by: QUALCOMM

Shiv K. Bakhshi, Ph.D. David Daoud
July 2007

IDC Opinion

Notebook PCs can be wirelessly connected to networks either through the use of detachable PCMCIA cards or through radios embedded in the devices. Should the shift from detachable to embedded connectivity solutions be a cause for concern? Or, does such a shift, in fact, offer key benefits to users?

This white paper addresses this issue. In this white paper, IDC argues that the shift from detachable to embedded solutions is a fairly standard progression in the matter of network connectivity of computing devices and offers key benefits to users. Such progression usually follows the maturity of the technology and constitutes a signal that the social adoption of computing devices with such connectivity has reached critical levels to justify embedded solutions.

The shift from detachable to embedded solutions is discussed here in the context of mobile – more precisely, cellular – broadband connectivity. In this white paper, the authors argue that an embedded connectivity constitutes a superior solution, and offers salient benefits to enterprise users and their IT departments. These benefits range from enhanced device performance and improved user productivity to operating expenditure savings and increased enterprise competitiveness.

In this white paper, the authors analyze the evolution of embedded solutions in notebook PCs with respect to mobile broadband connectivity. They review historical precedent by looking at WiFi connectivity, evaluate the performance of embedded and detachable solutions, and consider implementation costs for both enterprises and their IT departments. In the process, the authors seek to address, and dispel, some misconceptions relating to embedded connectivity solutions.

Defining Mobile Broadband and Embedded Solutions

In this paper, "mobile broadband," refers to currently-deployed, third generation, cellular network technologies, specifically CDMA 2000 1X EV-DO (Rev 0 & Rev A), WCDMA/UMTS, HSDPA and HSPA access technologies. The terms "cellular" and "mobile" broadband are used somewhat interchangeably. The authors believe that the line of reasoning articulated in this paper would apply equally to other mobile broadband technologies – such as WiMAX in its 802.16e incarnation, for instance – when they become available.
An embedded solution, for the purposes of this white paper, is defined as a set of hardware and software solutions integrated into a notebook for voice and high-speed data access via a third generation wireless wide area network. It involves a PC OEM who helps design the modules and incorporates them into the notebook during system assembly, a wireless modem maker that manufacturers the modem and supplies the drivers to function properly with the PC, and a telecom carrier that offers the cellular service.

**Market Sizing and Outlook**

The advent of WiFi hotspots earlier in this decade helped popularize the idea of wireless network connectivity for PC notebooks in public places. Intel, with its Centrino solution, legitimized the idea of embedded WiFi connectivity for PC notebooks.

However, as the idea of high-bandwidth wireless PC notebook connectivity in public places gained legitimacy, it created an opportunity for mobile network operators, who were upgrading their wide area networks to third generation. These mobile operators decided to exploit the bandwidth/distance tradeoff – correctly anchoring their offering in the idea of wide-area coverage (distance) rather than mere bandwidth.

Of course, with their 3G networks – both CDMA 2000 1X EV-DO as well as HSDPA/HSPA – the operators were able to offer users **high enough** bandwidth so that the difference between the bandwidth available in public hotspots and **anywhere** on public networks became one of **scale rather than of category**. The operators recognized that they had to meet a certain threshold with respect to bandwidth on their 3G networks, and did not have to literally match the bandwidth available in public hotspots. After all, while a user watching a video may notice a categorical difference between a 56-k connection and a 1-MB connection, he or she is likely to note little difference between, say, a 1-MB connection and a 10-MB connection.

The gambit – that good enough **is** often good enough – has paid off for the operators, who have been able to attract an increasing number of laptop-toting customers to their wide area networks disenchanted with the idea of being tied to a spot – even a hot spot – for network connectivity.

Until recently, given the relatively-recent availability of wide area 3G networks and a small customer base, mobile operators had chosen to provide PC notebook users network connectivity through the use of detachable modems, or PCMCIA cards. But, as the subscriber base has begun to grow and the idea of a wide-area broadband connectivity has begun to gain greater traction in the marketplace, mobile operators and their vendors have begun considering taking the next step: toward embedded connectivity solutions. Part of the reason is that many mobile operators realize that user experience – which can, to a large extent, be a function of an optimized and integrated solution – is likely to be critical to winning the marketplace battle for gaining and retaining a profitable subscriber base.
However, IDC believes that, inevitable though it may be in the long term, the adoption of embedded cellular broadband connectivity in the short term, much like the social acceptance of any new technology, is likely to be a gradual process. The prospects for such solutions – for both EV-DO and HSDPA/HSPA systems – are likely to be somewhat limited in the short term, with inadequate and poorly-understood end-user demand, and limited service ability inhibiting each other's growth.

