Notebook Computers Go Truly Mobile at the Intersection of 3G and IT

by Eugene Signorini | February 2007

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Executive Summary

On average, almost 40% of a company's employees are mobile, which Yankee Group defines as working away from their primary workspace at least 20% of their workday. Yankee Group forecasts that more than 50 million workers in the United States today fit this description—yet the vast majority of them are not equipped with the right mobile tools required to do their jobs. As enterprises attempt to maintain competitiveness, they are looking toward mobile and wireless technologies to drive business benefits in three ways: decrease costs, increase revenue and improve service.

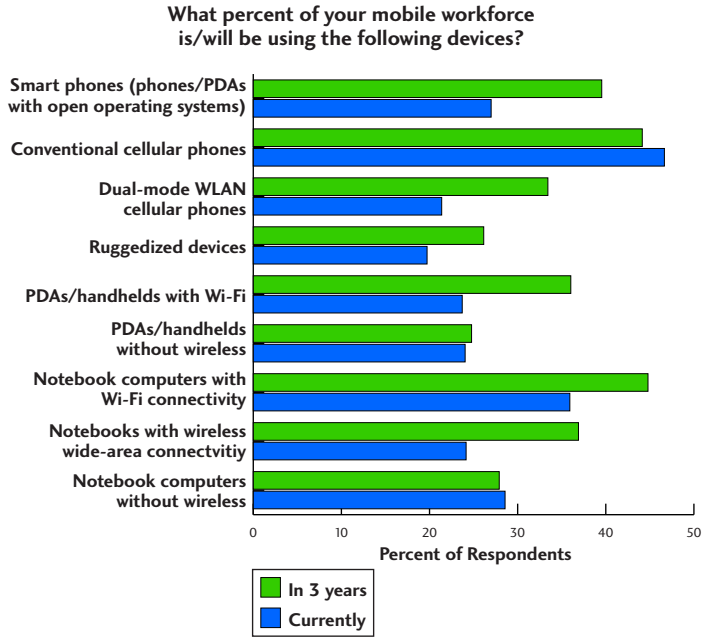
The Anywhere Enterprise™ requires many connectivity solutions to support its expanding mobile workforce. As mobile operators continue to light up the country with high-speed 3G wireless access, data connectivity over wireless cellular networks will become an increasingly popular access solution because of the ubiquity of service and the decreasing price points.

Exhibit 1 illustrates that notebook computers are still poised to be the most significant mobile data device of the remote workforce. True mobility will demand that notebooks become increasingly wireless and that mobile broadband connectivity for notebook computing is the next frontier for strategic enterprise mobility initiatives.

Exhibit 1

Notebook Computers Will Go Increasingly Wireless—and Truly Mobile

Source: Yankee Group 2006 Transatlantic Wireless Business Survey—US Large Business



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Executive Summary (continued)

Wireless wide-area enablement makes notebooks truly mobile—and yields the following business benefits for both corporate IT decision-makers and end-user employees:

- There is a lower total cost of ownership over other wireless remote access options, specifically Wi-Fi hotspots.
- Productivity is enhanced because mobile workers no longer need to be tethered to a location for access to mission-critical information and applications.
- There is both an end-user friendly environment for workers who require broad connectivity options, predictability and ease of use, and an IT-friendly platform for organizations that require management and control.
- Licensed networks such as 3G mobile broadband technologies are inherently more secure than unlicensed Wi-Fi networks. Corporate data may be leaked or stolen over Wi-Fi networks without extra network security software appliances.

Wireless wide-area enablement of laptops will rapidly move from retrofitting existing computers with PC Cards to purchasing notebooks with embedded 3G radio modules. This will cause a shift in traditional IT and mobile purchasing. With this shift come the benefits of the convergence of 3G and IT in laptop computers:

- Improved radiofrequency (RF) performance for better coverage and data throughput
- Optimized power management for increased battery life
- Lower cost of ownership from easier implementation and reduction in help desk support

In this Yankee Group Report, we review the mobility trends that are driving enterprises to evaluate more strategic enterprise mobility tools such as 3G wireless in notebooks. We also explore the business and cost benefits of using 3G over alternate connectivity options such as Wi-Fi. Finally, we evaluate 3G notebook deployment options and specifically examine the benefits of embedded mobile broadband laptop solutions.

