Comments from the UWB Alliance
to the
Communications Regulatory Authority, State of Qatar
Public Consultation on
Position Paper on IoT and M2M in the State of Qatar

About the UWB Alliance

The Ultra Wide Band (UWB) Alliance is a global not-for-profit organization that works to collectively establish ultra-wideband (UWB) technology as an open-standards industry. A coalition made up of vendors that either design, manufacture, or sell products that use ultra-wideband technology, the UWB Alliance aims to promote and protect the current allocation of bandwidth as well as promote the continuing globalization of the technology. As part of our mission, we advocate UWB technology and use cases to promote verticals showing the value of UWB for IoT and Industry 4.0 and to build a global ecosystem across the complete UWB value chain, from the silicon to the service. In addition, the Alliance is promoting and assuring interoperability through its work with Standards Development Organizations such as the IEEE and ETSI and then working with members to define upper layers and testing to assure compliance. For more information, please visit us at www.UWBAlliance.org.

Introduction

The Ultra Wideband (UWB) Alliance thanks the Communications Regulatory Authority (CRA) for the opportunity to provide comments on consultation[1]. We commend CRA for recognizing the importance of Internet of Things (IoT) and Machine to Machine (M2M) communications. We applaud the undertaking to provide guidance to the IoT and M2M ecosystems. The position paper covers many of the essential applications and technologies available, while omitting some that we feel are critical and widely used for IoT and M2M. In these comments we provide some additional information on technologies and applications we believe should be included in consideration when developing future strategy and policies for IoT/M2M.

We encourage CRA to include UWB as a key technology in the IoT/MTM ecosystems. UWB is already an established IoT/M2M technology and is growing rapidly. We offer in this submission information on UWB in the context of IoT and M2M to assist CRA.

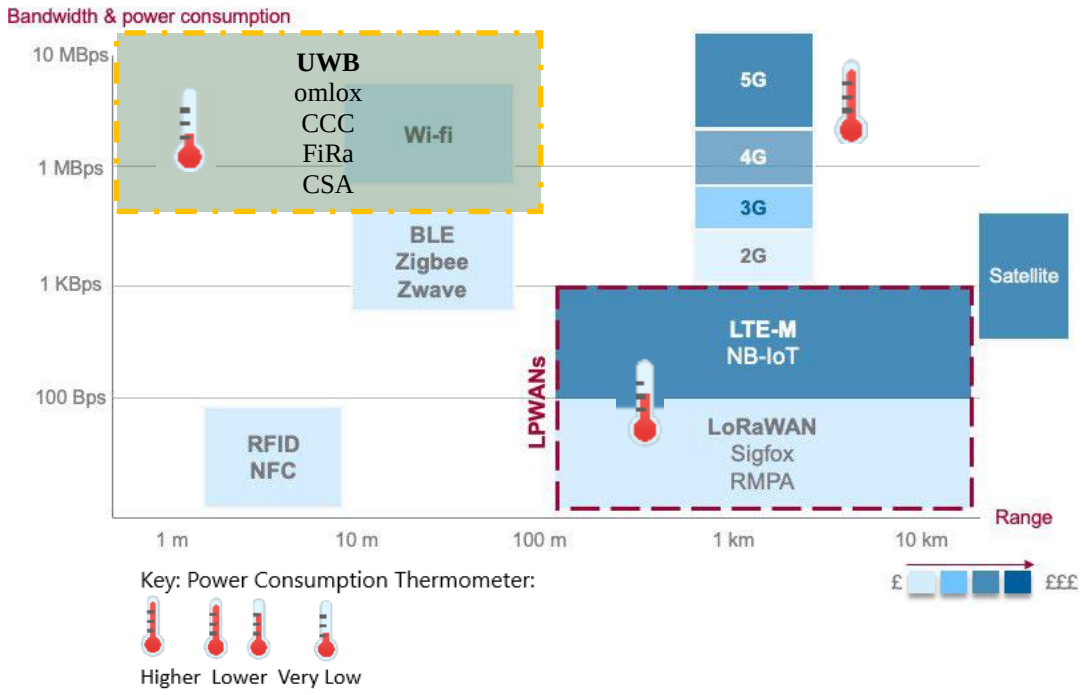
The topic of IoT is complex due to the vast diversity in the kinds of "things" that can fall under IoT and M2M communications. There are many kinds of IoT devices with very different uses and performance requirements that require very different technologies. Key to successful growth in the future is to recognize and plan for many different technologies, often operating in a common physical environment, each optimal to a different set of uses and users. For wireless IoT this is critically important to achieving optimal spectrum use. Using a technology where it is not well suited is inefficient use of the spectrum. Using "the right tool" for a given application can be far more efficient and effective.

