



Can you be found anywhere, anytime?

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Most of us know where we are on planet Earth - or close enough to make do. But sometimes we travel on business or for pleasure and suddenly wonder: Where am I? Or maybe we might want to know the location of a spouse, teenager, or pet.

More and more, GPS - the global positioning system - is coming to the rescue. But the satellite-based system has one big drawback: Its signals can't reach inside buildings or down into the skyscraper-lined streets of major cities, where millions of people live or work.

The result? One of the era's breakthrough technologies - tracking the location of everything from packages to cellphone users in distress - remains impractical to much of the population. Now that appears likely to change.

Racing to fill in the gaps where GPS can't reach, companies are experimenting with various wireless technologies. Solutions can't come too soon. The federal government has charged mobile-phone companies, even the ones that are Internet-based, to make their phones capable of being located when a user dials 911 for help.

But such tracking technology also raises privacy concerns, which are likely to heighten as the technology spreads. Some groups already worry about who will know where you are - and what they might do with the information.

One obvious solution to the gaps in GPS is an alternate, urban-friendly technology.

Among those bidding to provide that answer is **Rosum Corp.** in Redwood City, Calif. The five-year-old start-up has a simple plan: In urban areas, many commercial TV signals blanket the airwaves. The transmitting locations are known. Just plot the time it takes for several of the signals to reach you, and you can determine your location.

TV signals are already designed for indoor reception. "We're taking advantage of that," says Jon Metzler, director of business development for Rosum.

The quality of the signal doesn't have to be good enough to produce a TV picture, just strong enough to reveal where it's coming from, he says.

With about 1,300 television towers in the United States and nearly 1,900 over-the-airwaves TV stations, most of urban and suburban America is covered with TV signals. Where Rosum is weakest, in rural areas with open skies, happens to be where GPS works best.

Rosum officials hope to have their product commercially available soon. Among its backers is In-Q-Tel, the venture capital arm of the Central Intelligence Agency. "We're obviously very happy with their interest," Mr. Metzler says.

Finding you with wi-fi

Back on the East Coast, Skyhook Wireless in Boston has latched onto the same concept but is using another signal to do the job: wi-fi. Wireless fidelity is the opposite end of networking from GPS. Instead of a few big satellites in orbit, wi-fi boasts millions of small low-power transmitters that allow users to log onto the Internet wirelessly. The operating range of these signals is rarely more than a couple of hundred feet, but that's enough for them to spill out of buildings onto the streets. Skyhook says it has mapped the exact location of more 1.5 million wi-fi signals in the 25 largest American cities. Many of them overlap.

Walking down the street in Boston, for example, "you're pretty much being buried in five or 10 access points at any given time," says Ted Morgan, president and founder of Skyhook.

Just as with GPS or TV, multiple wi-fi signals can be used to determine a location, Mr. Morgan says. "Every positioning system uses the same concept, that if you have three or more reference points, you can use math to figure out where you are."

Skyhook doesn't log onto anyone's computer, he's careful to point out. "It's completely passive," he says. "We're just catching waves going around."

As with TV signals, wi-fi blankets urban areas, a nice complement to the strength of GPS in open territory.

Morgan expects GPS and wi-fi systems to appeal to different needs. But some users, such as companies with fleets of delivery trucks, may want to combine them for maximum coverage. UPS, for example, already equips its trucks with a powerful combination of Bluetooth (very short range wireless), wi-fi, cellular, and GPS technologies to collect and transmit data about locations and deliveries. "I think ultimately what you'll have is a collection of technologies all leveraging each other's strengths," Morgan says.

Privacy concerns

These advances also may be used to invade a person's privacy. As a result, Americans need to be more vigilant, some experts say. As GPS and other tracking technologies become more accurate and less expensive, people need to guard against "usage creep" from good purposes, like 911 calls, to less good ones, says Annalee Newitz, a policy analyst at the Electronic Freedom Foundation in San Francisco. Information about the whereabouts of people is going to be available, she adds. "We can't shake our fists and say, 'We don't want that!' when it's already happened," Ms. Newitz says.

Regardless, people already should be questioning who has access to their location data and for what purpose. "We want to be sure this data is being disposed of as quickly as possible," she says.

How TV-based positioning works

1 TV signals have embedded synchronization codes.