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I. Business Are Becoming Increasingly Mobile

More than 50 million US workers are considered mobile, which Yankee Group defines as being away from their primary workspace at least 20% of their time. To support this massive and still growing mobile workforce, enterprises must deploy solutions that provide these employees with access to corporate resources beyond e-mail such as databases and applications. Enterprises still struggle to understand the best ways to provide remote access to a varied mobile workforce.

Emerging wireless technologies are presenting more options to enterprises. Wireless networks, devices and applications are all evolving in ways that will enable information to be delivered anytime and anywhere. In this Yankee Group Report, we examine how enterprises can begin to capitalize on emerging mobile broadband technologies today through the incorporation of 3G wireless data in notebook computers. This report:

- Examines the mobility requirements within enterprises that will require business decision-makers to incorporate mobile broadband technologies into their strategic IT planning
- Highlights the business and cost benefits that enterprises gain from implementing mobile broadband access on mobile workers' notebooks
- Presents deployment options and implementation approaches for mobile broadband data access

II. The Changing Mobile Workforce

Although there is a segment of mobile workers who primarily roam within the office or a remote location, the typical mobile worker routinely travels beyond the four walls of the enterprise to serve customers or drive sales.

Mobile workers have quite diverse job titles and responsibilities, but Yankee Group has identified three broad categories of mobile workers (see Exhibit 2 on next page):

- **Mobile professionals:** This category includes knowledge workers such as consultants, managers and senior executives. This segment makes up on average 46% of total mobile workers.
- **Mobile fieldforce:** This category includes salespeople or remote technicians, which comprise 33% of the mobile workforce.
- **Mobile specialty workers:** This category includes physicians, factory staff or couriers, accounting for the remaining 22% of mobile workers.

Yankee Group survey results have shown that the percentage of mobile workers has been increasing steadily during the last several years—a trend we expect to continue. Contributing to this growth will be the increasing numbers of knowledge workers going mobile, particularly as emerging wireless technologies make it easier for them to work outside the traditional four walls of an office.

Enterprise business requirements differ by industry and firm type. Applications and information that remote workers require also differs by job function. However, companies are increasingly seeking to empower their mobile workforces by delivering critical information to employees closer to the point where business interactions take place. Enterprises are increasingly embracing mobility initiatives to support their distributed mobile workforces. Three main categories summarize the business benefits of going mobile:

- **Increase revenue:** Mobility solutions can enhance worker productivity by leveraging real-time information and line-of-business applications, which enable workers to make better-informed decisions and to process orders more rapidly. For example, field salespeople can use time and information more efficiently for business development opportunities.
- **Decrease costs:** Mobile applications can reduce workflow volumes through automation utilization and often can reduce overhead costs by upgrading antiquated paper-based business processes. Wireless technologies have been used to automate business processes within field service environments to decrease service costs.
- **Improve services:** Mobility can enhance public safety, healthcare, utilities, travel and other organizations that rely on real-time access to network resources for rapid response. In addition, mobility can provide differentiated services with location and presence information.

Both mobile workers and business decision-makers are realizing the need for mobile access to critical business information. As companies strive to increase revenue, decrease costs and improve service, they need to examine the business applications to which mobile workers need access to remain productive. Results from the Yankee Group *2006 Transatlantic Wireless Business Survey—US Large Business* reveal that businesses are rapidly moving beyond mobile e-mail enablement when evaluating remote worker requirements.

Among companies that already have invested in mobile broadband, e-mail remains the leading application that corporations are extending wirelessly today. However, access to third-party corporate databases and applications (such as CRM and ERP) is the top priority for future application expansion in these deployments.