Technologies for IoT Connectivity: consider Ultra Wideband

In addition to the technologies listed, we urge CRA to consider UWB in the mix of IoT technologies. UWB is presently used widely in many of the use cases and categories of uses identified in the position paper. UWB provides several unique capabilities, including highly precise (centimeter-accurate) range and location, extremely low interference footprint, high spectral reuse, and moderate data rate communication with very low energy consumption. UWB is optimal for precisely locating and tracking assets, people and other things. UWB is also being applied for accurate sensing, and moderate data rate low latency communication. More details are given in the Use Cases section of this submission.

[1] Public Consultation - Position Paper on IoT and M2M in the State of Qatar, https://www.cra.gov.qa/en/document/position-paper-on-iot-and-m2m-in-the-state-of-qatar

In the following figure we show how UWB fits into Figure 2 of the position paper "Map of Radio Technologies Against Bandwidth and Range" as shown:



UWB does not completely fit the traditional trade-off between bandwidth, data rate and power consumption. We've added the thermometer icon to the figure above to depict power consumption. UWB can deliver moderate data rates at very low power consumption – closer to RFID and NFC and typically much lower than NB-IoT or LoRaWAN.

UWB utilizes bandwidth to achieve communication links at extremely low transmit power, many orders of magnitude below traditional radios such as RLAN or NB-IoT. Standards-based UWB[2] can provide up to 30 Mbit/sec.

Another important consideration in achieving efficient use of spectrum is the interference footprint created. This affects spectral reuse, the number of devices that can operate in a given area, and the diversity of uses possible in a given band. The traditional way to increase link distance (radio range) is to increase power. This also increases the impact footprint greatly, which reduces overall efficiency of spectrum utilization.

Because UWB is limited to extremely low transmit power, high power is not an option. Innovative implementers have found other ways to achieve moderate range (e.g. 100 meters for ranging and

[2] See IEEE Std 802.15.4-2020 and IEEE Std 802.15.4z-2020, which is the most widely used standard for UWB.

data) by other means. For example, a typical UWB implementation can achieve ~30 Mbit/sec data rate at 10 meters, and a ~1 Mbit/sec data rate at 100 meters, without increasing the interference footprint (using the same transmit power).

Use Cases

With reference to Figure 4: Use Cases of Particular Relevance to Qatar, we note that UWB is used in many of these use cases and use case categories.

In the following we describe how UWB fits into the categories identified by CRA. In addition to the large number of important use cases identified by CRA in the position paper, we include some additional use cases that CRA did not enumerate but may wish to consider.

Connected Cities and Transportation

Increasingly UWB is becoming available in consumer and commercial motor vehicles. UWB for the digital key provides secure access control to vehicles. UWB precision sensing capabilities that are being used effectively and efficiency for presence detection: For example detecting the presence of children or animals left in the vehicle. The extremely low transmit power used for UWB sensing exposes occupants to significantly (orders of magnitude) less energy than other RF solutions. These innovations are available now many vehicles and are expanding across the industry and model lines.

In addition to access control (digital key) and presence detection of occupants, UWB can provide precise navigation augmentation. UWB provides centimeter-accurate ranging and localization, greatly augmenting precision provided by satellite navigation. UWB can be used indoors or in other environments where clear view of the sky is unavailable. The precision of UWB is being used for smart parking applications, where guidance to a specific parking spot (sub-meter accuracy) is required. Another application where UWB will excel is plug-less EV charging, where alignment of the vehicle with the charge coupling must be very precise.

UWB can provide very precise vehicle-to-vehicle ranging and relative positioning as well as location referenced to roadside infrastructure. In regions that allow UWB use with outdoor infrastructure, UWB use can expand to augment traditional navigation with high precision in smart city uses such as smart traffic.

UWB has been used in rail systems, providing precise location of trains and train cars, both relative to infrastructure and to each other.