The high initial cost of the service and unimaginative pricing models are not likely to help matters; in fact, it can be argued that current service prices ($50–$80 per month) and required monthly subscriptions may have served to limit subscriber growth to enterprise users and, within that group, to users within certain information-sensitive and/or information-intensive verticals.

PC notebook vendors, however, are beginning to view an embedded wide area network connectivity solution as a key differentiator; they believe that there is pent-up demand for such connectivity based on the popularity of WiFi-based wireless networking. As a result, desktop and laptop PC vendors have become very aggressive in making embedded cellular or mobile broadband connectivity available. We expect a rise in the shipments of notebooks with embedded cellular radios to nearly 6% in 2007.

In the medium term, we expect a wider availability of notebooks – principally, high-end notebooks – with embedded cellular radios. Concurrently, we expect service costs to decline, but not significantly enough to capture the mainstream market. By 2009, we expect about 15% of PC notebooks to be available with embedded cellular connectivity.

We believe a growing installed base of devices is likely to encourage cellular carriers to lower the subscription cost of the monthly service as well as become more flexible – dare one say, imaginative? – in pricing their offering. Some have already become more flexible in the service options available, including offering a day pass for cellular broadband service.

In the long term, toward the end of the forecast period and beyond, we expect the momentum for embedded cellular broadband connectivity to gather steam, and expect nearly 25% of all notebooks shipped by 2010 to come equipped with cellular or mobile broadband connectivity.

IDC assumes monthly service costs will stay above $30 through most of the forecast period. However, as a result of a mutually reinforcing dynamic, an increase in the volumes of embedded radios will justify a decrease in service fees over the forecast period, resulting in an increase in penetration across the commercial and consumer segments.
TABLE 1

Worldwide Cellular Penetration in Notebooks, 2005-2010 (000)

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2005-2010 CAGR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total notebook shipments</td>
<td>65,272</td>
<td>82,170</td>
<td>100,457</td>
<td>119,045</td>
<td>136,784</td>
<td>155,233</td>
<td>18.9</td>
</tr>
<tr>
<td>Cellular</td>
<td>355</td>
<td>1,759</td>
<td>5,820</td>
<td>10,426</td>
<td>20,149</td>
<td>38,444</td>
<td>155.3</td>
</tr>
<tr>
<td>Share (%)</td>
<td>0.5</td>
<td>2.1</td>
<td>5.8</td>
<td>8.8</td>
<td>14.7</td>
<td>24.8</td>
<td></td>
</tr>
</tbody>
</table>


From Detachable To Integrated/Embedded Solutions: A Historical Precedent

The movement from detachable to integrated solutions is a fairly common progression in technology implementation. Such progression, as we have noted above, usually follows the maturity of the technology and constitutes a signal that the social adoption of computing devices with such connectivity has reached critical levels to justify embedded, integrated solutions.

What lends credence to this belief is the case of WiFi, which we believe constitutes a great precedent. Admittedly, the case for the diffusion of embedded wide-area network connectivity is made a little bit more complex by the presence of a third-party service provider in the mobile broadband ecosystem. But it does not alter the quintessential logic of the argument.

When launched in 1994, WiFi adoption was extremely limited, inhibited by the high cost of WiFi cards, estimated at about six times their current cost. The expansion of WiFi into the mainstream started in 2002 with the introduction at COMDEX of a series of products featuring 802.11 g, approved a year later by IEEE.

Since then, WiFi technology has expanded largely thanks to the availability of embedded WiFi solutions in notebooks, combined with the proliferation of access points in homes, hotels, cafes, and other public places such as airport and train terminals.

