

# Overview of the Main Long-Range Communication Technologies

	Live in NZ	Data Costs	Advantages	Limitations	
Low-Power	<b>LoRa</b>	<ul style="list-style-type: none"> <li>- Yes, urban areas</li> <li>- Spark are presently trialling (915 MHz) network. Expected to be live in 2018.</li> <li>- Kotahi live (868 MHz)</li> <li>- ThingsNetwork (You can deploy yourself but there are only a small number of Gateways in New Zealand)</li> </ul>	<ul style="list-style-type: none"> <li>- No data cost, if you provide your own Gateways with Kotahi.</li> <li>- Likely Spark will position itself to be compete with Sigfox.</li> <li>- Price Estimate: NZD 0.50 - NZD 1.50 per device per month</li> </ul>	<ul style="list-style-type: none"> <li>- Low cost modules (approximately USD 8 - USD 18 in quantity)</li> <li>- Anyone can add their own Gateways / be a network provider i.e. a farm could add their own Gateway (prices coming down).</li> <li>- Price Estimate: NZD 1k - NZD 2k</li> <li>- Lots of network providers available</li> <li>- Link budget will be similar in both directions</li> <li>- Easy integration to your application of interest</li> <li>- Can be used on multiple base frequencies 415, 868, 915 and sub-bands within these</li> <li>- Excellent Range (Receiver -137 dBm, Transmit +20 dBm, link budget 157 dB)</li> </ul>	<ul style="list-style-type: none"> <li>- Remains to be seen how well this will work with a large number of devices on these networks</li> <li>- Data rates are quite low with remote firmware updating not easily possible - although this might be possible at a later date</li> </ul>
	<b>Sigfox</b>	<ul style="list-style-type: none"> <li>- Yes, urban areas</li> </ul>	<ul style="list-style-type: none"> <li>- Low data cost per year.</li> <li>- Price Estimate: NZD 0.08 - NZD 1 per device per month</li> </ul>	<ul style="list-style-type: none"> <li>- Very low cost modules. Price Estimate: USD 2 – USD 8 per module</li> <li>- Excellent transmit range (159 dB link budget)</li> <li>- Sigfox can supply range extenders if they do not have coverage in your area</li> </ul>	<ul style="list-style-type: none"> <li>- Reliant on a single network provider</li> <li>- Two Way communication is not practical, so retransmission is required to ensure reliable packet delivery</li> <li>- Very low data - 140 messages a day max</li> </ul>
	<b>Narrowband IoT (NB-IoT)</b>	<ul style="list-style-type: none"> <li>- Trialling only (Likely live in 2018. Presently there is a limited availability of NB-IoT electronic modules for development)</li> </ul>	<ul style="list-style-type: none"> <li>- Vodafone likely to be similar to cost to whatever cost Spark offers LoRa</li> </ul>	<ul style="list-style-type: none"> <li>- Medium cost modules.</li> <li>- Price Estimate: about USD 10 – USD 30/ module</li> <li>- Can connect to the network then stay in a deep sleep for up to 310 hours while still staying connected to the network<sup>2</sup></li> <li>- Allows for defined check-in times to listen to the network from approximately 2.5 s to 300 seconds</li> <li>- Medium data rates and amount of data approximately 20-60 kbs - most ideal for remote updating of field firmware</li> <li>- Should be a fast roll out (early 2018) once tested as a large number of Vodafone towers already support it, thus only a software roll-out (heard from a few sources)</li> <li>- 20 dB coverage increase of GSM solutions (SARA-N2 Datasheet)</li> <li>- Low peak current requirement (lower cost batteries)</li> <li>- Excellent Range (Receiver -135 dBm Transmit +23 dBm, link budget 158 dB)</li> <li>- Stationary sensors only</li> </ul>	<ul style="list-style-type: none"> <li>- Not many hardware providers at present</li> <li>- Reliant on a single network provider (in NZ Vodafone only deploying at this stage)</li> <li>- If there is Limited range there is no way to extend a network</li> <li>- Not as low power as Sigfox and LoRa for low data rates</li> <li>- Requires a sim card or sim chip (extra cost and management)</li> </ul>
High-Power	<b>Standard Cellular 3G/4G</b>	<ul style="list-style-type: none"> <li>- Yes</li> </ul>	<ul style="list-style-type: none"> <li>- Medium Cost.</li> <li>- Price Estimate: NZD 0.50 - NZD 3.00/Mb per month</li> </ul>	<ul style="list-style-type: none"> <li>- Fast data rates</li> <li>- Works wherever there is cell coverage and high reliability</li> <li>- Multiple network providers</li> </ul>	<ul style="list-style-type: none"> <li>- Expensive modules.</li> <li>- Price Estimate: &gt;USD 25 – USD 50 for 3/4G)</li> <li>- High power usage</li> <li>- Reliant on network providers</li> <li>- High peak current requirements &gt;1A</li> <li>- Takes a long time and a lot of power to connect to the towers approximately 10 s - 30 s</li> <li>- Goes out of date fast (2G likely turned off in 2020) 3G will likely not last too much longer</li> </ul>
	<b>Satellite</b>	<ul style="list-style-type: none"> <li>- Yes - anywhere in the world (limited coverage at the poles for certain types)</li> </ul>	<ul style="list-style-type: none"> <li>- Expensive!</li> <li>- Price Estimate: USD 15 - USD 30 per month for 20 kb</li> </ul>	<ul style="list-style-type: none"> <li>- Range pretty much anywhere</li> </ul>	<ul style="list-style-type: none"> <li>- Expensive modules.</li> <li>- Price Estimate: (approximately USD 100 to USD 400)</li> <li>- High power usage</li> <li>- Large modules</li> <li>- Reliant on satellite providers</li> </ul>