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trajectory

THE OFFICIAL MAGAZINE OF THE UNITED STATES GEOSPATIAL INTELLIGENCE FOUNDATION

LOCATION NATION

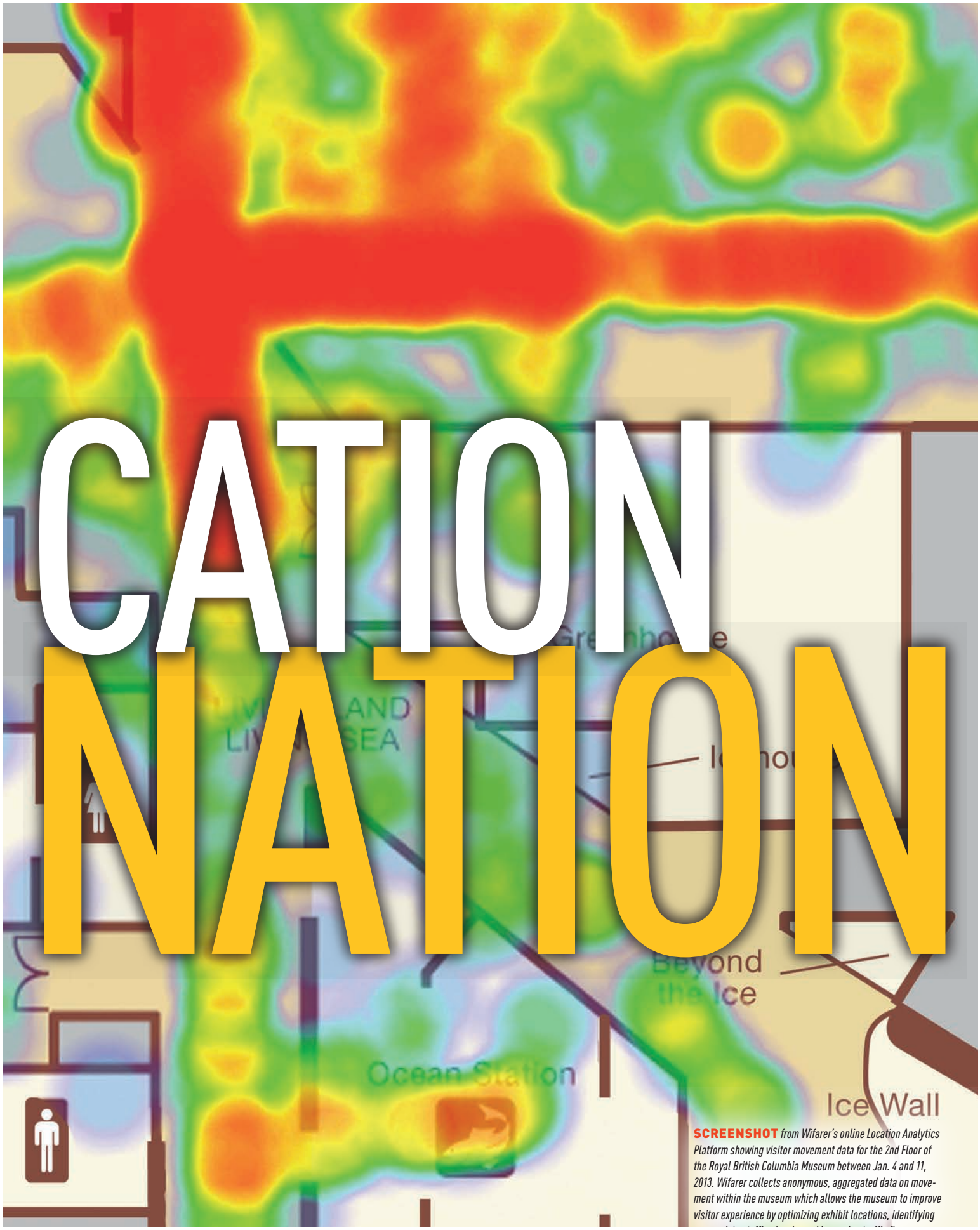
THERE'S A MAP FOR THAT

2013 USGIF MEMBERSHIP DIRECTORY

Hanna-Barbera saw it coming. In 1962, the creators of *The Flintstones* put forth their vision for the future when they introduced *The Jetsons*, an animated sitcom about George Jetson and his Space Age nuclear family. Living in the year 2062, George enjoyed infinite comfort and convenience, his life inextricably laced with technology. Instead of newspapers he had the TeleViewer, an interactive screen that blended text with video. Instead of telephones, he had video chat. And instead of driving to work, he commuted in his flying car. Meanwhile, his wife, Jane, delegated the household chores to a small army of smart appliances, including an automatic vacuum cleaner and a humanoid robot named Rosie.

