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Mixed Messages on Mobile E-mail

By Andy Dornan

03/03/2004 1:00 PM EST

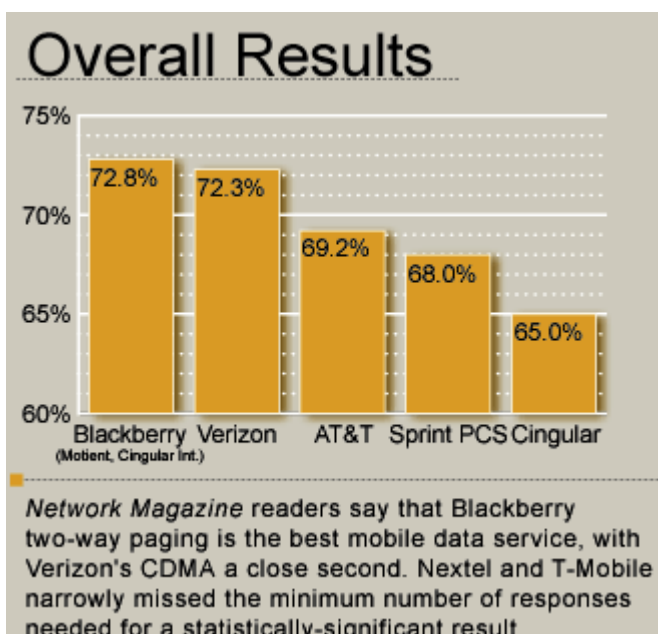
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Convergence is an article of faith in the wireless industry. Carriers have bet billions on a future in which voice and data travel together over the same radio frequencies. Pundits, analysts, and service providers all agree: Instead of lugging around separate laptops, cell phones, and PDAs, users should be able to access the network through a single terminal that combines the functions of a phone and a computer.

Customers are less convinced. While integrated devices and unified communications might sound nice in a sales pitch, *Network Magazine* readers say they don't meet expectations yet. In our first survey of mobile data services, more than five thousand network architects rated providers on eight separate criteria, ranging from coverage to security.

After the votes were counted, five U.S. mobile operators were used by enough readers for their scores to be statistically meaningful: AT&T Wireless (www.attwireless.com), Cingular Wireless (www.cingular.com), Sprint PCS (www.sprintpcs.com), Verizon Wireless (www.verizonwireless.com), and Research In Motion (RIM, www.rim.net). The first four are cellular carriers, whose main business is voice but have branched out into data. RIM is the company behind the BlackBerry e-mail pagers. It doesn't actually own a network, but made our top five by reselling capacity (bundled with its own hardware and software) on two-way paging networks run by Motient and Cingular.

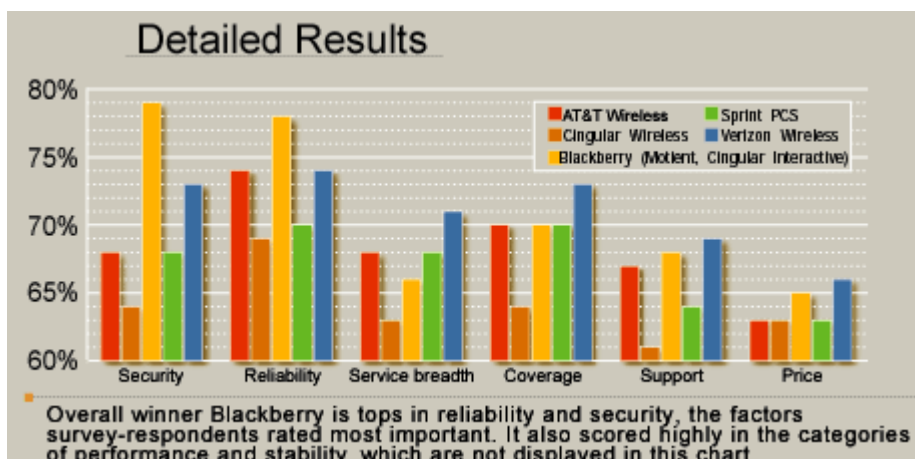
The results? By a very narrow margin, responders rejected the multimedia bells and whistles in favor of RIM's simpler approach (see Overall Results). Paging doesn't offer voice or high data rates, but it's reliable and secure, the latter thanks to tight integration between BlackBerry devices and RIM's behind-the-firewall software.



