EvoTag–An Innovative Device
for Child Tracking

❏   Shilpa Mahna Bhatnagar

India, as a nation, is struggling to provide a secure environment to its citizens. The security issues are spread across gender, age or social strata. Each segment of the society is working rigorously on finding solutions to these issues, in addition to training and sensitization. While on one side, the security of small children at their tender age worry almost all parents and guardians in the country, there is also a need to secure old parents, especially for those who have to travel away from them in search of better livelihood.

Statistics only aggravate the fear. In 2007, the statistics on child sexual abuse in India were staggering, at more than 53% (http://www.childlineindia.org.in/pdf/MWCD-Child-Abuse-Report.pdf). Every one child in two had faced abuse. And sexual abuse is just one of the types of crime against children, others being trafficking, kidnapping and involvement in juvenile crime.

As parents of young children or children of old parents, the constant dilemma is to safeguard the family members when they are not near or move out of the area of influence. Distances create insecurity and also make the victims more vulnerable. Prevention based on accurate alerts and immediate actions are the key to dealing with these issues.

Why Technology now?

So why use technology now? And which technology one should use to solve these issues? Well, the answer lies in the ongoing mobile device revolution in India. India is now the second largest user base of Smartphones, crossing US at 220 million users as per statistics by Counterpoint Research in 2016. The government and telecom companies are aiming to bring a digital revolution at doorstep of every Indian at low cost. So, a solution that can be bundled in Smart phones is preferable. In addition, the advent of IOT technologies, like Bluetooth low energy, allow devices to be worn, with radiation levels a thousand times lower than cell phones. The technology is being used as baby monitors for infants due to its safety levels. Combine this with broadband connectivity and penetration; desired information can be transmitted securely to any place in the world in almost real time.

The Evoxyz Made -in-INDIA innovation –Evolution 1.0 with EVOTAGs

Incepted in year 2014, Evoxyz Technologies, a micro location enabled IOT platform organization started building a solution that could address the security needs as applicable to all people with varied vulnerabilities. The solution platform is made generic, be it for children in school, elderly at home or for women at work.

In 2015, Evoxyz started deploying security solutions using Evotags, its Bluetooth Low Energy devices on Evolution

Figure 1: Evotags worn by kids – Provide live safety location tracking to parents

1.0 platform, and now has them running successfully in multiple locations.

Figure 1 shows the different Evotags and associated Mobile Apps that are deployed for different schools in NCR region, as part of a product suite called Evoschool. Students wear the tags, as either normal printed I-Card or more fancy wearable options. Using the Bluetooth low energy trackers in school and buses, the parents are able to receive and see live location of the child at all times on their smart phones, inside the school or on the way between home and school. In addition to this, a patented complex algorithm runs a rule based system and alerts the school administrators in case of any suspect of a security incident. So, if a child's location is found anomalously different from that of her classmates or at a location forbidden for students, the alert to administration prevents a security incident. If the child disembarks from the school bus at a location different from designated bus stop, an alert is sent to administration and parents. Parents view live location of school transport too on their Smartphones. Since all data and processing is done in a secure cloud over the Internet, there is no need to maintain computer servers in school for this capability. In addition, Evoxyz is able to manage the solution remotely.

The same Evotag was subsequently enhanced for personal use as well.

Evotag in different form factors
Small and sturdy

Linked with smartphone
Get Alerts

Safe to be worn
by kids

Same Evotag configured for different uses

Motion Sensors
inbuilt

Figure 2: Evotag useful for many uses through smartphone

Figure 2 shows how the same Evotag could be used for different purposes. So, if you are worried about losing your child when playing in the park or when visiting a mall, just use Evotag as a badge on your child and switch it on using your smartphone. The smartphone will alert you if the child moves away by a certain distance from you. Due to its motion sensing capabilities, the same Evotag when attached to the door can be activated as a watchman in the night. If there is a slightest movement of the door in the night, the Evotag will ring your phone.

Evolution 1.0 platform was developed with focus on micro location tracking, but with its ability to track the indoor and outdoor location of humans or devices precisely, is now being used for multiple purposes.

The Innovation Journey

As a part of the platform development various technologies were evaluated and integrated within the platform to meet wide variety of needs and audience. The initial focus was to provide solution to security issues, especially for children.