IDC believes that embedded WiFi solutions contributed greatly to the growth of the notebook market. The WiFi interface is based on industry standards and unlicensed spectrum, making it an inexpensive and popular technology. Product manufacturers have taken advantage of this wireless interface and embedded it in many mobile products. Notebooks have benefited from and provided an ideal platform for demonstrating the utility of WiFi technology. This section refers to the 802.11 a, b, and g specifications (with the forthcoming n specification), which are current industry standards and have been tested for interoperability by industry groups.
WiFi networking based on the existing standards is reaching the zenith of its popularity. Still, we do not expect a major shift in the market presence of this connectivity technology. Market share growth for WiFi technology based on 802.11a/b/g standards embedded in notebooks will continue to be steep through 2007, when it will reach its peak at nearly 98% penetration in notebooks shipped. This high saturation rate will be driven mainly by the low cost of the technology, its near ubiquitous presence in certain kinds of public spaces (like airports, hotel lobbies and cafes), and its utility.

IDC believes that the shift from detachable to embedded connectivity seen in the case of WiFi over time is likely to be emulated in the case of mobile broadband.

**Detachable Versus Embedded Solutions: Performance Evaluation**

As in the case of WiFi, IDC expects mobile broadband to go mainstream in the long term, essentially facilitated by the integrated solutions instead of through the use of PCMCIA cards. There is a strong case to make in favor of embedded solutions in terms of performance.

Because of their integrated nature, embedded solutions provide superior performance compared to competing detachable units. Leading OEMs responsible for the design and manufacturing of notebook PCs use a holistic and comprehensive approach to parts assembly in an effort to maximize performance and boost efficiencies. Such efficiencies in integrating hardware and software lead, for example, to improved battery life, better use of the antenna, and better overall performance as connectivity software is pre-configured and pre-installed. In contrast, detachable solutions are not always optimized for superior performance, because the same detachable unit must work with different client devices. This creates inefficiencies (as in reduced battery life or disruptive electro-magnetic noise), which leads to poorer overall performance and requires additional effort from end-users with respect to loading drivers and software, and ensuring OS compatibility. Of course, these compromises also add to cost. From a user perspective, embedded solutions provide the twin advantages of convenience and durability. For instance, there are no independent loose parts or movable antennas to deal with. These two factors are also critical to IT departments seeking to limit or reduce cost of maintaining their installed base.

A weaker antenna in detachable solutions also provides interference in terms of data communication. Many detachable cards are not even tested with specific notebooks before they are sold. When integrated into the notebook, the modules go through a thorough development cycle meant to optimize their performance and reduce interference. Embedded solutions take a design approach that intends to eliminate electro-magnetic interference, in contrast to a detachable solution. Electromagnetic interference and noise tend to compromise the performance of the antenna.

From a physical standpoint, an integrated device is more robust than a detachable card. The constant insertion and removal of the detachable card put both the card and the PC at risk of damage.
Still, while many IT departments mention the flexibility of using detachable solutions, embedded solutions are just as flexible as a PC card in that they can be removed, changed, and upgraded over time, enabling technological upgrades of tested modules without the disadvantage of loss or substandard cards.

**Issues Pertaining To Lock-In With Carriers**

Some critics of embedded solutions argue that an integrated offering, unlike a detachable PCMCIA card, invites lock-in with an operator. IDC believes that while this may intuitively seem correct – the standardized PCMCIA slot on a notebook can, indeed, accommodate cards from more than one carrier – the idea does not stand careful consideration of the way things work. Perception, at least in this case, does not necessarily match reality.

The argument, made often enough by enterprise IT managers, has several elements to it: First, there is the argument based on a visually compelling and intuitive element. "It is easy to take out the card provided by one operator and insert another provided by different carrier, and that is that." Unfortunately, that is not always that. For instance, a detachable card issued by an operator comes with software that also needs to be loaded on the computer. To use a PCMCIA card provided by a different carrier requires different software to be loaded on the computer. But, more importantly, a PCMCIA card issued by an operator represents a contractual relationship with the operator – typically, a two-year long relationship (the mobile operators subsidize the PCMCIA card for a reason, as explained in another segment of this paper below).

So, in that sense, detachable cards do not offer any advantage over embedded solutions. The card may be detachable, but the contract is usually sticky. As a result, even PCMCIA card users have to incur switching costs on the basis of contract penalties.

In another variant of this argument, it is held that a user with a detachable card can more easily switch between two or more operators using the same access technology standard because he can reuse the card, while a user with an embedded solution cannot. Again, this is not true. The detachable cards cannot be reused, even if the hardware apparently looks the same, since the software used by individual operators is different.

In other words, the use of PCMCIA cards does not offer businesses and their users any inherent advantage. Like the PCMCIA card, the embedded module can be changed when switching operators.