AGING PAGING

But if this tempts you to sign up with RIM, you'll be disappointed to learn that RIM isn't acting as a service provider anymore: It exited the paging market because not all its customers were satisfied with data alone, nor with the slow transfer rates of paging. The company has even bought into the convergence creed: It now offers a range of BlackBerry devices that incorporate voice as well as data, requiring a subscription to a more traditional cellular network. You can still get the text-only service, but you have to go through an ISP or direct to a paging operator.

Our survey shows that cellular carriers aren't always inferior to RIM. Verizon came in a very close second overall, only half a percentage point behind RIM. It actually won in four of the right categories, with a particularly strong showing in coverage and range of services (see Detailed Results below).



Of all the major U.S. carriers, Verizon is furthest down the road to 3G, suggesting that many network architects do find converged wireless networks useful. Whether you're one of them depends on which factors you consider most important.

SECURITY THROUGH SIMPLICITY

RIM's strongest point is security, a feature stemming more from the BlackBerry hardware and software than from the wireless networks themselves. The software must be installed on a server behind the enterprise firewall, ensuring that messages are encrypted all the way from the data center to the client devices. When e-mail is sent to a BlackBerry, not even the paging carrier or RIM can read it.

The BlackBerry software doesn't just handle encryption. Its main purpose is to act as an interface between the enterprise e-mail system and the wireless devices. Designed to work with Lotus Domino (Notes), Microsoft Exchange (Outlook), or standard POP and IMAP, it takes care of functions such as filtering, converting attachments to plain text, and splitting long messages into shorter chunks that can fit into a pager's memory. The same software is also used to push messages to RIM's new converged BlackBerries, affording them the same strong security as the basic pagers that most RIM customers still use.

While the BlackBerry software is highly rated, it isn't unique. Every cellular carrier provides software that can interface with an enterprise e-mail system and handle the same kind of tasks. While most are based on off-the-shelf platforms from Seven, Visto, or Infowave, they're heavily customized to fit each provider's own network and cell phones.

In terms of functionality, the cellular carriers' software beats RIM's. While the BlackBerry software requires a BlackBerry device, carriers such as Verizon are used to supporting a wide range of different clients from different manufacturers. Their platforms can make e-mail accessible through everything from a basic phone using the sub-Kbit/sec Short Message Service (SMS) to a multi-Mbit/sec 3G device with an integrated PDA and Web browser. Some even offer remote control agents that run on desktop PCs, providing

even more functionality. For example, the Seven platform used by AT&T and Sprint lets mobile users access all the data and applications on their desktop PC from a cell phone, provided that the PC is left switched on and connected to the LAN.

But there's always a trade-off between security and functionality, and RIM sides with security. The complexity of the non-BlackBerry offerings means that they're usually provided as a hosted service, making end-to-end encryption more difficult. A service that lets a cell phone control a PC is a powerful tool, but one that can do a lot of damage if the phone is stolen.

OLD FAITHFUL

According to our survey, the most important factor in choosing a service provider is reliability. RIM also comes out on top here, due more to the paging networks that text-only BlackBerries use than to RIM's software.

"BlackBerries kept corporate communications alive when almost nothing else worked," says Thomas Guidry, IT director at New York City public radio station WNYC (www.wnyc.org). He first issued BlackBerry pagers to senior managers in the aftermath of the September 2001 terrorist attacks, when much of the city's communications infrastructure was knock-ed out.

The BlackBerries proved so useful that Guidry's station now uses them to keep in touch with most of the staff, from sales representatives querying customer contact details to news reporters filing copy. "During the recent blackout, BlackBerries were essential in maintaining communications," he says. "Our investment in BlackBerry technology has been vital."