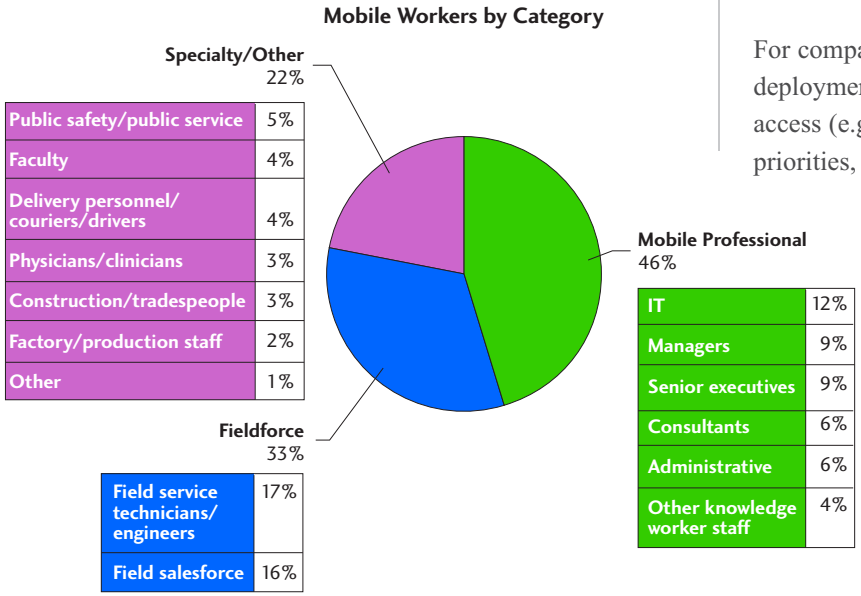
For companies evaluating mobile broadband and planning deployments within 12 months, web browsing and intranet access (e.g., through a mobile VPN) are the top application priorities, followed by e-mail and fieldforce automation.

These broad application requirements indicate that companies need to examine wireless connectivity solutions and mobile devices that support rich application access and data transfer.

Exhibit 2

The Mobile Workforce Is Increasing and Varied

Source: Yankee Group 2006 Transatlantic Wireless Business Survey—US Large Businesses



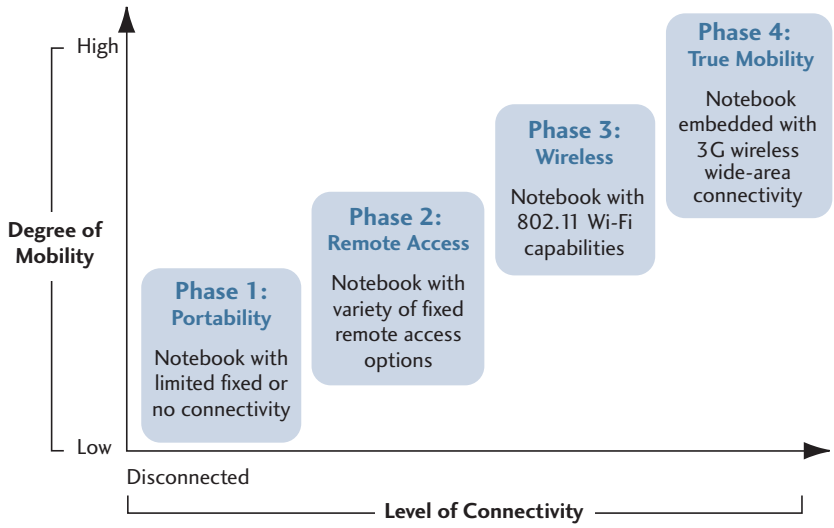
Note: Total does not equal 100% due to rounding.

Notebooks Remain Critical for Employee Mobility

The Anywhere Enterprise requires many connectivity solutions to support its expanding mobile workforce. Organizations today deploy remote access solutions over fixed DSL and cable, public and private Wi-Fi networks as well as wireless wide-area networks. As mobile operators continue to light up the country with high-speed 3G wireless access, data over cellular will become an increasingly popular access solution because of the ubiquity of service and decreasing price points. Integrated devices such as smart phones and PDAs are emerging options for mobile workers, providing convenient access to corporate information such as e-mail and personal information management (PIM). But these form factors have limitations for data consumption such as tiny screen sizes, convoluted user interfaces and restricted keypads that prevent heavy traffic from power users.