Second, the argument is made that, if one opts for an embedded solution, then he or she is handicapped when one travels abroad. While that may well be true, it is not because of the embedded nature of the connectivity. If appropriate networks are not available in a foreign country, the person traveling there is not likely to find any connectivity – even if he or she has a detachable card. And, this is true regardless of whether one has CDMA 1X EV-DO or (GSM derivative) HSDPA/HSUPA connectivity. In the case of the latter, a person traveling abroad may not have connectivity either because a network is not available – and HSDPA/HSPA is not as globally ubiquitous
as one might be tempted to believe – or because the operator issuing the card does not have a data roaming agreement with the foreign carrier. And, of course, because the software used by another carrier is most likely going to be different.

**Relative Cost Of Embedded And Detachable Solutions**

In this segment, we consider the relative costs of adopting embedded and detachable connectivity solutions. IDC believes that the benefits of adopting embedded solutions in a company’s notebook base far outweigh the costs, notwithstanding the perceived benefit of operator subsidies for detachable cards.

Subsidy model gives the impression of inexpensive detachable cards, but that is far from the reality. There are two elements to the cost of mobile broadband connectivity: 1) upfront cost incurred to acquire the connectivity hardware, and 2) the monthly cost of the service over the life of the contract. And, of course, the upfront cost of the hardware is always small compared to the cost of the service over the life of the contract.

In the case of an embedded solution, the upfront connectivity hardware cost (average of $180 per unit for an embedded platform) can be three to four times more expensive than that of a detachable unit. However, the total cost of ownership of a detachable unit is not significantly less, since operators recoup their hardware-related subsidies through the price of the service over the life of the contract. In other words, the real cost of the detachable unit may actually be comparable to that of an embedded solution, even though it may be paid by the buyer in installments during the life of the service agreement. (This, of course, assumes that service providers will be offering lower service prices when the user is employing a device with an embedded solution.)

But beyond consideration of hardware and service pricing, IDC believes that efficiencies gained from using embedded solutions far outweigh their cost. While many end-users are lured by the subsidy model that gives them the impression of paying less for the detachable card sold by operators, the efficiencies that result from the perceivably more expensive embedded modules provide enormous cost savings that make the use of detachable units less attractive. These efficiencies resonate well with IT managers and accountants, from overall IT operation management to the containment of deployment cost. They include, but are not limited to, the following factors:

- **PROCUREMENT AND SINGLE PURCHASE POINT**, or the reduction of what the economists call “transaction costs” through the reduction in the number of suppliers: Procurement in the case of embedded solutions is simplified because there is no additional process in the acquisition of hardware. Procurement management would follow a simplified model because the wireless module is part of notebook procurement and does not require its own purchasing process.

- **SUPPLY SOURCE MANAGEMENT AND SINGLE SUPPORT POINT**: Integrated solutions mean the notebook vendor or PC supplier remains ultimately responsible for technical support. That is, the user has “one neck to choke,” instead of dealing with another hardware supplier providing the detachable cards.
IT DEPLOYMENT: One of the most important costs of IT is hardware and software deployment. By having a mobile broadband module integrated into the PC notebook, companies will save money, time and resources, since adoption and rollout will not require two sets of schedules.

IT OPERATIONS & MANAGEMENT: There are at least two factors to consider here:

- For the IT staff, the workload is also reduced significantly in the case of embedded solutions. This is because embedded modules, the accompanying drivers, and 3G hardware and software are already configured in an optimum way, simplifying the setup and configuration phases. The notebook and its embedded solutions are already pre-tested, eliminating IT staff and end-user involvement.

- Embedded solutions remove the hassle of making connections when LAN, WiFi and 3G options are available. Embedded solutions simplify access management and reduce user confusion.

REFRESH CYCLES: Equally important to cost containment is that refresh cycles will now follow notebook and IT refresh schedules adopted by the user enterprise, when embedded solutions are considered. In contrast, the logistics of managing external cards would increase the cost of IT.

The use of these metrics in the calculation of the cost of mobile broadband deployment and how it relates to overall enterprise IT cost suggest that embedded solutions hold an important and clear competitive advantage over detachable connectivity solutions.

Adoption And Timing Implications Of Embedded Solutions

It is sometimes argued that embedded solutions create a technology lock-in. That is, when opting for an embedded solution, one should wait for the next iteration of a technology standard before buying into a technology solution. In other words, one should defer the adoption of a technology solution to fully benefit from an improved version.

