New Lessons from an Old Location Technology

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The purpose of this short paper is to tell of a granddad. The patriarch is the 20 year old Automatic Packet Reporting System (APRS) developed and in widespread use by the amateur radio community. APRS is an ad hoc mobile communication protocol for exchanging location information between large numbers of mobile users. APRS's popularity has soared in the HAM community, not really because of the technology which is actually quite straightforward, but because of the new applications and capabilities it has enabled. This paper discusses three lessons from the success APRS that have implications for general location-aware computing.

I begin with an ARRS technology introduction. An APRS node consists of a GPS unit connected to an APRS codec box connected to a 144.39MHz VHF transceiver (in North America). Some modern transceivers have APRS codecs built in. Nodes send their position to other nodes. Nodes can also act as "digipeters" to relay packets and increase the network span. Many places have high power digipeters located on mountains or tall buildings. Full fledged APRS nodes using a PC-class device as the codec box can display maps showing the position and status of all nodes within radio range as well as send short text messages between nodes. Many digipeters are now hooked to the internet resulting in services like findu.com allowing anyone to query the position of any APRS node (Go ahead. Track my car. You know you want to. My call sign is KD7MTZ). Naturally, you must have an amateur radio license to run an APRS node.

Being an application workshop, the focus in this paper is on a couple lessons 20 years have revealed about location-enhanced computing and communication using APRS.

The power of location information comes not from knowing your position, but from sharing it. I usually know where I am, but APRS allows me to aggregate the location metadata of a particular group. For exactly this reason, APRS has made a huge impact on managing teams and events. I use it to estimate my HAM friends' positions while skiing. Search and rescue manages the operations of deployed teams. Marathon coordinators can see the positions the volunteers' lead and chase cars. APRS avoids some of the repeated calls for "What's your 20?" (i.e. Where are you?), the most frequent question in wireless communication. APRS has proven most effective with groups engaged in a shared task. The lesson for general location-aware applications is to look for applications involving a team with shared goals before applications focusing on individuals or unaffiliated groups.

There is no "killer" location-aware application. Rather, the utility of location information is in a collection of simple, low complexity applications. Over the years people have built hundreds of small apps around APRS ranging from weather stations which broadcast their position, to location tagged text messaging, to location annotated vehicle cameras, to the guy whose truck could be triggered when stolen to send the police a URL showing its position and heading. Taken together, these applications give APRS immense value and encourage development and deployment of the infrastructure, but few are significant enough alone to justify a private sector investment in equivalent infrastructure. The actions of commercial entities are consistent with this philosophy. Companies like Kenwood and Motorola which sell APRS-like infrastructure sell it only as part of massive integrated systems with many linked applications like Automatic Vehicle Location (AVL), 911 dispatch, and city-wide location-aware communications.

For privacy, try an off switch first. APRS users are allowed to blur the precision to which they reveal positions by reducing the number of decimal places in the reported latitude and longitude or more complex randomization. In practice, these features are rarely used. Most amateurs think it is far better to simple have an off switch. HAM radio enthusiasts are of course not representative users. Being technologists they may be less (or is it more?) concerned about privacy. Nonetheless, the lesson from APRS is that rejection of an off switch as a privacy solution must precede creation of more complex privacy mechanisms.

BIOGRAPHY

Jeffrey has been a member of the research staff at Intel Research Seattle since August 2004. His research interests are in employing devices, services, sensors, and interfaces so computing can calmly fade into the background of daily life. Specifically, he investigates location-aware computing and works on the Place Lab project.