Integrated devices complement notebook computers, which will remain the preferred choice of mobile workers who require data-intensive applications. According to the Yankee Group *2006 Transatlantic Wireless Business Survey—US Large Business*, wireless wide-area-enabled laptops will increase their market penetration of mobile users from 24% today to 37% in 2009.

Exhibit 3
Evolution of Notebook Mobility
Source: Yankee Group, 2007



Although embedding connectivity into notebook PCs is hardly a new concept (e.g., dialup modems, Wi-Fi), embedded mobile broadband represents a move by PC manufacturers to make notebook computers truly mobile—no longer bounded by fixed-line connections such as Ethernet or even by Wi-Fi hotspots, which still tether users to a location.

3G Enables True Mobility

Even with the emergence of new mobile devices, notebooks are not going away—far from it. Instead, laptops will still be the most significant mobile device of the remote workforce. It is also evident that both end users and administrators require more mobility from notebooks. Although notebook computers have improved their power and battery utilization as well as their size and weight, true mobility means that users can connect their notebook to critical information and applications from anywhere.

Notebooks initially provided workers with a portable work environment—with or without connectivity. Dialup access and then Ethernet were the first steps to providing mobile workers carrying laptops with remote access; but location and wires constrained mobility. Embedded Wi-Fi (802.11 technologies) in notebooks was the next step, freeing users from wired connections and making configuration standardized. However, mobile workers were still tied to a physical location—the Wi-Fi hotspot.

The evolution of mobility dictates that true notebook mobility occurs not when the connection becomes wireless, but rather when the connection becomes wireless and untethered from a physical location (see Exhibit 3). Wireless wide-area data services—specifically 3G service offerings—offered by the major cellular carriers are making true notebook mobility a reality today. And notebook manufacturers have realized that, just like 802.11, wireless wide-area capabilities need to be embedded into notebooks to optimize the usability and manageability of the technology.

III. Wireless Wide-Area Access Provides Business Benefits

Addressing the Cost Benefits of Wireless Wide-Area Access

A significant benefit of 3G wireless solutions also happens to be the central barrier identified by rival Wi-Fi hotspot providers: total cost of usage. At $59.99 to $79.99 per month, 3G pricing for wireless connectivity causes a knee-jerk reaction in many individual and corporate buyers who assume that the costs are too high. However, beyond the soft benefits of anywhere access, which increases productivity, there are hard cost benefits associated with choosing a wireless wide-area notebook strategy versus ad-hoc Wi-Fi hotspot connectivity options.

To optimize ROI, companies must develop a framework to compute Wi-Fi hotspot access costs for supporting their mobile workforce. The framework should consider the following variables:

- Profile of a mobile worker
- Mix of mobile workers by role and profile
- Connection locations
- Connection frequency
- Effective pricing of comparable wireless connection options

Many businesses will find that 3G wireless connectivity makes sense on a cost-benefit level for mobile workers with a threshold of travel and connectivity requirements. We outline a step-by-step method for organizations to assess the cost benefits of true mobility with 3G notebook access.

Step 1

The first step of the assessment is to create a realistic mobile worker profile reflective of the organization. Yankee Group has identified three categories of mobile knowledge workers based on a mobility profile:

- **Transient worker:** This group of mobile workers is generally away from their primary workplace 4 days a week and is the most mobile of the three categories. Transient workers also tend to stay at the same location for the duration of their travel. These workers could include consultants who work at client sites, but also need connectivity at their hotel or airport.
- **Road warrior:** These mobile workers travel frequently, averaging 2 to3 days per week. Road warriors rarely stay at a single location for business travel. These workers could include executives and salespeople.
- **Occasional business traveler:** These workers spend about 1 day per week out of the office for business travel.

Step 2

The second step is to identify where these mobile workers connect. Location is important to track because of the wide pricing fluctuations attributed to the available connectivity options such as Wi-Fi or hotel Ethernet.

From our primary research and information provided by Wi-Fi aggregators, we found that mobile workers connect to Wi-Fi networks at airports most often. In November 2006, iPass reported that more than 48% of their total Wi-Fi connectivity sessions occurred at airports. This rings true for the road warrior and the occasional business traveler because they spend a significant amount of time at airports relative to their trip duration. However, transient workers generally spend fewer hours at airports and more hours at hotels as a percentage of their total travel time.