So, for instance, it may be argued that one should not buy into CDMA 1X EV-DO Rev 0 for the simple reason that EV-DO Rev A is likely to offer greater competencies. Or, to think in terms of the GSM derivatives, one should defer adopting an HSDPA solution today, because there is likely to be an improved version – HSDPA 3.6 rather than only 1.8 – around the corner.

IDC believes this view is anchored in an unfortunate and myopic view of the world, not to mention a flawed logic. It is not unlike arguing that one should continue to ride the bus and not buy a car today – and thereby forego the flexibility and related advantages of owning a car – because a superior version of the car is likely to be available tomorrow. Such flawed assessment also has serious implications for corporate productivity and competitiveness, as argued below.
Technologies evolve gradually, on a continuum of competencies and capabilities. Each stage of technology evolution reflects the technological order of the day. Companies that fail to adopt the best solution when it is available in historical time risk falling behind in terms of competitiveness and workforce productivity. Companies that choose to postpone the adoption of technology because of an expected release of new revisions may be making a critical mistake.

The case of network standards – and related embedded solutions – is no different. Integrated mobile broadband solutions and the technology standards that they espouse are also continuously evolving, with new revisions slated to appear down the road. But it would be difficult to argue that an enterprise or a user should wait for a revision, while competition may have already adopted the existing version and begun to exploit the advantages that it affords. This is particularly unfortunate when the gains from the adoption of the current version of technology may afford a categorical advantage – as in a shift, say, from riding a bus to owning a car – while the gain from waiting for a revised version may be marginal – as in, to continue with the example, moving from a compact car to a midsize one.

To illustrate how this flawed argument could impact business productivity and operational efficiency, we shall briefly look at the case of an enterprise waiting out EV-DO Rev 0 for the sake of EV-DO Rev A.

The shift from CDMA 1XRTT to CDMA 1X EV-DO Rev 0 represents a categorical shift in data throughput capabilities of the network – from somewhat better than dial-up speeds to cable modem speeds. CDMA 1X EV-DO Rev A is surely going to be an improvement on Rev 0, but it is not likely to be a categorical leap in the sense that EV-DO Rev 0 was over 1XRTT. To forego the potential advantages in productivity afforded by the adoption of EV-DO Rev 0 can only speak to a paucity of strategic planning.

EV-DO Rev A is currently in the stage of carrier certification and vendors already have the modules ready to ship. However, the existing mainstream version remains CDMA 1X EV-DO Rev 0. From a technology standpoint, EV-DO Rev A provides only an improved uplink. This means that, for the bulk of road warriors and mobile workers who are not too concerned about moving sizeable files, but who need standard Internet browsing, accessing/downloading emails, basic VOIP, and other typical corporate applications, EV-DO Rev 0 might have been sufficient. Waiting out EV-DO Rev 0 in favor of EV-DO Rev A, then, amounts to foregoing current productivity benefits in a misguided bid to adopt a superior technology.

In the current hyper-competitive environment in which mobile broadband connectivity can provide a salient competitive advantage to an enterprise seeking to mobilize its workforce, waiting out EV-DO Rev 0 can only be viewed as a myopic and misguided.
Challenges

Mobile broadband is in its infancy. Its adoption today (as of the first half of 2007) remains relatively limited and full of challenges. As pointed out in the market sizing section, less than 6% of the more than 100 million notebooks to be shipped this year will have embedded connectivity for mobile broadband. While the technology and its use are extremely promising and likely to expand rapidly in the long run, the diffusion of the technology in the short and medium term could face challenges as a result of several key factors:

- **Carrier service pricing:** The current service pricing approach of mobile carriers could be a serious hurdle to adoption of embedded connectivity on PC devices, both in enterprise and consumer segments. The service pricing should take into account alternatives available to the users – or, in other words, competitive pressures from other technological solutions. Consider the enterprise space, for instance. Large enterprises currently using PCMCIA cards can share those cards between enterprise users, utilizing the connectivity/service as a shared resource "deployed" on an as-needed basis. Carriers might wish to recognize this and devise a similar solution for embedded connectivity by offering "tokens" (or codes) that can be shared among company users. Similarly, they may consider session-based pricing for consumers who might otherwise seek WiFi connectivity for their high-speed needs. In some geographic enclaves, such connectivity is sometimes available free through municipal WiFi initiatives – although the quality of that connectivity is often suspect given that these are best-effort networks. If the carriers offer session-based pricing, they might be able to attract usage on grounds that they offer guaranteed connections on dedicated networks. If the user is allowed to use his/her phone number and PIN as a log-in mechanism, the charge for the session could be added to the user's regular phone bill.