Paging is a tried-and-tested technology that has been around long enough for operators to build extensive, redundant networks. They operate at lower radio frequencies than most cellular systems, giving signals a longer range and better penetration within buildings.

Store-and-forward messaging is also inherently more reliable than real-time voice: Users rarely notice a pager passing out of range for a few seconds; the e-mail just takes a few seconds longer to arrive. Of course, this doesn't scale to applications that can't handle a low transmission rate or high latency and jitter.

DO LESS WITH LESS

Guidry's RIM service uses the Cingular paging network, which is separate from Cingular's less highly rated cellular network. With RIM exiting the service business, he's now billed by Earthlink (www.earthlink.net), but has noticed little difference in the service itself: Earthlink still uses the Cingular network and RIM's hardware and software.

Guidry is also experimenting with the larger converged BlackBerries, but finds them less reliable. "With the newer BlackBerry cell phone units, we experience shorter battery life issues," he says. Unlike a cell phone, a pager is able to last for days without being plugged into an electric outlet. Once again, this is thanks to its simplicity: The less it does, the less power it needs.

Battery life isn't the only reliability issue with the newer converged BlackBerries. None of them support both paging and cellular networks, so they rely on cellular operators' data services, all of which rated less reliable than paging-only services in our survey.

Reliance on any one carrier can leave you vulnerable when disaster strikes. Guidry is under no illusions that paging networks are perfect, and he's taking no chances. "We are making sure that we have multiple redundant carriers so that we do not have a single point of failure," he says.

RISK ASSESSMENT: CONVERGED MOBILE VOICE AND DATA

Maturity	★★★★★	Though bubble-era predictions said it would be mainstream by now, 3G is still in its infancy. Coverage remains poor, with client devices seeming like kludgy compromises between phones and computers. Applications that run over slower networks also need development, as many still expect LAN-like data rates and latency. WAP sites often fail to display properly due to a failure to adhere to standards.
Feasibility*	★★★★★	High-speed mobile data networks are no longer science fiction. They can be provided, and they work. Unfortunately, technical feasibility isn't enough. Carriers everywhere have scaled back their 3G plans, and high costs can make the service hard to justify for all but the flushest expense accounts. Nearly a million square miles of the United States still lack even analog (1G) cellular coverage, a problem compounded by a lack of interoperability.
Impact*	★★★★★	It's easy to find impressive statistics about the productivity benefits of mobile e-mail. Every vendor seems to have commissioned an analyst firm to show that it allows employees to spend up to three extra hours a day working, saving thousands of dollars a year. These studies always make unrealistic assumptions, but hype aside, the ability to turn downtime into work time is valuable. The question is whether it justifies the costs.
Risk	★★★★★	GPRS and CDMA are both here to stay, but the same can't be said of every mobile software vendor or service provider. To mitigate risk, go gradually. Don't trust coverage maps or get locked into a long-term contract. And be aware of security concerns: The greatest threat isn't interception of the radio link, but that mobile devices (and the data held therein) make attractive targets for thieves.
*Assumes large, distributed, self-maintaining commercial enterprise with no special needs related to this technology		

COVERAGE CHARGE

Redundancy isn't the only reason to use more than one service provider. Even when a mobile network is functioning perfectly, it still leaves some gaps in its coverage. If you're lucky, another network will be able to fill those gaps, though often not to most users' standard. Each provider's software is customized to work with its own network, so roaming can result in lower data rates and reduced functionality.

Verizon scored the highest marks for coverage in the *Network Magazine* survey, beating out both the paging networks and the other cellular companies. "Verizon has better coverage for rural areas than other providers," says Mary Stadelbacher, president of consultancy Pionus Creations (www.pionusc.com). "But there have been times that reliability and performance have been poor. Signal strength has also been sporadic, even in high tower density areas."