Step 3

The third step is to estimate the number of connectivity sessions the mobile worker consumes in the average week. Wi-Fi connectivity consumption is largely based on and proportionate to the number of days traveled outside the office.

For this framework, Yankee Group forecasts that mobile workers connect to Wi-Fi networks between one and one-and-a-half times per day of travel on average. Mobile workers who are more stationary generate fewer Wi-Fi sessions on multiple networks, which is a main factor for determining total connectivity sessions.

Transient workers are on the lower end of Wi-Fi connectivity sessions generated on a per-day-of-travel basis, but they consume the most Wi-Fi sessions per week by virtue of being heavy travelers. Road warriors and occasional business travelers consume higher rates of Wi-Fi sessions per day of travel but lower total Wi-Fi sessions per week.

Step 4

The last step of the framework is to estimate the effective pricing of connectivity. Because of the volatile pricing structure of the Wi-Fi market, Yankee Group has segmented Wi-Fi pricing by location. Wi-Fi hotspots that charge for access have a wide range of price points for daily rates, ranging from $6.95 to $9.99 for airports and coffee shops, and from $9.95 to $15.00 for hotels. The other side of the pricing story is around free access to Wi-Fi hotspots, which varies by Wi-Fi location. For example, coffee shops tend to be free. But most hotels and airports—especially those frequented by business travelers—are pay-to-use.

Effective pricing is calculated by taking the average pricing for each hotspot location and blending in the propensity for free services. Airports charge higher effective pricing rates than hotels primarily because few airports offer free services (i.e., only three of the top 20 busiest US airports offer free Wi-Fi services). Coffee shops offer the cheapest effective pricing rates because of their propensity to be free.

Once this framework is in place and completed, businesses can determine Wi-Fi hotspot costs for different segments of their organization's mobile workforce. Yankee Group has created a framework that provides a representative cost for the different mobile worker profiles. Exhibit 4 shows the cost of à la carte Wi-Fi access (i.e., purchasing access for each daily connection session) for each mobile worker by type:

- The transient worker consumes more than $138 per month on Wi-Fi access charges.
- The road warrior spends more than $87 per month in connection fees.
- Even the occasional business traveler can rack up about $41 worth of access charges in a given month.

Exhibit 4

Wireless Wide-Area Access Provides a Cost-Effective Alternative to Wi-Fi

Source: Yankee Group, 2007

	Transient Worker	Road Warrior	Occasional Business Traveler
Average travel (days per week)	4 or more	2 to 3	1
Mobile workers who fit the segment	4% to 6% (e.g., consultants)	8% to10% (e.g., senior executives, field sales force)	18% to 22% (e.g., knowledge workers)
Remote access availability	**Airports, coffee shops, hotels**		
Connectivity location — Airports — Coffee shops — Hotels	42% 5% 53%	52% 3% 45%	51% 4% 44%
Connectivity sessions per day of travel	1.2	1.5	1.4
Effective remote access pricing by location	**Airports: $8.14 per day Coffee shops: $2.99 per day Hotels: $5.97 per day**		
Total cost of ad-hoc Wi-Fi usage per month	$138.44	$87.83	$40.99
Total cost of mobile broadband usage per month	$59.99	$59.99	$59.99
Estimated Savings per month	$78.45	$27.84	N/A

There are monthly service plans available by remote access aggregators and their partners such as iPass, Fiberlink and AT&T, which offer discounts to heavy users. However, these service plans limit the mobile worker to a smaller subset of available remote access networks that may not provide adequate coverage—which erodes savings. Mobile workers who continue purchasing these ad-hoc services can actually overspend on wireless access, as shown in Exhibit 4 (on previous page).

Despite the sticker shock of 3G wireless plans today, these services can be cost-effective to segments of highly mobile workers. As prices trend downward, enterprises will have to seriously evaluate whether 3G is cost-effective to deploy to the rest of their mobile workgroup.

