

For most of us, the tool that gives us all this functionality is a personal computer. But soon — perhaps not this year, but maybe next, and definitely by 2010 — a significant portion of the world's three billion mobile phone users will be able to effortlessly do all this and more right from their cellular phones.

The stage has already been set. The introduction of the Apple iPhone last year dramatically raised the bar for phone manufacturers and cellular services, and sent user expectations to the stratosphere. Love it or not, the iPhone forced the dialog about what a mobile device can be and do to an entirely new level. Manufacturers and cell services have been scrambling to make iPhone-esque devices, and to one-up Steve Jobs' latest sensation. Cellular service providers have been prodded to finally open up their networks. And while all this has been happening, Google has thrown its colossal weight behind a new, open mobile software platform, inviting anyone and everyone to develop the next killer cell phone application.

Now that the Internet has matured and become a ubiquitous fixture in personal and professional life, mobile is clearly the new digital frontier. And companies and capital are lining up to lay stake to the biggest claims.

"There's no question about it," says Keynote Systems' Global Director of Streaming Media Jeff Geiser, "mobile is where the final fight is going to happen in terms of eyeballs. For the next two or three years, that's going to be the fight in the market."

GETTING THE PIECES LINED UP

There are three pieces of the puzzle that have to fit together before the cell phone takes over as "command central" for managing our lives, work, and entertainment. First, content has to be available and optimized for the mobile platform. Second, carriers have to have the bandwidth and reliability to push larger and larger data streams out. And third, handsets

have to have the form factor, capabilities, and interface to make them comfortable and intuitive to use. Each of these factors is in a different stage of development, and none are quite far along enough to trigger widespread adoption of enhanced mobile services.

COMING TO A TINY SCREEN NEAR YOU

Mobile content is one piece of the puzzle that is growing exponentially. Every company that has content — particularly the big media and entertainment companies and Web sites — is figuring out how they can address the mobile market. News and sports content is at the head of this push, and television content is close behind. As a sign of how far along the sports media is, Keynote Systems notes that for this year's Super Bowl, four major coverage sources — ESPN, Yahoo! Sports, Fox Sports, and CBS — delivered their content without a hitch before, during, and after the game.

"We were both impressed and a little surprised by the performance of the four mobile Web sites," said Shlomi Gian, director of mobile business development at Keynote. "The reliability and quality performance could also indicate that the sites were built to handle much higher traffic than what is currently generated by mobile users."

(Ironically, Keynote observes that 25 percent of the Web sites for Super Bowl advertisers experienced "significant to major performance slowdowns and outages.")

With the advent of phones with bigger screens and a horizontal format such as the iPhone, television programming is gaining traction in the mobile market. Third-party providers such as MobiTV are at the leading edge of streaming-to-mobile technology, leveraging the bandwidth of 3G networks where available to push out high-quality, 30 frames-per-second streaming programming.

Sometimes content goes the other way, too. During the Super Tuesday presidential primaries in February, MTV sent

phones out to a number of viewers and asked them to go out and create videos at their local polling places, and then upload them to MTV for broadcast. Keynote's Geiser calls this model "crowd-sourcing," and notes that the leveraging of mobile phone-shot video is taking hold in the blogosphere as well.

"We've seen at key industry events a lot of bloggers using mobile phones to do interviews on trade show floors and upload them to their blogs," Geiser says. "They use their phones to capture and upload their stories, and their audience can see right away what's going on at CES, and preview the latest products, for example."

Beyond simply porting video content for the small-format screen, however, is the question of how users interact with it.

According to Geiser, "There hasn't yet been a lot of innovation that acknowledges that the way you interact with a Web site, or the way you interact with streaming content on a cell phone, needs to be unique. It's more than taking what you see on a laptop and dumbing it down for a mobile phone.

"More than just 'what kind of content are we going to provide,' the question providers have to ask is how do users interact? How do we present it to them? How do we make the way users interact with their phone and this video a little more seamless?"

3G OR NOT 3G?

The cellular service providers hold the second piece of the puzzle, and that is providing enough bandwidth and speed to make video and data-intensive applications fast, smooth, and responsive. The key to delivering this capacity is finishing the build-out and then fully leveraging new 3G networks. The 3G standard has been in place in Europe and Asia for years. In the U.S., the major carriers now have 3G networks largely in place, with full coverage in major population centers.

At this point, the challenge is the



third piece of the puzzle, the mobile devices themselves. Utilizing a 3G network requires using a 3G phone, and there simply are not many of them in consumers' hands yet. Even the iPhone currently in distribution is a 2G phone; the 3G version is expected to be introduced later this year, though an announcement was conspicuously absent at MacWorld in January. Carriers have not yet aggressively promoted upgrades to 3G handsets, and the price points are still comparatively high.