- **High cost is partly the result of the service provider business model:** It is often argued, a view not always shared by all players, that telecom carriers face an interesting dilemma: how to raise adoption while keeping the service in good standing. The argument is that the price of the service is high, because the carriers fear that lower prices could boost network usage to drastic levels, causing a risk to the functioning of their networks and core service. This is a solid argument that indeed can only be fixed with added investments in the network prior to moving the offering into the mainstream.

- **Poor understanding of telecom usage and costs by enterprises:** The lack of real understanding of telecom usage in the enterprise is also an obstacle to adoption of embedded connectivity. As companies look at their telecom costs, they often fail to assess where the costs come from. For example by analyzing how much they pay for their employees access in hotels, airports and other public settings, enterprises could indeed discover that the current mobile broadband offerings may carry lower cost, certainly as the cost of service continues to fall.
The real challenges of going mainstream: Though the growth of mobile broadband adoption appears to be currently linked to a large extent to adoption in the enterprise market, the technology will inevitably have to expand into the mainstream to wider segments. IDC calculates that less than 9% of all PC activity focuses on companies that have more than 1,000 employees. This proportion is minuscule compared to the 25% share of the small and mid-market segments, and the vast consumer market, nearing the 40% share. With the proliferation of new form factors, including ultraportable PCs, mainstream users will likely require ubiquitous access to online services. And, mobile broadband looks well positioned to provide such access. Having an integrated solution in the platform would inevitably make the mainstream adoption much faster. But, for now, notebook OEMs have not built systems with embedded wireless geared to the mass market. As carriers beef up their offerings and services, IDC expects mainstream adoption to begin.

Differentiating between marketing and education: PC vendors interested in seeing greater unit sales might wish to work with operators in providing both marketing support and education to potential customers. Care should be taken to avoid conflating the two ideas. Marketing merely seeks to create product awareness. However, adoption suffers when users do not know how to use the product. At the moment, marketing on mobile broadband has been the domain of telecom carriers. IDC argues that the carriers alone are not enough to reach a wider audience and move the potential into mass market.

IDC Conclusions

IDC believes that the shift from detachable to embedded solutions is a fairly standard progression in the matter of network connectivity of computing devices, and offers key benefits to users. Such progression usually follows the maturity of the technology and constitutes a signal that the social adoption of computing devices with such connectivity has reached critical levels to justify embedded, integrated solutions.

In the final denominator, embedded connectivity for mobile broadband constitutes a superior alternative than detachable PCMCIA cards for reasons of convenience and superior performance – and provides the enterprise and/or individual both capex and opex savings. Beyond tangible costs, embedded solutions are likely to enhance productivity of the enterprise user (through superior performance) and the IT department (through lowered transaction costs and easier manageability of the device).

Enterprises should carefully analyze their intuitive assumptions about the perceived advantages of detachable connectivity solutions. Careful consideration of the way things work – especially with respect to service provider relationships – is likely to compel the conclusion that detachable solutions provide little advantage over embedded solutions when it comes to broadband connectivity. In fact, they are likely to conclude that embedded connectivity solutions provide key benefits to both individual users and their IT departments.
Enterprise IT managers might do well to avoid the temptation to defer adoption of an available useful and effective solution for the sake of an "improved" technology iteration at a later date. If the current version of a technology – like, say CDMA 1X EV-DO Rev 0 or HSDPA 1.8 – meaningfully addresses their current needs, they might do well not to forego the current benefits afforded by the technology in the search for an improved – and, perhaps, theoretically perfect – iteration of the technology. As an old, and wise, mentor of one of the authors used to say, "perfect can be an enemy of the good." And "good" is, often, a high enough goal to aspire to.

Copyright Notice

External Publication of IDC Information and Data — Any IDC information that is to be used in advertising, press releases, or promotional materials requires prior written approval from the appropriate IDC Vice President or Country Manager. A draft of the proposed document should accompany any such request. IDC reserves the right to deny approval of external usage for any reason.

Copyright 2007 IDC. Reproduction without written permission is completely forbidden.