Evoxyz realized that the first step towards incident prevention is identification and communication of circumstances that could cause a security incident. Location is a key parameter of identifying any scenario. Thus precise identification and communication of location became a key decision maker in usage of the technology.

It is important that we communicate a precise micro location to the relevant stakeholders to take actions well in time. GPS has been established in the location technology field for quite some time with a phenomenal set of applications developed by organizations like Google. The key limitation of GPS is that it works well outside any premises, but it is unable to provide accuracy in indoor locations. To cover security issues, a technology that could map precise location to the level of few meters in indoor premises was needed. Thus, technologies like RFID, UHF, Wi-Fi and Bluetooth Low Energy that could detect user proximity were considered. For accuracy, software algorithms were considered which could help in identification of precise location.

Did it mean that GPS could not be used at all? The answer was negative. Each technology has benefits and limitations. Doing away with one technology and only focusing on others was not the right approach. GPS is a matured technology and works with extreme reliability in the outdoor locations. Hence a hybrid approach of GPS plus Indoor technologies is the answer to detecting the accurate and precise location of a user.

Subsequently, Evoxyz decided to map and use technologies based on use cases and the segment of users and areas where are to be deployed. All technologies are integrated in its IoT platform, called Evolution 1.0, so that it can service all use cases.

- Passive RF ID is a mature technology that is able to detect the identity of the person by means of an ID card and a RF reader. RF reader is a device that detects the user ID card uniquely and has the capability to send the information to any computing server for further analysis and actions. It can connect to the Internet through different mechanisms, for example, Radio Access Network, Wi-Fi or Ethernet. When a precise location of the RF reader is configured, the location of the person with the RF ID card can be associated as well. The technology is stable and cost effective. However, the problem is that it provides only point-in-time location, since it provides location information only when user swipes the card on the reader. Another problem for this technology is that it depends on manual intervention of swiping, and so in case the user is still in the proximity but has not swiped the ID the location will not be detected. This is particularly a concern area for small children, who are not expected to swipe at all instances.

- Technologies like Ultra High Frequency and Active RF ID reduce the issue of manual intervention like swiping of the ID as they have the auto detect capabilities. However, the distance range of detection of the user is still small, and hence many readers are needed to cover an indoor complex. In addition, an active RF ID consumes considerable power.

- Bluetooth Low Energy (BLE) provided solutions to most of the issues. It is a very low emitting, continuous broadcast location that keeps broadcasting information and are detected at higher distances. Due to low energy in transmission, the battery life runs from months to years. The readers detect RSSI value to provide an approximate distance. However, accuracy based on RSSI is limited due to BLE signals being susceptible to reduction of signal power due to any material between the tag and the reader. Evoxyz overcame this issue by developing complex software algorithms and estimate accurate distance based on readings from multiple readers in the same indoor complex.

Technology Innovations are not limited to an industry

As summarized above, a beneficial characteristic of BLE as a technology is that it is extremely low energy radiating and hence bears negligible health hazards. This enables the technology to be used for all, right from newborn babies to elderly people, and from small devices to large machines. From the technology standpoint, these IOT devices are future proof as they can easily be clubbed with sensors that detect body temperature, motion, and even heart rate in addition to transmitting its identity. This makes them ready for more use case like heath devices, intrusion detection, asset management and cold storages.

While lot of organizations and researchers are working on the BLE based IDs and have fair share of success, Evoxyz invested in complex algorithms in BLE Readers through which the accuracy of location inside a premise is achieved.

Today, Evoxyz is the one of the top organizations in the world transmitting accurate real location of children to their parents. The Evoschool App shows the child's footsteps moving around in the school from one location to another, inspired by Harry Potter's Marauder's Map. The Youtube video of Evoxyz's Evoschool solution deployed in a Gurgaon school, comparing it with Marauder's Map, has generated interest not only in India but also in many other countries.

Evoxyz is now building a complete platform around this technology that is a combination of hardware, software and intelligent algorithms. It collates IOT data with location information and presents it to solution providers like logistics supply chain managers, and Health care providers to take intelligent decisions.

A technology initiative that started with Child Security in schools is now taking giant leap to provide the same benefits to other industries as well.

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Author is CEO and Co-founder of Energy Technologies.
She can be contacted at email: shilpa@evoxyz.com