LOCATION-BASED SERVICES (LBS), THE EVOLUTION OF GPS, IS EVOLVING WITH BREAKNECK SPEED. IN JUST A FEW SHORT YEARS, IT HAS CHANGED THE WAY THE WORLD THINKS ABOUT AND INTERACTS WITH PLACE.

BY MATT ALDERTON | IMAGE COURTESY OF WIFARER INC.



SCREENSHOT *from Wifarer's online Location Analytics Platform showing visitor movement data for the 2nd Floor of the Royal British Columbia Museum between Jan. 4 and 11, 2013. Wifarer collects anonymous, aggregated data on movement within the museum which allows the museum to improve visitor experience by optimizing exhibit locations, identifying*

Just 50 years from *The Jetsons*' epoch, the world still lacks flying cars. However, it has TeleViewers in the form of iPads, video chat courtesy of Skype, and even a robot vacuum thanks to iRobot's Roomba.

Society now also has location technology, similar to the kind that notified Jane when George was almost home from work, and automatically flew the family car to its destination of choice. An evolution of GPS that's known as location-based services (LBS), this breed of technology is evolving with breakneck speed. In just a few short years, it has changed the way the world thinks about and interacts with location.

"Every single new 21st-century data source contains location," said Simon Thompson, director of global business solutions at GIS software company Esri. "This is creating massive amounts of data about people … and what you're now seeing is quants moving from financial services and Wall Street into marketing, real estate, and [other] areas in order to tell you what you can get by mining all this data."

Thompson describes the simultaneous proliferation of social media, location-aware technology, and mobile device usage (SoLoMo) as a perfect storm of geospatial potential.

William Hanna and Joseph Barbera fantasized about such potential with *The Jetsons*. Science fiction writer Arthur C. Clarke, on the other hand, outright predicted it: "Perhaps in 30 years the orbital relay system may take over all the functions of existing surface networks and provide others quite impossible today," Clarke, author of *2001: A Space Odyssey*, wrote in a letter to his friend, Andrew G. Haley, in 1956. "For example, the three stations in the 24-hour orbit could … make possible a position-finding grid whereby anyone on earth could locate himself by means of a couple of dials on an instrument about the size of a watch … It might even make possible worldwide person-to-person radio with automatic dialing. Thus no one on the planet need ever get lost or become out of touch with the community, unless he wanted to be. I'm still thinking about the social consequences of this!"

The social consequences are stunning—particularly in the context of the mobile web, which becomes more bloated each day with cutting-edge applications capable of collecting, analyzing, and utilizing location data. With immediate benefits for individuals and businesses, and promising applications in government and defense, LBS is poised to turn one's physical coordinates into a digital key that unlocks a new era of personalized commerce even a Jetson would envy.

EXPONENTIAL GROWTH

Since the dawn of the iPhone in 2007, smartphone ownership has spread exponentially. In 2012 alone, smartphone ownership among American adults rose to 46 percent from 35 percent the year before, according to the Pew Research Center's Internet & American Life Project.

Growing equally fast are mobile apps. The share of adult cellphone owners who had downloaded an app nearly doubled from 22 percent in 2009 to 38 percent in 2011, according to Pew. Taking into account adults whose phones came pre-loaded with apps, more than 50 percent of all U.S. adult cellphone owners now have apps on their phones—many of them location-enabled. In

"Every single new 21st-century data source contains location."

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ESRI APP DEVELOPERS *use the ArcGIS platform to launch the next wave of mobile applications enhanced with location analytics.*

PHOTO COURTESY OF ESRI

fact, the number of U.S. adults who get location-based information on their smartphones has nearly doubled in the last year, growing from 23 percent in 2011 to 41 percent in 2012, according to Pew.

"This is a space that's heating up a lot right now … there's an instinct that [LBS] is going to be a really big deal for smartphones in the same way that GPS was a really big deal for [navigation]," said Dan Ryan, founder and CTO of indoor positioning company ByteLight. "In the future, you can imagine a situation where you walk into a retail store and your phone leads you to a particular product. Or maybe you pull out your phone in front of an exhibit you like at a museum and it pushes you some content about that exhibit. The whole idea of geospatial-aware computing has everything to do with making computing more relevant and more useful."

Relevance means context, according to Thompson, who says LBS is evolving beyond "location"—latitude and longitude—to accommodate "geography" and "place."