Connected Industry and Related Logistics:

Locating things precisely is the traditional use of UWB. UWB provides a unique capability to locate and track in real-time with centimeter precision. UWB has been widely used in factory and

supply chain logistics to track parts and other assets such as tooling. These are often very large-scale facilities such as automotive and aircraft factories. UWB is also widely used in tracking cargo and for inventory management. UWB is widely used in very low power RFID tags.

The capability for high precision and high dynamic real-time accuracy of UWB has enabled a new generation of automation in warehouses, providing very precise indoor navigation of automated vehicles ("package pickers").

UWB is also useful in industrial settings in providing access control within a facility as well as monitoring the location of personnel. This can be an important assist in lone worker safety and security. In addition to indoor navigation, which can assist personnel, very precise ranging is used for automatic "hands-free" access control to achieve higher integrity and authentication than is possible with other technologies.

UWB is being used in agriculture applications where precise range enables accurate relative positioning of farm vehicles such as tractors and trailers for more efficient operations.

Connected Healthcare

UWB systems have been developed and are in use in healthcare for monitoring patient vital signs and detecting patient movement. UWB can be used for non-contact measurement of vital signs such as heart rate and respiration rate. UWB is also used widely for asset tracking, which in hospitals and healthcare facilities is used to track critical equipment.

Connected Sports

UWB is used in professional sports to do real-time location of players and things. In US professional football, the graphics showing the trajectory of the ball precisely and the precise track of a player are provided by a system using UWB ranging and communication. Similar systems are being used in European football leagues for the same purpose, and such use is expanding.

UWB is deployed in wearable devices such as smartwatches and AR/VR devices. In addition to providing accurate tracking of player motion, UWB can augment other technologies such as RLAN to carry data such as low-latency audio. UWB can provide uncompressed high-definition audio with lower latency than conventional wireless, at lower energy consumption. This makes UWB also ideal for low latency human interface devices such as gaming mice and keyboards.

The use of UWB in smartwatches and fitness trackers enables a new level of precision for sensing uses such as heart rate monitoring. This is an area where we see potential for significant innovation and growth.

With the high-volume deployment of UWB in smartphones, other applications in sports events are possible such as navigating within the stadium, monitoring foot traffic and providing smart guidance to event attendees. This can be an integral part of future "smart stadiums".

Connected Business and Homes

With the inclusion of UWB in smartphones and consumer devices, UWB provides the "find my things" capability that enables smart home assistants to answer the question "assistant, where are my keys?" As the UWB-enabled smartphone becomes the digital key, UWB will also make this question obsolete[3].

UWB has become the standard technology for access control in vehicles (digital key) and is growing rapidly for the same use in smart buildings. UWB-based systems have been deployed in hotels for secure hands-free keyless access to elevators and rooms. Several systems have been developed for exterior smart locks that provide both secure and convenient hands-free entry to industrial buildings and homes. Currently, UWB sensing is being introduced in vehicles to detect left behind children and pets.

UWB-based sensing can be used to optimize HVAC control based on the presence of people inside a room, office or other space. Innovation such as this can lead to significant reduction in energy usage, and resulting positive environmental impact.

Detecting the presence and location of people in a building can also be used for alerting people of potential hazards and to detect unauthorized entry into an area.

UWB is being used in smartphones for secure payment systems that use precise ranging to improve authentication integrity. This is being used in retail sales, providing wireless and touch-free checkout.

Policy Considerations

As noted in our comments to the prior consultation on updated version of the Class License for Short Range Devices, we endorse the efforts of the CRA in updating the rules for operation of UWB. As noted there we encourage CRA to adopt the latest updates in the ETSI EN 302 065 series of standards and consider future updates as these standards continue to evolve.

We ask that in considering the long-term strategy for IoT and M2M, CRA consider the value UWB provides and avoid allocations for other technologies that disrupt the existing users such as UWB. Some of the technologies included may require dedicated allocations of spectrum and/or use

[3] To be replaced with the question "Assistant, where is my phone?"

power levels that are incompatible with other uses over a large area. We encourage CRA to recommend limitations that ensure the greatest diversity of use of the bands.

Preserving the usability of spectrum for extremely low power, low interference UWB can provide great value, and encourage innovation that achieves the greatest value from the available spectrum.

Conclusion

We commend CRA for taking this leadership role in IoT and M2M and encourage expanding the position paper to include other widely used technologies such as UWB.

We again thank CRA for this opportunity.