The Case for Satellite IoT

A Closer Look at IoT Use Cases

Michael Minchin, Product Management IoT

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Markets

ST Engineering

IoT Growth Extends Across All Verticals

Transportation & Construction	Agriculture	Energy	Critical Infrastructure / Disaster Prevention	Maritime
Real-time tracking of heavy equipment and mobile assets	Farm machinery, performance and asset tracking	Pipeline &network monitoring	Water level / wildfire monitoring	Real-time information on status and location of maritime assets
Equipment utilization	Farm automation, irrigation systems	Tank, well and pump monitoring	Critical assets monitoring	Fishing catch reporting
Optimization of usage	Soil, water and nutrient monitoring	Smart Metering	Safety management	E-logging
Safety management	Crop health monitoring	Scada data collection		4G / Satellite Hybrid
	Livestock monitoring	Wind park monitoring & management		





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Enabling Connected Agriculture

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Farm Automation: Automated irrigation systems. Targeted treatment in an autonomous and scalable manner.

Farm Machinery:
Telemetry reporting. Predictive maintenance. Autonomous machinery.

Connected Farms: Bridge connectivity gaps combining VSAT long Haul link with local coverage (Private LTE, WiFi). Bring the cloud to farm with edge compute, and data analytics.

Environmental Monitoring: Real time information on nutrient moisture and pH levels. Track trends and predict irrigation needs. Enabling water conservation while ensuring there isn't over or under watering of crops.

Environmental Monitoring

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Coffee Nutrient Analysis

- Coffee plantation imaging and ground sampling with over 88,000 data points analysed over 6 years
- Prediction of Nitrogen, Phosphorus, Potassium for accurate fertilization usage
- Promotes proper and targeted use of fertilizer
- Prevents excessive amounts of fertilizer being used which contributes to the reduction of harmful greenhouse gases

Improving Efficiency of Wind Park Operations

Improve operations: Monitor the health of the turbines. Predict maintenance needs by monitoring temperature and vibration to avoid costly downtime and repairs

Increase Performance: Remotely control the turbines to maximize power output. Optimize the placement of the turbines to maximize wind capture.

Monitoring: Automate tasks such as meter reading and data analysis. Collect data on energy production. Wind and other environmental conditions

Security& Regulatory conformity: monitor for potential security breaches. Monitoring system to ensure correct operation according to local regulations. Provide remote access to ensure safety lights & alerts. turned on to warn nearby air traffic & pilots at night, in fog and obscured visibility.

Green Energy Use Case

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Ensuring Windpark Compliance with Aviation Obstruction Regulations

- International Civil Aviation Organizations demand assurance that wind park turbines are visible to airplane pilots and do not pose a risk to air traffic
- Wind park operators need to provide remote access to ensure safety lights & alerts are turned on to warn nearby air traffic & pilots at night, in fog and obscured visibility
- Frequent testing are required by law to test their lighting systems on a regular basis to ensure that they are functioning properly

Disaster Preparedness

Infrastructure and environmental Monitoring: Analysis of soil quality, ground water levels

Wildfire prevention: Real time information on dryness, levels of humidity, wind speeds and temperatures

Inundation alerts: Analysis of hydro-meteorological risks

Critical Infrastructure: Where sovereignty of data, landing rights and low-cost spectrum are key customer requirements

Disaster Prevention Use Case

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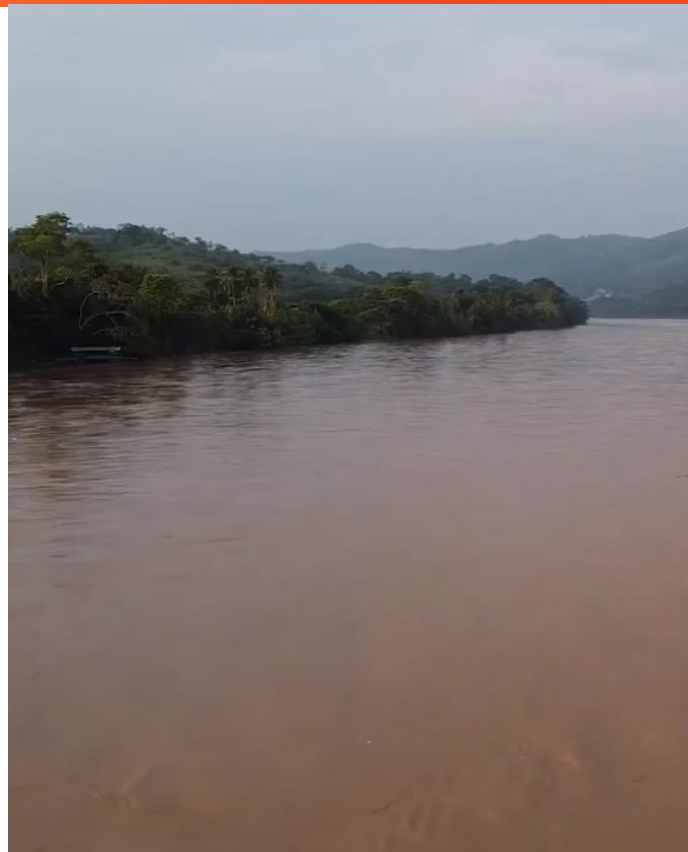
Analysis of hydro-meteorological risks