3G Notebook Mobility Provides Additional Benefits

As companies implement wireless technologies to meet their mobile workforce needs, they must work through the requirements of decision-makers (employers) and end users (employees) as they make their purchase decisions.

Meeting Employer Mobility Requirements

Corporate IT organizations strive for homogeneity across different working environments. Policies and control should be applied to any device over any network. IT has considerable experience managing and supporting desktop devices and applications, but the number of wired and wireless networks associated with mobility presents very different challenges. Enterprises have many requirements around mobility initiatives:

- **Manage the prosumer majority.** Today's enterprise mobility market is dominated by the prosumer (52% of business cellular users) who pulls devices and services into the organization as business tools. End users will find ways to use the technologies they need to be successful while they are mobile; this includes buying devices on their own and connecting through a variety of available networks (e.g., Wi-Fi hotspots), many times regardless of the cost to the company.
- **Manage impact to the bottom line.** Costs associated with supporting a mobile workforce can be significant, especially when much spending on cellular voice and remote data access is decentralized (often only appearing through travel and expense reports).
- **Implement seamless and secure connectivity.** With a growing number of mobile employees requiring access to more business applications and information over multiple access networks, two challenges must be overcome. The first is providing a consistent secure connection to IT infrastructure regardless of the type of network; the second is providing this secure access to users regardless of location.
- **Extend corporate policy to mobile users.** Organizations must create policies around employee usage that define the scope of allowed remote application and database access as well as customer service and device support for various worker groups.

Meeting Employee Mobility Needs

There are many types of mobile workers, ranging from teleworkers to field technicians. Not all mobile workers require the same flexibility for network connectivity. But all mobile workers seek some core responsiveness from their mobile tools, including:

- **Consistent access to corporate data:** Mobile workers are sensitive to tools that delay or slow their data consumption. Predictability is key; mobile workers rely on the fact that they will be able to connect seamlessly, anytime and anywhere. Wide availability and predictability of coverage is essential.
- **Transparent and easy to use wireless and mobile access tools:** Workers demand fast access to corporate data without much burden on them. Users do not want to spend time dealing with different user interfaces, logins, etc. Simplicity is critical to gain end-user acceptance.
- **Device longevity and reliability:** Mobile workers expect robust battery life to power their usage patterns and require the ability to suspend and resume operation of their device.

Past experience tells us that if mobile workers become frustrated with their mobile experience from shortcomings to these requirements, they either disable the component, causing them angst, or resist using the technology. Usability is much more important in mobile deployments compared with wired environments. Corporate IT has to worry not only about deploying usable technology over multiple networks outside of the enterprise, but also ensuring it is rolled out securely and in a way that is both easy to manage and as transparent to the user as possible.

The intersection of 3G and IT in the notebook provides enterprises with a truly mobile tool for their workers. Exhibit 5 details how wireless wide-area notebook enablement addresses the requirements of employers and employees.

Exhibit 5
3G-Enabled Notebooks Meet Employee and Employer Mobility Needs
Source: Yankee Group, 2007

	Mobile Broadband-Enabled Notebooks	
	Requirement	**Solution**
Employer	Manage the prosumer majority	• Mobile broadband provides broad coverage and access. • IT maintains consistency and control.
	Manage impact to the bottom line	• Centralized purchasing and wide-area coverage alleviates ad-hoc hotspot usage and miscellaneous travel and expense reporting.
	Implement seamless and secure connectivity	• Consistent user interface* and network availability will increase reliability and will lift users' experience of the service.
	Extend corporate policy to end users	• Centralized administration of wireless remote access provides consistent policy management.
Employee	Consistent access to corporate data	• Mobile broadband provides one network for users, and alleviates the need to hunt for access. • 3G data networks enable fast, secure and reliable access.
	Transparent and easy to use	• User interface and sign-in process are constant. • Integrated billing with a wireless carrier eliminates the need to sign up and track expenses for multiple providers.
	Device longevity and reliability	• Embedded solutions with customized power management provide optimization for longer battery life. • Risk of component damage is lowered from the wear and tear of external PC Cards and USB solutions.