"Your geography is your distance from a location, how far you've traveled to get there and whether it's your home location or your place of business," Thompson explained. "Place is who is here and what they are doing. If I know at this location there happens to be a cinema that's part of an outdoor mall, I now have a whole contextual understanding of the people who are there and why they might be there."

ANYWHERE IS POSSIBLE

For consumers and businesses alike, SoLoMo represents a technological U-turn, according to Thompson, who says the Great Recession catalyzed a social and economic movement from "global" to "local."

"Location has become a mechanism to enable hyperlocal business intelligence," Thompson said. "A business that wants to grow in a slow-growth economy has a couple of choices: It can expand its footprint and hope to reach the mass market, which is the Coke and Pepsi model, or it can be very, very focused on operating in the most profitable areas and locations … We're moving away from living in clone towns where we're given the same shops and the same media and the same merchandise. Historically, mass-merchant brands used technology to out-compete small brands and local businesses, but now those local businesses can exploit and use technology in exactly the same way, so we're seeing a renaissance of local flavors."

SoLoMo isn't just localizing commerce. It's also localizing information, according to Charlie Davies, director and co-founder of British LBS company iGeolise.

"When the Internet began, it was all about how amazing it was that you could read content no matter where you were in the world," Davies said. "That spreading of content was great because it disengaged people from their actual environment. LBS has helped re-engage people in and around their local area. As a result, the Internet that was supposed to break away local boundaries is now securing them."

Simply put: After two decades of retreating into the virtual world, people are using LBS to rediscover the physical one.

"The moment you get in your car and drive somewhere, you are by definition bound to your physical environment in a way you're not when you're surfing your iPad," said Lise Murphy, vice president of marketing at Wifarer Inc., a Canadian provider of indoor positioning technologies. "That's an undeniable aspect of being human. You live in a specific place and you go to specific locations. So why not develop apps and technology to enhance your experience in physical spaces?"

The technological possibilities are just as infinite as the number of physical spaces one can visit. For instance, location-based apps already exist for:

- **Socializing:** Social media platforms like Foursquare, Facebook, Twitter, and Yelp allow location sharing among friends, family, and acquaintances. The result is a geosocial community that allows people to simultaneously exchange information about locations and spontaneously congregate.
- **Navigation:** Navigation is the primary use for GPS in mobile apps. Now, a new wave of technology is helping people navigate based on travel time instead of distance. iGeolise, for instance, allows smartphone users to select their mode of transport—car, public transit, or bicycle—then search locations based on proximity. For example, five minutes instead of five miles. The technology is being used in apps to help workers find jobs close

PRIVACY, PLEASE

According to the Pew Research Center's Internet & American Life Project, privacy is a major concern for mobile app users, 57 percent of whom have either uninstalled an app or avoided installing one because of concerns about sharing personal information. The risks are especially fraught when the information in question is location, raising concerns about stalking and surveillance.

For that reason, the Federal Trade Commission (FTC) included location in "Marketing Your Mobile App: Get It Right from the Start" (*www.business.ftc.gov/documents/bus81-marketing-your-mobile-app*), its guide to ethical mobile app development, published in September 2012.

"It's important to get users' affirmative OK before you collect any sensitive data from them, like medical, financial, or precise geolocation information," state the FTC guidelines.

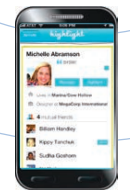
The guidelines, however, are just that: guidelines.

"Courts are starting to look at this issue, but there haven't been a lot of cases yet with respect to location information," said Kevin Pomfret, director of the Centre for Spatial Law and Policy. "The FTC has broad authority to protect consumer privacy, but they haven't moved directly into the location privacy area yet. Congress is looking at developing laws that would regulate how you can collect and use location information, but they haven't passed any. So, there's still a lot of uncertainty."

In the absence of location-specific laws and regulations, it's up to app developers to self-police in the area of privacy, which a majority are doing by requiring users to opt in to location sharing, anonymizing the location data they collect, and reporting location analytics only in aggregate.

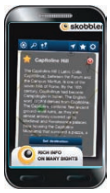
"There are natural privacy concerns and we need to be better at overcoming people's fears about the use of information while safeguarding their privacy," said Simon Thompson, director of global business solutions for Esri. "That's an area I think we'll really develop in the next 18 months."

MUST-HAVE APPS



HIGHLIGHT: Highlight uses Facebook data to show friends, friends of friends, and people with similar interests who are located around you. If you're at the airport, for instance, your phone will notify you if an old friend from high school is waiting for a flight at the gate next to yours. Also try Banjo.

