

From grassroots to space: current trends for satellite-enabled IoT

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Costa Rica

- Accounts for only 0.03 percent of the earth's surface (has only 51.100km²). However it contains nearly 6 percent of the world's biodiversity.
- 25.6% of the country's land area is in protected national parks and protected areas.
- 2007: Government announced goal to achieve carbon neutrality by 2021
- 98% carbon-free electricity production during last two years



TEC | Tecnológico
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Irazú Project
Apr/2016
Kickstarter Campaign Begins



Irazú
03/Apr/2018: Launch
SpaceX Falcon 9



LIVE 放出まで / Sending the Command

- 1 Irazu
1KUNS-PF
- 2 JGSA-USAT

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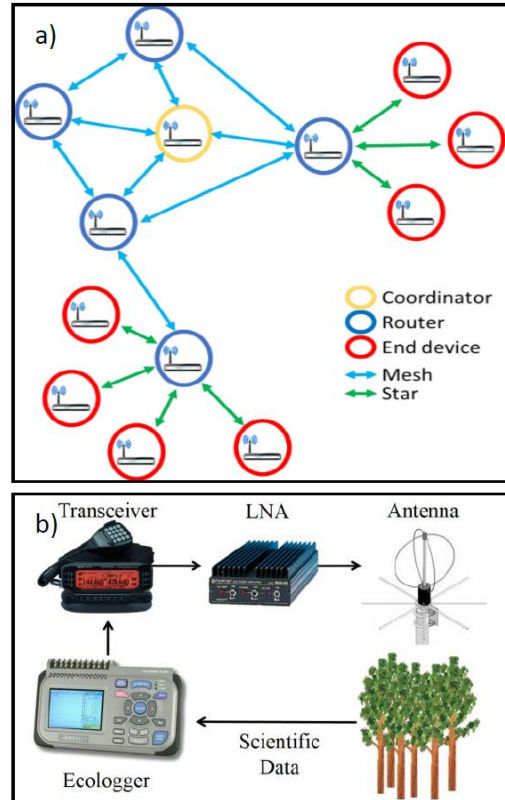
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Irazú
12/May/2018: Orbital release
Kibo Module, ISS

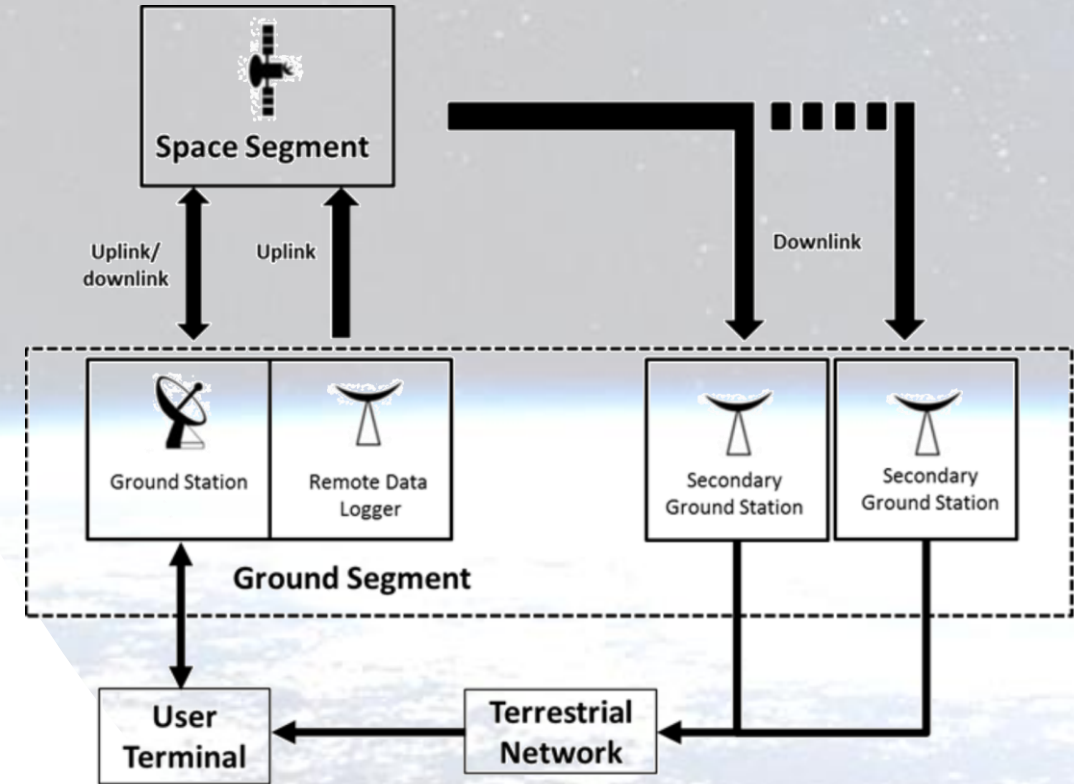
What?

