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? | LoRa Alliance  <https://lora-alliance.org/> |  | Noted |  |
|  | Name of technology and product name | LoRaWAN |  | Noted |  |
|  | Functional description | Wireless IoT data transmission and IoT device network technology.  Provides long communication ranges (100-200km on sea) together with extremely low energy usage (25mW). | Enables low-cost and battery operated sensor communications and data collection over very long distances, with battery lifetimes up 5-15 years. |  |  |
|  | Proposed user group | Maritime signalling equipment infrastructure condition monitoring. [Use case] |  | [may not] provide a tool to interact with vessels |  |
|  | 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 50 bytes, with device sending messages once per minute of less often.  Not suitable for continuous real-time streaming of data (like Internet data traffic). | Range and data rate may be inversely proportional (commend from D Love) |  |
|  | Where is it currently used (geographic and/or industry)? | LoRaWAN technology and LoRaWAN networks are deployed today globally, see <https://lora-alliance.org/> | LoRaWAN technology is used widely over most industry sectors, including: energy, electricity, water, logistics, smart city, environment. | Noted – see comment re Sigfox (similar technology) |  |
|  | 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. | Currently rarely used in the maritime environment |  |  |
|  | How could it be used within the maritime sector? | Enables efficient battery powered data collection from infrastructure deployed over very large areas, for example from maritime signalling devices. |  | [noted – Finland does not yet have own test carried out] |  |
|  | Who developed it? | The LoRa Alliance® is the fastest growing technology alliance. A non-profit association of more than 500 member companies, committed to enabling large scale deployment of Low Power Wide Area Networks (LPWAN) IoT through the development and promotion of the LoRaWAN® open standard |  | Noted |  |
|  | Is it commercial, non-commercial or military? | Used in both commercial and non-commercial projects. LoRaWAN technology standard is open and free to use, with large existing global vendor ecosystem.  LoRaWAN radio communications use free-to-use ISM radio bands (for example 868MHz band in Europe) |  | Noted |  |
|  | Is there an existing technology that meets the same requirements?  If so, what make this different? | 4G Nb-IoT technology caters partly similar use cases, but suffers from significantly higher end device energy consumption and shorter communication ranges.  Sigfox possible similar existing technology |  |  |  |
|  | Ease of implementation? | Large base of existing commercially available solutions and solution providers. |  | Existing infrastructure – requirement to have an operator (access to the system / commercially available providers) |  |
|  | What are the constraints for implementation? | Technology is not suitable for transmitting large amounts of data (like images or video). |  | Note limited bandwidth |  |
|  | what is the capability of the technology? (i.e. nominal range; data throughput; support for audio / video?) | Communication range over the water / on sea approximately. 100-200km from base station (depending on base station installation height).  Two-way data communications available.  Data throughput very limited: device can send message every 1-2 minutes, and a message can contain 50 bytes of data. | [no test data] | [no test data to prove the real range]  [Comments from D Love – found that range is inversely proportional to data rat / achieved 12 km point line of sight using 2.4GHz ISM band]  [coverage reliant on the operator / tower height] |  |
|  | What is the scalability of the technology? | Can support very large amount of sensors / end devices (millions of devices on a LoRaWAN network). One base station can handle over 1 million messages per day in typical conditions. |  | Noted |  |
|  | Is the technology backward compatible? | LoRaWAN standard is actively developed further, while maintaining backwards compatibility.  Sensor deployments are often expected to have 10 year lifetimes. |  | Noted |  |
|  | Is the technology dependant on another technology? | No specific dependencies. |  | Noted  [LoRaWAN is provided commercially] |  |
|  | Can the technology be demonstrated? | Yes, technology is widely commercially used globally. |  | Noted |  |
|  | Are there any results and test bed? Please List | See:  <https://lora-alliance.org/>  <https://www.semtech.com/lora>  <https://www.digita.fi/en/services/iot/> (LoRaWAN operator in Finland) |  | Noted |  |
|  | Is there a compliance summary? | See <https://lora-alliance.org/lorawan-certification> |  | Noted |  |
|  | Are there legal issues associated with the implementation of the technology? | No specific legal issues |  | Noted |  |
|  | Are there any intellectual property rights (essential patents) associated with the technology? | Semtech Corporation (see <https://www.semtech.com/company>) holds the IPR for the LoRa radio modulation technology, on top of which the open LoRaWAN network technology standard is built. |  |  |  |
|  | Is the technology safe to use [note – safety could be understood in different ways] | LoRaWAN providers very strong level of encryption (AES-128) for the data communications.  LoRaWAN networks are fully separate from the Internet networks.  Low power transmissions, minimum radiation [safety related to humans] |  | Noted |  |
|  | Does the use of the technology require extra training? | LoRaWAN solutions are typically straightforward and cost effective to implement. |  | Noted |  |
|  | Are there environmental considerations with the technology? | Technology uses very low power for radio communications, both on end devices and base stations.  Base stations’ own power consumption also very low, typically <50W for the base stations. |  | Noted  [note could be linked to ‘safety’ – human safety]  [energy efficient – environmentally friendly] |  |
|  | What are the financial considerations for implementation and use? | Cost of end device connectivity in public LoRaWAN operator’s network base fee  Each end device typically between 5€-10€ per year per end device.  End device cost typically on range of 50-200€. |  | Noted  Initial investment, then annual (operating) fees  [note – comparison with GSM connection costs]  [Plus – basic network fee, with the fee per end device] |  |
|  | Is the technology secure (i.e. protected against hacking; privacy of data)? | Strong AES-128 encryption implemented in the protocol. Separate ASE-128 encryptions for network command and payload data. |  |  |  |
|  | Readiness (EU Technology Readiness level - TRL) (level of maturity of technology) | Widely used commercially globally. |  | Technology Readiness level – highest (in operation already) |  |
|  | Can you provide independent References | Yes  See also:  <https://lora-alliance.org/>  <https://www.semtech.com/lora> |  |  |  |