HERE ON BIZ: Ideal for business travelers, Here on Biz synchronizes users' location with LinkedIn in order to show nearby professionals who are also using the app, facilitating impromptu networking at the convention center or even the hotel bar. Also try Unsocial.



FOREVERMAP: ForeverMap uses data from the OpenStreetMap project—the so-called "Wikipedia of maps"—to provide online and offline access to detailed maps of cities, states, countries, and continents. It includes routes for cars and pedestrians, while allowing users to search for points of interest around them. Also try Nokia's HERE Maps.

WAZE: Waze is a community-based traffic and navigation app that provides real-time updates from other users. With the ability to report traffic accidents, road hazards, and more, the best route to take is just a download away.

SHOPKICK: Shopkick is a location-based shopping app that awards points, called "kicks," when users physically visit a retail location. Consumers who save up their kicks can use them for rewards at their favorite merchants.

to home; travelers locate restaurants near their hotel; and retailers discover customers near their store.

- Indoor Wayfinding: Indoor navigation is a compelling proposition, particularly in sprawling venues like convention centers, stadiums, airports, hospitals, shopping malls, and museums. Because GPS typically isn't suited for indoor use, several companies are developing alternative solutions. Wifarer and Meridian, for example, utilize venues' existing WiFi networks to determine a smartphone's indoor location. ByteLight, on the other hand, has designed special LED light bulbs that are equipped with location transmitters. With Bytelight, when your smartphone's camera "sees" the light, it knows where you are, even in areas that lack WiFi. In all three cases, the technology gives users turn-by-turn directions—to the restroom, a vending machine, an exit, or even a specific product or service, such as the cereal aisle at a local grocery store or the baggage claim at a foreign airport.
- Exploration and Engagement: The same technology that allows users to navigate venues can also allow users to engage with them. Meridian, for example, has worked with New York's Metropolitan Transportation Authority (MTA) to create an app for the New York City subway system, which is home to more than 200 works of contemporary art. Using the MTA's app, commuters and visitors can browse the art, learn about the artists, and get directions to their favorite works.
- Notifications: Apps also can deliver location-relevant offers and alerts. Using the concept of geofencing, whereby a digital "fence" is drawn invisibly around a neighborhood, district, region, or venue, such as Cowboys Stadium in Dallas or SoHo in Lower Manhattan. Apps powered by GIS companies like Geoloqi and Maponics can detect when you've entered a given area and send relevant notifications to your smartphone. For example, a shopping list when you arrive at the grocery store or a coupon for the Gap when you pass by it on your lunch break. Using "geotriggers" in combination with custom geofences, users can even program their phone to wake them up when they get to their bus stop, or to turn on the lights when they're almost home from work.

GOING PUBLIC

Although location-based apps have yet to gain widespread adoption in government and defense, the applications are just as vast in the public as in the private sector, according to Bhavin Shah, vice president of marketing and business development for Polaris Wireless, which provides wireless location solutions in three verticals: enterprise, emergency response, and law enforcement.

"The [location-based] technologies that are being developed right now have unlimited potential," Shah said.

Forward thinkers in the DoD have already recognized such potential. In 2011, for instance, the National Geospatial-Intelligence Agency (NGA) introduced its own app store featuring mobile apps for national security. Called the GEOINT Applications Storefront, or the GAS Station, it currently features around 100 apps, though NGA envisions there will eventually be thousands. Likewise, the U.S. Army in 2010 launched an "Apps for the Army" application-development challenge, which yielded 53 mobile apps, 25 of which were certified for Army use. The Army Software Marketplace followed, of which a beta version was launched in March 2012, with 12 mobile training apps for soldiers to use on smartphones or tablets.

Elsewhere in the public sector, the nature of government means adoption of mobile apps in general—and location-based apps, in particular—still lags.

"Government agencies are being left behind because the sophistication doesn't keep pace with the laws and mandates they have to adhere to," Shah said. "As a result, a police officer can do 20 more things on his iPhone than he can with the old Motorola two-way radio device he still carries around at work."

Along with legacy systems and laws, public-sector obstacles include fragmentation—government agencies deploy technology disparately and inconsistently—and security: Most commercial solutions aren't yet secure enough for sensitive military and government applications.