** In comparison to Wi-Fi hotspots that each utilize a different sign-in process*

IV. 3G Wireless Notebook Deployment Strategies

Enterprises Must Incorporate Wireless Wide-Area Connectivity into Strategic Mobility Initiatives

The next 3 years represent an acceleration point—a transitional period when companies should begin to transform their limited opportunistic mobility initiatives into strategic mobility initiatives. Strategic initiatives will address a broader set of mobility requirements within the organization; represent a tighter, policy-driven approach to the management of mobile solutions; and tie closely into the overall corporate business strategy.

As companies develop their plans for strategic mobility, they must consider incorporating a broader set of technologies and mobile tools to create a true "mobility package" for end users. This includes integration and coordination between voice, data and remote access services. Many companies have used traditional wireline remote access services for their mobile workforces, with some firms incorporating 802.11 wireless and hotspot access into these solutions. However, wireless wide-area network access is the next frontier for enterprises as they attempt to meet the evolving requirements of their mobile workforces so they can truly work anywhere.

Understanding 3G

Wireless operators globally are deploying 3G wireless wide-area data solutions across two main technologies: EV-DO and HSPA. We briefly describe each of these technologies below:

- **EV-DO** stands for Evolution-Data Optimized. It is the 3G cellular data standard for CDMA carriers such as Verizon Wireless and Sprint Nextel. EV-DO Rev 0 provides data download speeds in the 400 Kbps to 700 Kbps range. EV-DO Rev A will provide data download speeds in excess of 1 Mbps and uploads up to 800 Kbps.

- **HSPA** stands for High Speed Packet Access. It is a 3G standard for GSM carriers such as Cingular and T-Mobile in the United States and Vodafone, T-Mobile and Orange in Europe. HSPA provides typical data download speeds between 400 Kbps and 700 Kbps, with occasional bursts exceeding 1 Mbps. UMTS, which stands for Universal Mobile Telecommunications Systems and is widely used in Europe, is another 3G wireless technology in the same technology family as HSPA. Although not as fast as newer HSPA technologies, UMTS provides download speeds of up to 384 Kbps.

Three Options for 3G Notebook Mobility

There are currently three deployment options for businesses wishing to enable wireless wide-area notebook connectivity: wireless PC Cards, tethered wireless devices and embedded modules. Decision-makers must evaluate each option based on the benefits and limitations of each approach:

- **Wireless PC Cards:** These solutions involve installing external wireless cards into a component slot such as a PCMCIA slot, ExpressCard slot or USB port. These options enable users to retrofit existing laptops that do not have embedded wireless wide-area functionality through standard PC interfaces. This is very similar to the initial use of 802.11 PC Cards when Wi-Fi first emerged. But PC Cards are external components. This means that radio and antenna performance, power utilization and interference with other internal notebook components have not been optimized to the specific notebook model. Additionally, external components can be lost or damaged through repeated insertion and removal.
- **Tethered wireless devices:** These solutions involve using another data-enabled mobile device—either a cellular phone or a wireless PDA—as an external wireless modem. Tethering generally occurs using a serial or USB cable or Bluetooth. Like PC Card solutions, tethering enables users to retrofit notebooks with wireless wide-area connectivity. One benefit is that users are not required to carry separate devices (e.g., a phone and a PC Card) and maintain two separate subscriptions. However, where PC Cards are designed specifically for notebook connectivity, most tethered mobile data devices are not. Instead, power consumption and data optimization is principally for the handheld functionality. Additionally, establishing a connection for the end user is more complex, including both physically connecting the device and establishing a wireless data session. Also, these solutions likely require IT to select and issue one standard mobile device for all mobile workers to maintain device and policy management and to minimize administration and support costs. In addition, tethering requires either a separate data plan or a data plan upgrade for notebook connectivity, eliminating any service cost savings from using a single device.
- **Embedded notebook solutions:** These solutions involve purchasing laptops with wireless wide-area radio modules incorporated from the OEM. Much as Wi-Fi evolved from PC Card solutions to embedded 802.11 radios, embedded wireless wide-area solutions become an increasingly attractive option to both enterprise decision-makers and end users. There is a perception that purchasing embedded mobile broadband will lock the notebook to a certain operator and will also prevent the user from upgrading to a newer radio technology in the future. However, in most cases, an IT manager or end user can upgrade or change the mobile broadband radio in a notebook. Ultimately, this is a good method of investment protection for the notebook and the business.

