Q&A for Tech Talk Topic: Bluetooth 5.1 Angle of Arrival

Q: When do you see AoX coming to smartphones?
A: It's difficult to predict because smartphone roadmaps are closely guarded. We are not aware of any smartphones today that support it.

Q: I'm using UWB for sub-meter tracking, and it has very short battery life. Do you think AoA could be a better option?
A: UWB can provide very good accuracy for RTLS systems, but AoA technology should provide you with a lower price point and much better battery life.

Q: Does Silicon Labs plan to offer an AoA SDK with an antenna array?
A: We have a reference design for a 16-antenna array with the accompanying SDK available today for alpha customers, but it is not publicly available yet.

Q: What is the range for AoA?
A: Indoor range can be 30-50 meters, depending on floors, walls, furniture, etc. Outdoor range can be as much as 100-200 meters.

Q: How does the antenna discriminate between the desired signal and reflections due to multipath?
A: Most of this is done using complex filtering on the raw I/Q data.

Q: How does AoA achieve sub-meter accuracy using signal strength? What if it is worn on a body?
A: A typical AoA system will combine data from multiple locators to triangulate/trilaterate to a precise position rather than relying on RSSI. An RSSI based system can only provide accuracy of 5-10 meters.

Q: Where can I find docs about how to do a RTLS with your products?
A: You can start learning basics from here: https://www.silabs.com/products/wireless/learning-center/bluetooth/bluetooth-direction-finding. And you can always contact your closest Silicon Labs office for more information.

Q: Is it possible to use AoA without stationary locators? Could AoA provide a relative position of mobile locators/beacons?
A: Yes it is possible, but much more difficult. The azimuth and elevation is always relative to the array, so you need to know the precise position and orientation of your array.

Q: To engineer a system in a large warehouse area, is there technical information on how to cover say for example, 50,000 square foot?
A: The rule of thumb is that every asset should be seen by three locators. The density of locators depends on the maximum distance between the asset and the locators which depends on the link budget. We typically recommend locators every 10-20 meters, or even closer if you need better accuracy. Unfortunately every space is different so its not a straightforward answer.

Q: How is the accuracy of AoA impacted by walls, elevator shafts, building floors, metal studs, etc. What is necessary to maintain 1 meter accuracy?
A: As long as we can receive the CTE beacon we will be able to provide a computed angle through our library. As with any RF, corruption of the beacon can occur if there is interference, a weak signal, etc.

Q: Could you triangulate using the Silicon Labs BLE modules?
A: On the locator side we recommend using a chip-down design since it needs an antenna array. On the TX side (asset) you can definitely use a module.

Q: In asset management, is it preferable to use the connection-oriented or connectionless communication?
A: This decision has trade-offs and depends on the specific use case, but AoA will support either approach.

Q: Could you give me an idea how many assets could be simultaneously tracked and an idea of the location update rate?
A: It depends very much on the update rate, but we believe one locator can easily track hundreds of tags.

Q: If the device is AoA&AoD then it is BLE 5.1 right? So why are you mentioning BLE 5.2?
A: The BG22 chip also supports some Bluetooth 5.2 features, but you are right the AoA/D features were introduced in Bluetooth 5.1

Q: Can we download the presentation?
A: All of the previous Tech Talk presentations and videos are available at https://www.silabs.com/support/training

Q: How big is the antenna array board?
A: Our current antenna reference design is a 4x4 array which is 17x17cm.

Q: Who can I contact regarding samples and keeping us up-to-date with the reference design?
A: Contact your closest Silicon Labs office using the list at https://www.silabs.com/about-us/contact-us

Q: Is the Quuppa solution compatible with 5.1, or is it proprietary?
A: It's a proprietary solution, but based on BLE radio.

Q: Will the “Works With” conference offer virtual sessions?
A: We will evaluate this as an option over the next few weeks/months.

Q: Did you say if the BG21 supports AoA or not?
A: The BG21 does not support AoA/D. The BG22 has some radio improvements that are not in the BG21, that significantly improve the accuracy of AoA.

Q: Can AoA direction finding and BT mesh be used together at the same time?
A: Not at this time

Q: What is the cost expectation for AoA readers? Tags should be cheap.
A: Certainly the locator will be more expensive than the tags, but cost will of course always depend on other features in the locator. The BG22 chip itself is the same.

Q: How do I get access to gerbers for the antenna reference design.
A: This can only be provided under NDA at this time. Please contact your local Silicon Labs Salesperson or rep.

Q: Which method (connection-oriented vs. connectionless) is better for battery life?
A: All other things equal, connectionless is better for battery life because fewer packets are transmitted.

Q: The BG22 can do OTA updates, right? How is it protected from hacking? -- e.g. Trust zone, etc.
A: You can review the BG22 security features at www.silabs.com/security or tune in to the security session on April 14th.

Q: Can you tell us the current consumption in an example AoA Tag?
A: As you know, this depends on multiple factors but one example we've measured on the BG22 uses an average of just over 2uA when advertising every 5 seconds.

Q: What am I losing if I use connectionless AoA? I know this is a trade off.
A: You will give up the ability to exchange two-way data and the data privacy which is provided by encryption in a system using connections.

Q: If the AoA function only provides angles in one dimension, how can the system triangulate a position in three dimensions?
A: To perform triangulation, multiple locators are necessary.

Q: Is there any limit to the motion of the asset tag?
A: Not really, but the faster it moves the more often it should transmit in order to provide accurate position, and this is a trade-off with battery life.

Q: Is there a roadmap for a dual-core version of the BG22? This would allow for some of the I/Q crunching at the edge and minimize network traffic.
A: We cannot discuss future roadmaps in this public forum. However, it's important to note that the BG22 is capable of performing angle calculations internally at a rate of several angles per second.

Q: When are the BG22 based pre-certified modules going to be available?
A: The BGM220 modules will be available in late Q2.