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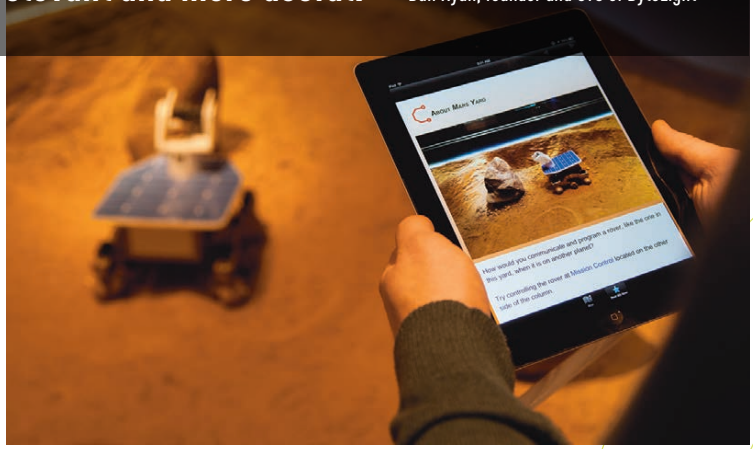

PHOTO COURTESY OF BYTELIGHT

BYTELIGHT'S *indoor location-based information is used to operate a personal exploration rover via iPad at the Mars Yard exhibit of the Museum of Science, Boston.*

Once those barriers are overcome, LBS will be primed to deliver on a larger scale a wealth of public safety and national security benefits, many of which already are being tested by early adopters. Using geofencing and indoor location services, for instance, law enforcement agencies with a special warrant could track criminals in a given area; the U.S. military could optimize base layout and logistics; emergency personnel could better and more quickly locate victims in a disaster zone; and local governments could issue real-time alerts to citizens about road closures, inclement weather, and public services.

PRODUCT PLACEMENT 2.0

We've all heard of return on investment, but because they yield location analytics, geospatially enabled apps promise a "return on location" for both consumers and enterprises.

Businesses, for instance, can more effectively target their products and services to the people that actually want them by recording where and when consumers check in, where they navigate to within a location, and how long they spend there.

"It doesn't matter if it's a Walmart, a Target, a bank, or a car dealership; everyone's changing their business model to … [match] the right people to the right product in the right place," Thompson said.

LBS also allows businesses to create new revenue streams by selling in-app advertising and identifying more business opportunities.

"One of our customers is a stadium," said Jeff Hardison, vice president of marketing and business development at Meridian. "We noticed that everyone at the stadium was searching for a water fountain [within the venue's app]. The management of the stadium had no idea [water] was in such demand. So they started selling bottled water next to the water fountains."

In early 2012, Foursquare completed an internal project that illustrates perfectly the value of location analytics: Using geofences supplied by Maponics, engineers analyzed Foursquare check-ins from across New York City to determine the character of places people were frequenting in various neighborhoods. Based on that analysis, they built profiles of each neighborhood for the purpose of comparison.

"Williamsburg and West Bronx are a very close neighborhood character match," explains Paul Gallagher, vice president of marketing and product development for Maponics. "If you're an advertiser who has a really good match with people in West Bronx, this allows you to say, 'Williamsburg is probably a good place for me to find the same type of buyer I'm trying to reach.'"

Next, Foursquare did the same analysis in San Francisco and several other U.S. cities. As a result, one could ascertain that the San Francisco equivalent of New York's East Village is the Mission Dolores neighborhood.

"If I have a product that's doing well in this local market, this allows me to see what global markets that's applicable to," Gallagher said.

The analysis is equally advantageous to consumers, who receive offers and experiences tailored to their interests in exchange for sharing their location.

"The consumer is inundated with information," Gallagher continued. "Whether it's emails or web articles or RSS feeds, there's just way too much information out there to make sense of it. People don't want to have to sift through it anymore. They want to receive only the information that's most relevant to them, and without being asked what that is. Without coming off as being Big Brother, [LBS] enables companies, businesses, and government agencies to leverage geographic data to read the consumer's mind and provide them with information that meets their needs in a timely fashion."

As location-based apps migrate further into government and defense, the needs being met won't just be social and commercial. Equally, they'll be civic and military, transforming the technology into a force for public good.

"The technology exists," Shah said. "Now the question is: How do we convert it into real-time actionable intelligence for government?"

The answer remains to be seen. However, one thing is clear: Despite the dystopian predictions of many a science fiction novelist, location technology won't further detach us from the physical environment. Rather, it will reunite us with it.

"Looking back at the last 15 to 20 years, we started interacting more with the world through our desktop computers, tethered to our home or office," Hardison concluded. "There on some level was less fascination with the physical world because the digital world was so exciting. Now, the physical world is interesting again because we can use our smartphones and other technologies to learn more about what's around us."

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PERCENT OF SMARTPHONE OWNERS USE LOCATION-BASED SERVICES

SOURCE: FLOWTOWN AND PEW RESEARCH CENTER

TO BE CONTINUED

Check out part 2 of this story in the next issue of trajectory, which will look at the use of mobile GEOINT in government.