- Dendrometers (daily growth), pyranometers (solar radiation), photosynthetic radiation sensors (incoming energy and reflected energy), weather stations (rainfall, relative humidity, temperature, barometric pressure, wind direction, wind speed), and underground sensors (soil moisture)

How?



Why?



Current perspectives for Satellite-enabled IoT

Market:

Satellite-enabled M2M/IoT: 1.5 billion in annual revenues despite being a fraction of the total connected objects

Applications:

- Military
 - Aerospace
 - Telecommunication
 - Transportation & logistics
 - Healthcare
 - Agriculture
 - Environment
- Remote or dispersed devices
 - Mobile devices (global reach)
 - No alternative networks

Segmentation:

- L Band, Ku-Band, and Ka-Band.

Limitations:

- Comparatively high cost vs 4g, WiFi, LoRa, SigFox, LTE-M, etc.

- Power consumption
- High latency
- Problems re. direct communication with multiple devices.

Major Key Players:

- Eutelsat S.A (FR)
- Inmarsat Plc (U.K)
- Maxar Technologies Ltd (CA)
- Orbital ATK Inc (U.S.)
- SES S.A (LU)
- Lockheed Martin (U.S.)
- Space Exploration Technologies Corp (U.S.)
- Thales Alenia Space (France)
- Thuraya Telecommunications Company (UAE)
- NanoAvionics (LT)
- Kepler Communications, Inc (CA)
- Iridium (US)
- SES (LU)
- ORBCOMM (US)

Current perspectives for Satellite-enabled IoT

Forecasts:

- Over 5.5 million Satellite-enabled IoT devices by 2023
- Estimated growth >12% per annum

Trends:

- Network complementarity and integration (particularly with LPWA)
- Increasing use of low earth orbit (LEO over GEO)
- Cubesat constellations: low cost, low power consumption and smarter solutions.
 - Lowering airtime costs / greater capabilities
- Increasingly attractive market for startups and investors alike
- LEO constellations could bring forward low latency connections (L-band)
- Cloud and AI-enhanced satellite networks also proposed

Value propositions:

- Global availability, internet of everything, everywhere
- Reliability (up to 99.9%) and reduced expenses
- Single solution that doesn't require additional infrastructure
- Bandwidth availability expected to increase

Newcomers:

- Myriota (AUS) – direct sensor to satellite cubesats
- Kepler communications (Ca) – 15 satellites
- Magnitude Space (NL) – 18 – 24 cubesats
- Spire Global (US) 48-150 cubesats for weather and tracking
- ASTROCAST (CH) – 64 cubesats for IoT
- FLEET (AUS) – 100 cubesat for IoT
- Sky and Space Global (AUS) 200 cubesats for IoT
- SpaceX (US) – Starlink 12000 cubesats for broadband
- Sigfox (FR) – hybrid system, Eutelsat LEO for Objects
- Facebook (US) – Athena (experimental, for broadband)

Some final thoughts

- Satellite-enabled IoT projects can connect national, educational and private efforts with meaningful goals.
- Success of Irazú renewed interest in the region's aerospace efforts.
- Capacity building efforts on both IoT and aerospace are necessary if similar projects are to be undertaken by developing nations.
- The range of options for similar projects has changed in the last 10 years.
- Currently, satellite-enabled IoT remains as a backup solution for IoT network deployments, to be used in niche cases, however this might change rapidly in the near future, particularly with recent investments!
- Opportunities are contingent on development of novel standards and regulatory developments.

Thank you!

Questions?

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