

## TECHNICAL BRIEF

### Origins of using Bluetooth Low Energy for Indoor Localization

The Bluetooth Special Interest Group (The SIG) governs the Bluetooth standards including what they do, how they work technically, certification and interoperability, branding, and standard evolution. They have been in business for almost twenty years. In 2009, the SIG announced its version 4.0, including Bluetooth Low Energy (BLE). The SIG's goal with Bluetooth Low Energy (BLE) was to enter the emerging low-energy IoT market, creating a standard that would allow devices to run for years on very low power. BLE was a radical departure from what is known as Bluetooth Basic Rate / Enhanced Data Rate (Bluetooth BR/EDR), or Classic Bluetooth, introduced in the late 1990s and used in handsets, speakers, earphones, car kits, etc.

As such, the BLE standard was never conceived as a localization tool but the idea that it could be used to create "iBeacons" (in the case of Apple) to identify position was put forth in early 2012. This idea was not driven or standardized by the Bluetooth SIG but it nevertheless took hold and somewhat fed upon itself to create a hype-cycle of capabilities way ahead of the physics and practical world limitation. During this enthusiasm, many prominent companies including IBM and Google jumped on the bandwagon because the idea of being able to accurately identify a cell phone (and its owner) inside a building (such as a shopping mall, museum) sparked the imagination of marketers for new methods to track consumers, advertise products and create new services. However, as time progressed, reality took hold. In the case of Google, this disappointment was compounded by the inability of the giant to get the rights to indoor mapping databases - owners of these maps were suspicious of Google (having seen what had happened with rapacious way Google drove Google maps). This made the whole indoor mapping space suddenly uninteresting to Google and it essentially pushed its indoor localization activity into the margins.

After this hype-cycle was over, it became clear that beacons could enable more limited "proximity-aware applications" for customers, businesses, and industrial environments. Pushing proximity data into the cloud and then using it to create value was the new approach.

#### BLE localization research at the majors and how and when they "gave up"

IBM was exploring the use of BLE beacons for indoor localization. One of the approaches that was discussed was particle filtering, however, the team has not made much progress with the product so far. This is because they are currently relying on the user phone to receive the RSSI values and do the "magic" to obtain user location. However, localization no longer seems to be the top priority of IBM anymore due to failed attempts at getting a highly accurate system. No "A" team is working on an indoor localization project. It is mostly interns that are assigned the task to explore BLE beacons for indoor localization. This is because tackling indoor localization is a challenging problem and it can be only tackled by thoroughly understanding the problem and putting both theory and practical experience into use.





Google Inc. came up with Eddy stone protocol for BLE based indoor localization and proximity detection. However, just like iBeacons based systems, this cannot guarantee a highly reliable and accurate indoor localization system. In 2017, Google moved away from BLE and is now exploring the experimental idea of a visual positioning service that would rely on Tango cameras to triangulate the user location. However, relying on visual sensors may not be ideal due to privacy concerns particularly in areas like hospitals. Furthermore, equipping every single entity with such 2 expensive sensors are not feasible financially. The company despite announcing in 2017 the plans to launch the product has not made any tangible progress to the best of our knowledge, indicating probable problems with the product.

Apple, the pioneers of iBeacons, has also been relatively quiet about indoor localization. When iBeacons were launched in WWDC 2013, they were considered the game changers for indoor localization. However, it was very soon realized that iBeacons are more suitable for only proximity detection rather than indoor localization. As mentioned earlier, tackling indoor localization is a challenging problem and it can be only tackled by thoroughly understanding the problem and putting both theory and practical experience into use.

All these companies are not primarily dedicated to indoor localization and the approaches that they rely achieve accuracy in the range of 5-10 meters which is appropriate for certain applications or industries which do not require high accuracy and merely obtaining the proximity will suffice.

### Conclusion

In summary, for both technical and commercial reasons, the majors have moved on and this creates an ideal window of opportunity for a technologically deep and business savvy team to address this fundamental gap in the market.

*TrakPoint Solutions, Inc. located in San Diego, CA is a technology company offering a hardware-supported, cloud-based, B2B SaaS service to indoor facilities for electric tracking of critical assets. TrakPoint eliminates the need to rely on the customer's WiFi or network infrastructure by utilizing an independent IoT network with cellular backhaul. This advanced technology is the only solution designed to provide economic, reliable indoor asset tracking with guaranteed accuracy and performance. For more information on TrakPoint Solutions or InsideTrak, please go to [www.trakpointsolutions.com](http://www.trakpointsolutions.com) or call 1-888-650-TRAK.*

