

Overview of the Main Long-Range Communication Technologies

	Live in NZ	Data Costs	Advantages	Limitations	
Low-Power	LoRa	<ul style="list-style-type: none"> Yes, urban areas - Spark are presently trialling (915 MHz) network. Expected to be live in 2018. - Kotahi live (868 MHz) - ThingsNetwork (You can deploy yourself but there are only a small number of Gateways in New Zealand) 	<ul style="list-style-type: none"> - No data cost, if you provide your own Gateways with Kotahi. - Likely Spark will position itself to be compete with Sigfox. - Price Estimate: NZD 0.50 - NZD 1.50 per device per month 	<ul style="list-style-type: none"> - Low cost modules (approximately USD 8 - USD 18 in quantity) - Anyone can add their own Gateways / be a network provider i.e. a farm could add their own Gateway (prices coming down). - Price Estimate: NZD 1k - NZD 2k - Lots of network providers available - Link budget will be similar in both directions - Easy integration to your application of interest - Can be used on multiple base frequencies 415, 868, 915 and sub-bands within these - Excellent Range (Receiver -137 dBm, Transmit +20 dBm, link budget 157 dB) 	<ul style="list-style-type: none"> - Remains to be seen how well this will work with a large number of devices on these networks - Data rates are quite low with remote firmware updating not easily possible - although this might be possible at a later date
	Sigfox	<ul style="list-style-type: none"> Yes, urban areas 	<ul style="list-style-type: none"> - Low data cost per year. - Price Estimate: NZD 0.08 - NZD 1 per device per month 	<ul style="list-style-type: none"> - Very low cost modules. Price Estimate: USD 2 – USD 8 per module - Excellent transmit range (159 dB link budget) - Sigfox can supply range extenders if they do not have coverage in your area 	<ul style="list-style-type: none"> - Reliant on a single network provider - Two Way communication is not practical, so retransmission is required to ensure reliable packet delivery - Very low data - 140 messages a day max
	Narrowband IoT (NB-IoT)	<ul style="list-style-type: none"> Trialling only (Likely live in 2018. Presently there is a limited availability of NB-IoT electronic modules for development) 	<ul style="list-style-type: none"> Vodafone likely to be similar to cost to whatever cost Spark offers LoRa 	<ul style="list-style-type: none"> - Medium cost modules. - Price Estimate: about USD 10 – USD 30/ module - Can connect to the network then stay in a deep sleep for up to 310 hours while still staying connected to the network² - Allows for defined check-in times to listen to the network from approximately 2.5 s to 300 seconds - Medium data rates and amount of data approximately 20-60 kbs - most ideal for remote updating of field firmware - 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) - 20 dB coverage increase of GSM solutions (SARA-N2 Datasheet) - Low peak current requirement (lower cost batteries) - Excellent Range (Receiver -135 dBm Transmit +23 dBm, link budget 158 dB) - Stationary sensors only 	<ul style="list-style-type: none"> - Not many hardware providers at present - Reliant on a single network provider (in NZ Vodafone only deploying at this stage) - If there is Limited range there is no way to extend a network - Not as low power as Sigfox and LoRa for low data rates - Requires a sim card or sim chip (extra cost and management)
High-Power	Standard Cellular 3G/4G	<ul style="list-style-type: none"> Yes 	<ul style="list-style-type: none"> - Medium Cost. - Price Estimate: NZD 0.50 - NZD 3.00/Mb per month 	<ul style="list-style-type: none"> - Fast data rates - Works wherever there is cell coverage and high reliability - Multiple network providers 	<ul style="list-style-type: none"> - Expensive modules. - Price Estimate: >USD 25 – USD 50 for 3/4G) - High power usage - Reliant on network providers - High peak current requirements >1A - Takes a long time and a lot of power to connect to the towers approximately 10 s - 30 s - Goes out of date fast (2G likely turned off in 2020) 3G will likely not last too much longer
	Satellite	<ul style="list-style-type: none"> Yes - anywhere in the world (limited coverage at the poles for certain types) 	<ul style="list-style-type: none"> - Expensive! - Price Estimate: USD 15 - USD 30 per month for 20 kb 	<ul style="list-style-type: none"> - Range pretty much anywhere 	<ul style="list-style-type: none"> - Expensive modules. - Price Estimate: (approximately USD 100 to USD 400) - High power usage - Large modules - Reliant on satellite providers