1. Emerging Technologies – Review Table

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Question** | **Technology Candidate Response** | | **Working Group Response** | |  |  |  | | --- | --- | --- | | **Green** | **Amber** | **Red** | |
| **Infrastructure** | **User** |  | **Status** |
|  | Where has the referral come from? | Sigfox  <https://www.sigfox.com/> | Commissioner of Irish Lights. |  |  |
|  | Name of technology and product name | Sigfox | Sigfox is a low power, long range, low speed communication technology. |  |  |
|  | Functional description | Sigfox is a Low Power Wide Area Network (LPWAN) technology specially designed for the Internet of Things (IoT). End Devices (Monitoring devices, sensors) consume little power and operate over large distances (>100Km over sea). These devices transmit over unlicensed ISM Band frequencies and are received by a network of Sigfox Basestations.  Messages are then sent over telecoms bachhaul links / connections to the Sigfox cloud server.  Users connect to the Sigfox cloud servers via an API to receive / transmit their data | The Sigfox business model takes a top-down approach. The company owns all of its technology, from the backend data and cloud server to the endpoints software. SigFox is essentially an open market for the endpoint devices. Sigfox gives away its endpoint technology to whatever silicon manufacturer or vendor wants it but it still needs to be Sigfox certified / compliant.  Large manufacturers like [STMicroelectronics](http://www.st.com/web/en/home.html), [Atmel](http://www.atmel.com/),Murata, [Texas instruments](http://www.ti.com/) make Sigfox radios transceivers. |  |  |
|  | Proposed user group | Lighthouse Authorities / Ports / AtoN Providers | Currently commercially available in many sectors. |  |  |
|  | What are its Key limitations | Limitations on amount of transferred data and frequency of message sending. | Suitable for transmitting sensor data with of maximum size of 12 bytes, with devices sending messages 6 times per hour or less.  Not suitable for continuous real-time streaming of data (like Internet data traffic). |  |  |
|  | Where is it currently used (geographic and/or industry)? | Sigfox coverage networks are currently live in many countries in Europe, South Korea & Japan and a small amount of other countries globally (over 60). Also plans to roll out the service in many other countries globally. <https://www.sigfox.com/coverage/> | Some of the countries that Sigfox is currently live in doesn’t have full country coverage (example UK) |  |  |
|  | How is it currently used? | Widely used for collecting sensor and other small data, from often battery operated end devices.  Can also be used for sending command & control messages to devices. | Supply chain & Logistics, Manufacturing, Smart Buildings / Cities, Utilities and Energy, Agriculture sectors  <https://www.sigfox.com/use-cases/> |  |  |
|  | How could it be used within the maritime sector? | Enables efficient battery powered data collection from infrastructure deployed over very large areas.  Minor Navigational equipment infrastructure telemetry or field sensor equipment monitoring / remote resetting (example: meteorological equipment). | Sigfox has been proven as a reset switch on remote devices e.g. dataloggers on AtoN buoys equipped with MetOcean sensors. Previously these required a physical visit if a reset was needed. This function is also possible at lighthouses. See Q27 for cybersecurity advice. |  |  |
|  | Who developed it? | The technology developed by two Frenchmen in 2009. They then setup Sigfox (start up company) | Sigfox is now owned by UnaBiz Technology |  |  |
|  | Is it commercial, non-commercial or military? | Sigfox is a commercial provider where is each connected end-point device pays a subscription to use the network  Sigfox devices transmit in unlicensed ISM Band frequencies |  |  |  |
|  | Is there an existing technology that meets the same requirements?  If so, what make this different? | LoRaWAN is a similar LPWAN technology (non-cellular IOT technology) that can operate over the same unlicensed ISM Band frequencies. Sigfox uses a different modulation and lower bandwidth  Nb-IoT technology also caters partly similar use cases. It is cellular (licensed spectrum) based but has higher device energy consumption and shorter communication ranges. Usually provided by an existing mobile operator (example Vodafone)  There is also commercial satellite IOT technologies emerging (Swarm and GlobalStar) and competing for the same business | LoraWAN has a higher data payload. There are not many commercially available LORAWAN networks available. Users may have to install and maintain their own network. |  |  |