Her sentiments are echoed by others. Verizon is the most popular carrier among *Network Magazine* readers as measured by number of users. It also received the widest range of ratings, reflecting geographic variability. Several customers of other carriers commented that they use Verizon as a backup in areas where their preferred provider's service is unavailable.

Verizon's problem is that its network is at different evolutionary stages. Some parts use EV-DO, a 3G technology that offers peak data rates in excess of 2Mbits/sec. Others are still based on obsolete analog FM radio, which offers no data capability at all. Most are somewhere in between, with customers typically seeing about 60Kbits/sec using CDMA 1X, the same system that Sprint PCS employs throughout its smaller network. Verizon is in the process of converting its network to 3G and plans to have coverage in most major metropolitan areas by the end of 2004. FCC regulations require that the carrier (and some of its competitors) retain limited analog coverage.

AT&T Wireless and Cingular have an even greater coverage problem, one so limiting that the two are in merger talks. In the 1990s, both based their networks on TDMA, which unlike CDMA has no smooth upgrade path to 3G. As a result, both are ripping out their old base stations and replacing TDMA with GPRS, the system mandated in Europe and popular worldwide. Whereas Verizon's various new technologies are at least backward-compatible with the older ones, GPRS and TDMA aren't. Unless they have a rare dual-mode device, GPRS users in a TDMA zone won't receive any signal at all.

UPHILL UPGRADES

The pace of change in cellular technology is a common cause of complaint. Many network managers are upset about the demise of CDPD, which is essentially a more primitive version of the new converged services. CDPD carries IP over analog or TDMA

networks designed for voice. It's typically used with a laptop running a standard VPN or unencrypted POP client, so no special interface software is required on the server side.

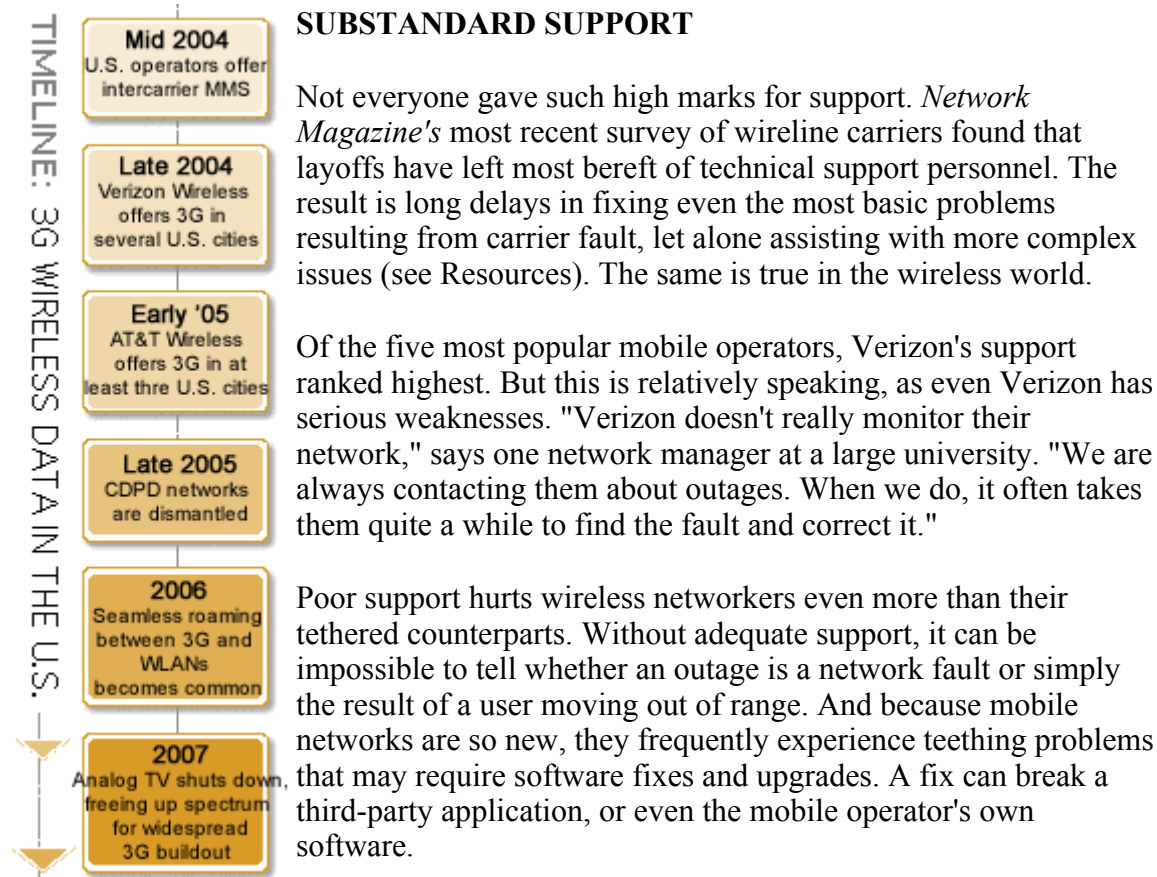
Verizon and AT&T both operate CDPD networks and are trying to move customers to their newer technologies. Verizon will phase out CDPD during 2005, but AT&T needs the radio spectrum occupied by CDPD sooner than that. It has announced plans to shut down the network in mid-2004, a decision that makes some users feel forced into an upgrade. Although GPRS and CDMA are faster and cheaper, they require investment in new NICs. A new card can shorten the laptop's battery life and sometimes requires a newer OS or a higher-spec PC than a CDPD card.

