


# Small data, low cost, anywhere on Earth

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Myriota is a satellite communications company that specializes in sending small packets of data at ultralow cost from anywhere on Earth. Myriota provides Internet of Things (IoT) services in locations where terrestrial providers cannot profitably operate, including such locations as oceans and the Australian outback. This article provides an overview of the company's global IoT platform.

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## Remote applications overview

The demand to connect small, low-cost devices is now widespread, and it is being driven by the need to reduce operational costs, increase productivity, and decrease risk across all sectors of the economy. IoT services are being developed and deployed to meet this demand. The IoT provides narrow-band connectivity at dramatically lower cost and power consumption than is possible with traditional wideband communication systems, e.g., 3G and 4G LTE. Existing IoT services focus on solutions that require terrestrial infrastructure to operate. This is cost-effective in populated areas where the density of devices is large, such as cities, but it is not cost-effective in remote areas where the density of devices is small. Such locations cannot be profitably supplied by terrestrial IoT solutions.

Figure 1 shows an example of such a remote location in Australia. The tanks visible in the figure supply water to livestock in the area. A failure of the tanks or the pumps supplying them results in stress and ultimately death of the livestock. Tanks across Australia are commonly monitored by physically driving to the site to perform a visual inspection every few days. This requires significant human effort. Myriota's satellite transmitter monitors the water level of the tanks visible in Fig. 1, dramatically reducing the human effort required.

Farmers, utilities, resource companies, environmental agencies, governments, and defense agencies with remote operations have a need for remote IoT connectivity. The

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potential applications are broad and cover all sectors of the economy. Examples include

- extending the footprint of smart utility meters to rural and remote areas
- tracking of fishing vessels for compliance and licensing
- managing inventory for large populations of low-cost equipment
- livestock tracking for traceability, mustering, animal health, and feed optimization
- remote monitoring of meters for agricultural water and wastewater flows
- retrieving data from environmental monitoring devices
- retrieving data from ground-deployed sensors for defense applications.

Myriota's global IoT platform is the solution for these and other remote applications. The company provides all of the benefits of terrestrial IoT: long battery life, low cost, security, and reliability with the unique additional benefit of global coverage. Myriota-powered IoT works anywhere on Earth.

## Global coverage

Myriota delivers global coverage by transmitting directly to satellites in low-Earth orbit (LEO). This removes the need for ground-based infrastructure. Myriota has overcome significant technical challenges to realize this direct-to-orbit capability, which are discussed in the following sections.

### *Long communications range*

During communication, the distance between a Myriota satellite transmitter and a LEO satellite varies between 500 and 2,500 km depending on the altitude and elevation of the satellite. In comparison, terrestrial IoT solutions might work within a few tens of kilometers range. The result of this long distance is that messages received by the satellite are extremely weak. Myriota's communications receiver employs powerful synchronization and error correction to ensure that messages are correctly received.

### *Massive multiuser communications*

A LEO satellite observes a continental-sized piece of Earth at any one time. Figure 2 shows the region of Earth visible when a satellite is over Australia. The satellite sees all of Australia and Papua New Guinea, some of the Southern Ocean, and much of Indonesia, simultaneously. A continent like Australia might contain millions of Myriota terminals, and so the satellite receiver sees millions of Myriota terminals at the same time. Myriota's communications receiver handles this. The receiver is able to synchronize and decode messages from all of these terminals at once even when these messages substantially overlap each other in time and frequency. This is like being in a busy restaurant and comprehending all conversations going on at the same time.

## Long battery life

The Myriota satellite transmitter is designed to last for years with few batteries. Current draw in sleep mode is typically less than 2 μA. The ultimate battery life depends on the rate at which messages are transmitted and the rate at which sensors, such as global navigation sensors, are activated. A Myriota satellite transmitter in a fixed location transmitting three messages a day will last more than five years with two standard lithium 1.5-V AA batteries.

## Low cost

Both the device and data costs of the Myriota service are comparable with terrestrial IoT providers. When small data volumes are required,

**FIG1** A water tank in the Australian Outback, located on a property called The Gums, 50 km east of Burra in South Australia, monitored using a Myriota satellite transmitter.