- Hydro-meteorological natural hazards to the population can be caused by severe floods, storm surges, landslides and droughts
- IoT sensors can help analysis these risks by collecting relevant information for decision-making in matters of prevention and analysis of risks of meteorological and hydrological origin.
- Data analysis can provide evaluation of the water balance of bodies of water such as rivers, lacs and sea level
- Measurement of physical-chemical data may be incorporated to detect significant changes in the quality of the water resource
- Different types of sensors from hydro-meteorological stations are aggregated and transmitted over Satellite IoT Terminals to an IoT network



Satellite IoT Topology

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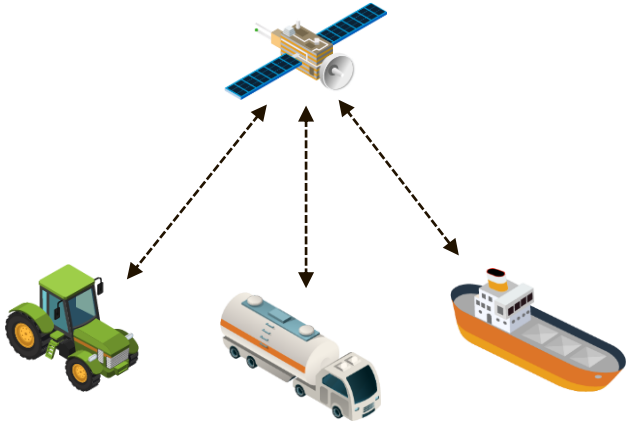
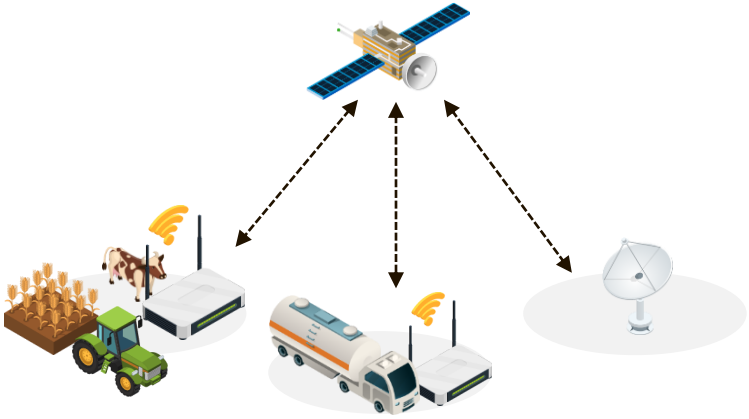
Direct to Satellite



- High efficiency, High density of terminals
- Low power; Low data rates
- Suitable for wide area deployments
- Proprietary messaging protocols
- Events-Based or Demand-Based
- Higher Throughput 10-100Kbps
  e.g., up to 25MB monthly usage

IoT Aggregation



- Low efficiency; Lower density of terminals
- High power; Higher data rates
- Suitable for localized deployments
- IP protocol
- Demand-Based or Continuous
- Throughput 200-2,000Kbps
  e.g., 100's MB monthly usage

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IoT Product Strategy

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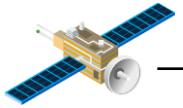

IoT Direct to Satellite

IoT Aggregation

Requirements

Both **Fixed** and **On The Move**

Teleport

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Cloud
Private/VPN/Internet

IoT Server

Data Lake

Low Data / Timeliness - **IoT Sensors** - High Data / Timeliness

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Entry level VSAT MDM2010

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Compact, efficient turnkey solution for IoT, fixed Broadband and Small Enterprise

- Wideband S2X FWD up to 500 Msps
- Mx-DMA MRC up to 10 Msps return Link
- Peak throughput: 100/10 Mbps
- 10,000 PPS, 4,000 TCP sessions
- Optimized logistics, Multi-Language web GUI
- WiFi + advanced routing
- Support for single- and dual-cable iLNB’s
- Bundles: 2W Ka & Ku with 75cm or 1m antenna options

MDM2010

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Direct to Satellite Terminal Series

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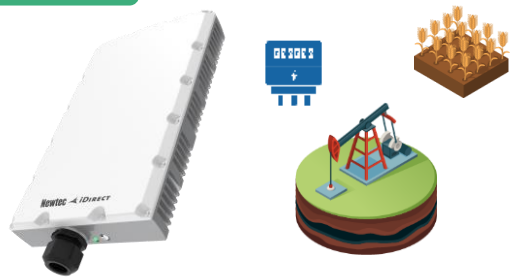
Fixed



- Intended for use cases requiring fixed mounting in remote locations
- Patch antenna, outdoor low-power solution utilizing PoE and suitable for remote solar installations
- Manual-pointing installation and acquisition using an intuitive auto-commissioning smartphone app
- Versatile connectivity options using Wi-Fi, BLE for phone, tablets, sensors as well as Ethernet for IoT devices and gateways/aggregators

Dynamic

- Compact solution for portability and mobility use cases
- Phased array antenna for automatic acquisition and tracking
- Fast beam switching with polarization and frequency switching
- Portability for COTM out of the box
- Mobility provided through optional one-time license add-on

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iDirect IoT Solutions

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Flexible solutions. Supplementing our successful platforms. Removing the barriers to market

Leveraging our scalable Evolution, Velocity, and Dialog platforms by:

- Incorporating an IoT-optimized waveform
- Cloud-based NMS
- New small form-factor IoT terminals for fixed and mobile applications

Providing customers with a complete IoT connectivity solution by:

- Building on a flexible service enablement model
- Paired with subscription-based options
- For immediate market access

Reducing risk, cost and time to market by:

- Eliminating upfront capital investments
- Removing operational complexity
- Enabling easy deployment of IoT services through our portfolio of solutions

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Questions?

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