Even the shift from analog to digital can be problematic. When metal and plastics company AJ Rose Manufacturing (www.ajrose.com) upgraded its users from analog cell phones to Verizon's CDMA, the signal quality within its factory dropped. The reason? Like pagers, analog cell phones use a low radio frequency, which passes through walls and machinery better.

Where CDMA coverage was available, it didn't always deliver the promised data rates. "Network overload would sometimes dump users from digital to analog, causing lost calls," says John Doughtry, AJ Rose's IT director.

Verizon can't change its frequencies, so Doughtry has taken matters into his own hands. "We are in the process of evaluating a repeater within the building to eliminate the dead zones," he says. But to Verizon's credit, the carrier has improved reliability. "Network overload has decreased in recent months, primarily because of additional cell towers that Verizon has added," says Doughtry. "I give good marks to Verizon for listening to their customers' complaints."

SUBSTANDARD SUPPORT



"Sprint's service forces upgrades without proper instructions," says an IT director working in local government. His staff ran into problems when Sprint updated the client software for PCS Business Connection, Sprint's e-mail access service. The upgrade simply didn't work, rendering the service useless. The IT director had to make several calls to different support technicians to learn that he should have uninstalled the previous version of the software before installing the new one—something Sprint had neglected to

mention at the start.

CALLED TO ACCOUNT

Our survey shows little difference between wireless operators in one respect: They all scored uniformly low in the pricing category. And prices weren't the only complaint. Many respondents accused carriers of hiding the true costs of mobile data services, with bills substantially higher than the advertised price.

Carriers aren't always to blame for this. The FCC places a variety of taxes on cellular service, many of which customers aren't aware of until they receive the bill. However, the FCC also lets carriers charge their customers "cost recovery" fees for implementing services such as 911 and Local Number Portability (LNP). Phone bills typically group these fees together with taxes, but unlike taxes these charges vary between carriers, making price comparisons that exclude them difficult. Verizon makes a point of not charging customers LNP fees, but not everyone is so up front. To avoid nasty surprises, demand a detailed quote including all taxes and fees.

Costs are falling, however. Most providers now offer flat-rate plans with unlimited data use, giving customers an opportunity to ensure that bills match budgets. Plans that bill for data per megabyte or per minute often look cheaper, but these add uncertainty and can be a false economy for all but very light users.