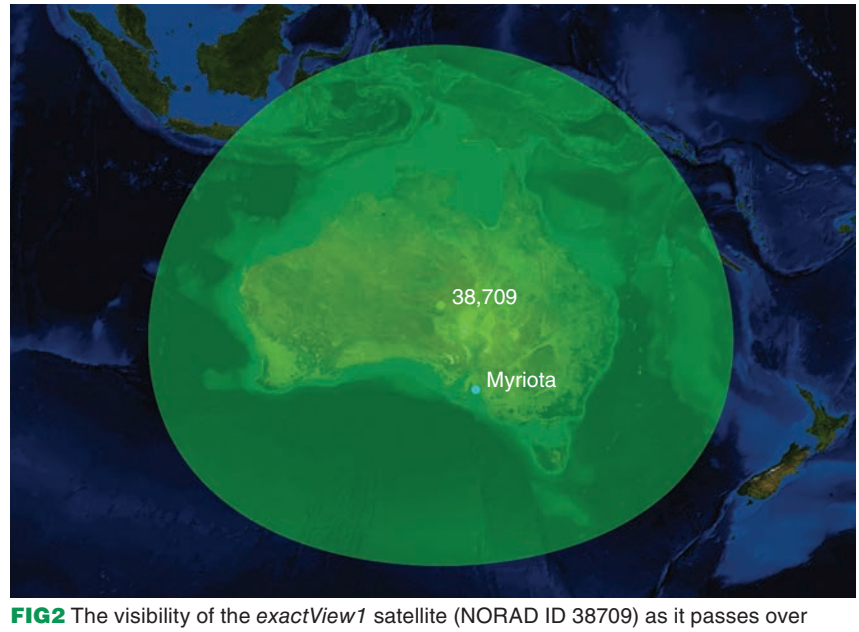


**FIG2** The visibility of the *exactView1* satellite (NORAD ID 38709) as it passes over Australia. The satellite sees the entire continent of Australia and Papua New Guinea, some of the Southern Ocean, and much of Indonesia simultaneously.

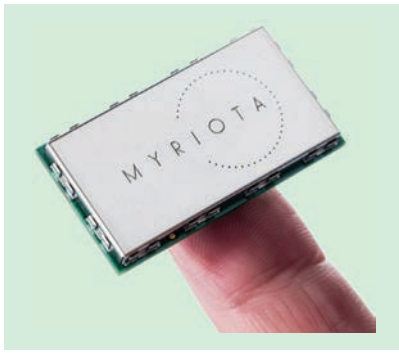


**FIG3** A Myriota satellite transmitter module.

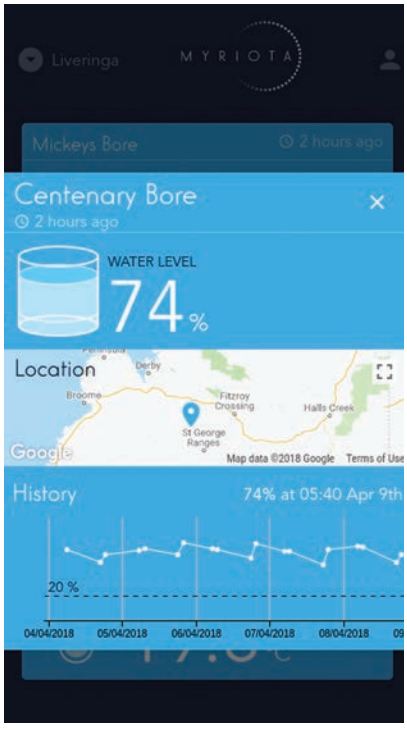


**FIG4** The mobile web application used by farmers to monitor remote water tanks.

Myriota is significantly more cost-effective than incumbent wideband terrestrial communications services (e.g., 3G and 4G LTE) and drastically more cost-effective than existing satellite services.

## Security

Data transmitted by the satellite transmitter is encrypted using industry standard AES-128 and AES-256. Myriota employs industry-standard authenticated encryption ensuring that both data and the identity of devices are secure. The company does not impose data formats. The format of data is known only to the end-user and his or her application.

## Receiving device data

To receive messages sent from Myriota satellite transmitters, Hypertext Transfer Protocol Secure endpoints can be registered using a web application within a browser or programmatically using a Representational State Transfer application programming interface (REST API). Devices can be managed through the same web application and REST API.

## Getting started

A Myriota development kit contains a Myriota core module (Fig. 3) and development carrier board. The Myriota satellite transmitter contains standard interfaces—inter-integrated circuit, serial peripheral interface, universal asynchronous receiver–transmitter, analog-to-digital converter, and low-energy counter—that can be used to integrate with sensors.

## Sample applications

### *Farmers*

Farmers in Australia use Myriota to monitor water tank levels in remote locations (Fig. 1). Myriota's web application (Fig. 4) provides an intuitive interface to view both current and historical tank levels. The application indicates changes in tank levels as livestock come in for water and as tanks are replenished by pumps. A failing tank or pump causes the water level to drop below a user configurable threshold, and the farmer is immediately notified.

### *The Australian Institute of Marine Science*

The Australian Institute of Marine Science deploys marine drifters in locations around Australia to monitor water temperature and air temperature and pressure.

## About the authors

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