"You go through a cycle," Geiser says. "It will take time to get the new technology into the hands of consumers, as people trade in their phones over the next two to three years, and as price points come down, and data plans come down."

"When the iPhone goes to 3G later this year, that will be a landmark event," Geiser continues. "That kind of phone, and the ability you'll have to watch video on that screen and the overall capabilities of a phone like that will really bring a lot of focus to video on the mobile phone. That will be a sort of watershed event for video on mobile platforms."

MEASURING MOBILE QUALITY

Great content, great applications, great handset — but what is it really like for the user? As with all things interactive, it boils down to a matter of how fast and well the signal gets from point A to point B, including any stops it makes along the way. The three critical measures for mobile are:

- Response time: How many seconds does it take to complete a transaction?
- Success rate: What percent of the time does a mobile transaction successfully complete?
- Download speed: The average speed (bytes/second) it takes to move data to the mobile device.

Perhaps not surprisingly, success

in these three measures is determined by the three pieces of the puzzle described above: the content that is provided, the carrier network, and the mobile device itself. So measuring mobile performance is a matter of a) ensuring that the application or content is responding as expected, b) ensuring that the carrier signal is robust, and c) ensuring that the particular handheld device is performing as intended.

Testing a mobile application requires actually navigating to a site from a handset and performing specified tasks. The problem is that there are hundreds and hundreds of handsets on the market, each with its own profile and idiosyncrasies. Keynote solves this problem by emulating the handset profiles and using the emulations to send traffic to the site being tested.

"We're able to emulate over a thousand different handset profiles," explains Manny Gonzalez, Keynote's senior director of mobile technology. "And when the mobile Web site sees the traffic coming in from one of the emulated devices, it believes that traffic is coming from a real handset."

"So we can go visit a Web site and take on the personality of a Motorola RAZR, a V3 phone," Gonzalez continues, "and then we can switch and take on the personality of an LG device or a Nokia device or a Samsung device."

This testing service is called Keynote Mobile Application Perspective, and it is suitable for scenarios where a request is made that requires a response back — navigating a Web site, for example, or testing the availability and responsiveness of short codes or SMS-based applications used for texting, polling, or even conducting financial transactions. Testing specific custom applications, however, as opposed to Web site performance, requires accessibility to more device functionality than is possible through emulation, and for these scenarios Keynote Mobile Device Perspective offers an effective

test methodology.

"An application developed for one series of handsets is not necessarily going to run on another series of handsets" Gonzalez explains. "Your best bet in that case is to have a real handset to use for the testing. We actually deploy real physical handsets, integrated with hardware that Keynote has developed so that we can remotely control that handset and run tests on it."

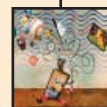
With Mobile Device Perspective, anything that can be done while physically holding a phone in your hand can be done remotely through the programming mechanisms Keynote has developed. Reverse engineering handsets for this type of testing, however, involves more time and cost than using the emulation process. It is best suited when very detailed testing is required for a relatively small number of handsets.

"Today we do streaming tests for the carriers using Mobile Device Perspective," Gonzalez explains, "so we're able to benchmark the availability of streams — performance, how long it takes to start buffering the video stream, if there's any re-buffering we capture that — all the performance characteristics that you or I as an end user would experience if we're going to download or stream some video content."

"The advantage with Keynote is that customers don't have to choose a vendor based on their problem," Gonzalez concludes. "We can solve it with either one of these technologies, Mobile Application Perspective or Mobile Device Perspective, and some customers are in fact using both."

MAYBE NEXT YEAR

The consensus among the experts interviewed by *Benchmark* is that 2008 will be a year to continue building out infrastructure and applications and get more capable mobile devices into the hands of more users. Much work is being done behind the scenes, and



consumers can expect to start reaping the benefits in 2009.

“There is no single company that I know of, with maybe a few exceptions, that is not investing seriously in mobile, that is not building technology that will be compatible with mobile devices,” says Shlomi Gian, Keynote’s director of mobile business development. “When is it going to happen? It’s more a question of when you and I will agree to start paying \$X.99 to get the enhanced content and services.”

Geiser concurs. “The market is still relatively new. Consumption of those services is going to remain, at least for this year, with the early-adopter market. We’re probably a good year away before it even begins to be mass market. But all of the underpinnings are being put into place right now.

Perhaps 2009 or 2010 will be the year our cell phones become something much more, the year we can leave our laptops and MP3 players behind. One of the most important developments to watch will be

coining a name more encompassing than “cell phone” and more exciting than “mobile device.” Any suggestions? Email us your ideas...preferably from your cell phone.