Embedded Notebook Mobility: The Integrated Approach

Wireless wide-area embedded into notebooks has several near- and long-term benefits:

- **There is lower TCO.** Today, costs associated with embedded modules on notebooks range from $179 to $225. Additionally, embedded solutions cost less to maintain. Fewer trouble tickets and support calls will reduce IT administrative support costs and offset any upfront investment in embedded modules.
- **Embedded solutions are optimized for better performance.** Mobile operators are working closely with both the mobile broadband modem module vendors and the PC OEMs to optimize radiofrequency (RF) performance for each notebook model. Product development will shield modules from interference to maximize RF performance. PC Card solutions lack optimization for network performance with each specific notebook model. Additionally, integration of the module will lead to longer battery life because OEMs can efficiently manage the radio and other power management options with their products.
- **There are implementation, administrative and support benefits.** Purchasing notebooks with embedded modules means that IT administrators can more easily create a standard hardware and software image on wirelessly enabled laptops. From a training and implementation standpoint, users won't need to be instructed on installation and removal of PC Cards or tethered devices; they'll only need it for the software user interface. Additionally, help desk issues related to external component installation and lost/damaged devices will be reduced.
- **The mobile broadband module is transparent to the user.** By eliminating external PC Cards and device tethers, mobile broadband access becomes just another component of the notebook. There is less risk of lost, broken or incorrectly installed components (e.g., PC Cards, PCMCIA slots), and mobile broadband-connected notebooks will now retain an extra open PCMCIA slot.

Embedded notebooks will cause a shift in traditional IT and mobile purchasing. Rather than deploying mobility solutions in an aftermarket approach, decision-makers must evaluate their mobility demand significantly earlier in the procurement cycle. Wireless wide-area data service will now be tightly coupled with laptops instead of with smart phones or PC Cards.

Therefore, closer collaboration between IT groups such as desktop managers and telecom/mobility managers will be required for embedded notebook solution decisions. In many cases, embedded notebook deployments will simply be a swap of legacy notebooks with PC Cards based on desktop replacement cycles.

V. Recommendations

- **Integrate notebooks and mobile broadband.** Notebooks will remain the most widely used mobile device for the mobile workforce in the near term, and integration of mobile broadband is key to enable true mobility. Smart phones and integrated voice/data devices will be complementary tools for mobile workers. Wireless PC Cards provide a near-term option for mobile broadband, but these will give way to more extensive embedding of mobile broadband into laptops.
- **Include embedded notebooks in IT planning today.** The good news is that embedded wireless wide-area data will trickle through most PC OEM models during the next 12 to18 months, ranging from high-end business machines to consumer laptops. Wireless wide-area connectivity is rapidly following the 802.11 embedded evolution path.
- **Profile your mobile workforce.** Understanding the roles of your mobile workers and their usage profiles, including the times and locations they need to connect to critical information, is the first step in justifying an investment in wireless wide-area notebooks.
- **Drive true mobility into the workforce.** The incorporation of wireless wide-area untethers mobile workers and creates a truly mobile office, enabling quicker response times to your customers and increased productivity in your workforce.
- **Ensure that your IT decision-makers work together as a single decision-maker.** A common theme around enterprise mobility is the requirement of centralizing mobility in IT. Embedded notebooks will help drive this enterprise initiative as mobility transcends across a traditional IT asset. Rather than make two disparate decisions on product and service, embedded notebooks require one decision for both.

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The people of Yankee Group are the global connectivity experts™—the leading source of insight and counsel for builders, operators and users of connectivity solutions. For more than 35 years, Yankee Group has conducted primary research that charts the pace of technology change and its effect on networks, consumers and enterprises. Headquartered in Boston, Yankee Group has a global presence including operations in North America, Europe, the Middle East, Africa, Latin America and Asia-Pacific.