Per-minute plans are particularly risky. Because some billing systems still round up to the nearest whole minute, and data transfer can involve many connections that last only seconds, you could find yourself being billed twice for the same minute. One Sprint PCS customer complained that a one-minute surfing session involving ten clicks was billed as ten minutes, not one. He would have been better off with Sprint's unlimited use tariff.

For many enterprises, pricing is still a deal-breaker. "We only have a few users on this service," says a network administrator at a food manufacturer piloting Cingular's service. "I would like to add more, but have not been able to justify the cost." Until costs come down, mobile e-mail won't be ready for the masses.

Services or Software?

Nothing in IT stirs up more passions than outsourcing. Service providers love it because it helps them gain more high-margin business. So do cost-conscious executives, as cutting staff and equipment can help boost the bottom line. Many network managers are more skeptical.

Handing part of your network over to an unknown party means losing control and trusting someone else to handle security and reliability. The risks seem particularly high when the companies bidding for the outsourced contracts are telecom carriers. Though they may have more IT smarts than most enterprises, they're part of an industry with more than its fair share of felons and shaky financials.

But hosted services are still a popular choice when mobilizing e-mail. One reason is that carriers have a better understanding of mobile devices and are thus better able to adapt e-mail to them. Another is that they charge little or nothing for the hosted mobile services that link an enterprise e-mail system to a mobile device. Wireless carriers make money selling air time; everything else is a loss-leader. Consumers get free phones, enterprises free application hosting.

REJECTED APPLICATIONS

While carrier-provided software may be something for nothing, it isn't always the best choice. If you need to support users on multiple carriers, it makes sense to buy software from vendors such as Air2Web, Extended Systems (www.extendedsystems.com), or

Openwave. This lets you set up your own interface between your applications and mobile devices so that you're not tied to one carrier.

Customer-facing applications are another area where the DIY approach makes sense. If you don't control the devices used by the people accessing your systems, you'll need a Wireless Application Protocol (WAP)-based site that's accessible over the Internet. However, the carriers have ignored this market for a reason: It's tiny, with most users finding that mobile e-mail provides higher Return on Investment (ROI) than the wireless Web.

Different screen sizes and nonstandard browsers make it difficult to ensure that a WAP site will always display properly, and user interface problems still haven't been solved. "It takes ten minutes to do something on the wireless Web that takes ten seconds on a desktop," says the CTO of a software consultancy. "If you have a phone in your hand, it's easier just to make a call."

Senior editor Andy Dornan is the author of [The Essential Guide to Wireless Communications Applications: From Cellular Systems to Wi-Fi](#), published by Prentice Hall. He can be reached at adornan@cmp.com.

Resources

1G, 2G, 3G ... Confused about the various 3G and cellular technologies? In a nutshell, there are three main 3G standards used worldwide. And whereas most countries have agreed on just one, the United States' main operators are using all three. To further complicate matters, no carrier (U.S. or international) has actually built a complete 3G network yet. All still use "2.5G" technologies such as GPRS and CDMA, which offer speeds comparable to dial-up. (CDMA is a bit faster, GPRS a bit slower.) For more on these differences, see "[Are We Better Off Without 3G?](#)" June 2003.

Service Survey The *Network Magazine* survey didn't just ask about mobile data. Readers also had valuable-and surprising-input in fixed-line data categories. For the complete survey methodology and reasons why customers remain faithful to WorldCom, see "[The People's Voice](#)," August 2003.

PROS AND CONS

Two-way Paging

[RIM/Earthlink, Motient, Cingular](#)

Client: Pager, PDA

Pros: Good coverage - Mature technology - Low cost

Cons: No voice support - Low data rate - Uncertain future

[CDMA or GPRS](#)

Sprint, Verizon (CDMA) - AT&T, Cingular, T-Mobile (GPRS)

Client: Cell phone, PDA, laptop

Pros: Higher data rates - Single device for voice and data - Single bill for voice and data

Cons: High cost - Poor (but improving) coverage - Single point of failure for voice and data