|  | Ease of implementation? | Large selection of ready to go development end device solutions available which are Sigfox certified to use the network. | User monitoring platforms can easily connect to the Sigfox backend via API’s over the internet (Https) |  |  |
|  | What are the constraints for implementation? | Very low data transmission  Low frequency of transmission | Some countries don’t have a Sigfox network available |  |  |
|  | what is the capability of the technology? (i.e. nominal range; data throughput; support for audio / video?) | Communication range over the water / on sea > 100km from base station (depending on base station installation height), but that can be much less in Urban areas (20Km)  Two-way data communications available.  Data throughput very limited: device can send messages maximum 6 times an hour.  Message payload can contain 12 bytes on the uplink (end device to cloud backend) and 8 bytes on the downlink of data. | Not suitable for Video / Audio / File transfer. |  |  |
|  | What is the scalability of the technology? | Sigfox network can support a very large amount of sensors / end devices (millions). |  |  |  |
|  | Is the technology backward compatible? | Yes |  |  |  |
|  | Is the technology dependant on another technology? | No specific dependencies. |  |  |  |
|  | Can the technology be demonstrated? | Yes in countries where the Sigfox network is currently live. Equipment commercially available |  |  |  |
|  | Are there any results and test bed? Please List | <https://www.sigfox.com/sigfox-unabiz-taiwan-iot-testbed/>  <https://onlinelibrary.wiley.com/doi/abs/10.1002/itl2.74> | None found in the Maritime sector |  |  |
|  | Is there a compliance summary? | Yes,  <https://build.sigfox.com/certification> |  |  |  |
|  | Are there legal issues associated with the implementation of the technology? | No |  |  |  |
|  | Are there any intellectual property rights (essential patents) associated with the technology? | Sigfox’s base stations and infrastructure is protected by its own patents. |  |  |  |
|  | Is the technology safe to use [note – safety could be understood in different ways] | Low power transmissions, minimum radiation (safety related to humans)  Sigfox has designed security features into the system from the start but payload may not be encrypted over the radio link. |  |  |  |
|  | Does the use of the technology require extra training? | Like with any new technology a certain level of training is required.  Once the user solution is developed, the Sigfox solution is straightforward to rollout. | Sigfox’s cloud based back-end provides an easy to use web interface for device management |  |  |
|  | Are there environmental considerations with the technology? | End devices use very low power and can easily added to existing solutions without having to increase battery systems.  End Devices are usually of small size | Commercially available units available for asset tracking (bicycles ) |  |  |
|  | What are the financial considerations for implementation and use? | Cost of end device connectivity (subscription) to Sigfox network typically between €6 and €13 per annual  Each end device typically less than €100 but depending on complexity / use case  Costs associated with development of an end use device if not already available  Costs associated with developing an user platform system to display information | There is some cloud based platforms that can be used to display user data  <https://thethings.io/sigfox-dashboard-iot-platform/> |  |  |
|  | Is the technology secure (i.e. protected against hacking; privacy of data)? | Sigfox has designed a number of security measures to protect against hacking but in its basic form the payload is transmitted from the end device over the radio link without encryption.  Sigfox does provide an extra option of payload encryption over the radio link (AES128)  Connection between cloud based backend and user platform is via the internet and uses secure https protocol | Users can also implement their own end to end encryption  Can be susceptible to replay attacks over the Radio link  Applied Cryptography Group did a report on Sigfox security issues  <https://eprint.iacr.org/2020/1575.pdf> |  |  |
|  | Readiness (EU Technology Readiness level - TRL) (level of maturity of technology) | The Sigfox has been commercially available for > 10 years |  |  |  |
|  | Can you provide independent References | <https://www.sigfox.com/references/> |  |  |  |