



L'impegno Italiano nel settore dei CubeSat: tecnologie e missioni future

#### Bi-directional IoT Satellite Service (BISS)

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#### A. Negri – IMT srl (02-04 Luglio 2024)





## **IMT at glance - Mission**

IMT SrI is an Italian private company (SME), founded in 1991 and active on three main activities:



**System Engineering:** Design and Development of Nano/Microsatellites and relevant On-board units for space commercial, scientific and defence applications (EOSS, HORTA,  $\mu$ SADA, C-DST)



**Parts Engineering:** Characterization and Testing of Electrical, Electronic and Electro-Mechanical components (*Qualification of rad-hard MOS-FET-N-Channel, Advirosing to ASI on EE Space Parts*)



**IoT solutions:** Development of IoT Solutions for Smart Cities, Environmental Monitoring and Agriculture (BISS – BiDirectional IoT Satellite Service)



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#### **Unique solution in rural zones**

When you deploy in remote environments, your connectivity options become far more limited. While cellular networks are available worldwide, some deployments may be too isolated for even cellular coverage. In these cases, the alternative has traditionally been to build your own infrastructure on site: an expensive process that also requires you to maintain and secure the network yourself.





Satellite IoT is an excellent solution for these unique circumstances. Instead of taking the time to build, deploy, and maintain new infrastructure on site, you can simply connect to the infrastructure that's already available in the sky



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### As Quality Backup

Even in countries with several networks to choose from, there will undoubtedly be gaps where no carrier has adequate coverage, such as sections of a long rural highway or remote locations like the middle of a forest.



In these situations, satellite IoT can serve as a quality backup solution to close gaps in coverage.







#### **Satellite IoT Market**



Data provided by www.transparencymarketresearch.com



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The global Satellite IoT market size is projected to grow from USD 1.1 Billion in 2022 to USD 5.1 Billion by 2030, at a compound annual growth rate (CAGR) of 21.02% during the forecast period

Data provided by www.fnfresearch.com



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#### **BISS Partners and Schedule**

BISS is founded by the **ASI** in the **ALCOR Program**. **IMT leads** the BISS project with the following Subcontractors and Supports:



#### **BISS Main Purposes**

The main purpose of BISS (Bi-directional IoT Satellite Service) is to provide IoT connectivity basing on the following key features:



**Global Coverage (Internet of Everything Everywhere)**, the scale of the IoT demands ubiquitous network coverage even in remote locations, which are best served by satellite networks



Lowest Power or Lowest energy consumption footprint and device autonomy for several years



Lowest cost IoT communication proposition for massive quantity of users

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#### Low Power Wide Area Network

LPWAN stands for "Low-Power Wide Area Network", a type of wireless network particularly well suited for projects in Internet of Things (IoT) and machine-to-machine (M2M) systems. LPWANs typically support the interconnection of low-bandwidth, battery-powered devices over long distances.







#### Why the LoRa transmission is used?

LoRa offers:

- Long range communications
- Low cost and Ultra low power transmissions
- Long Battery life
- Immunity to multipath and fading
- High Capacity



• Embedded end-to-end AES-128 Encryption, Unique ID, Application and Network Keys



#### **BISS General Overview**

Satellite or Terrestrial connections selectable with security connections. Satellite IoT messages up to 50



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#### **BISS Satellite**

Based on 6U CubeSAT with Deployable antennas and Solar Arrays. Estimated Mass at Launch: 8.5 Kg







# The LoRaWAN connectivity tests

A dedicated test to evaluate the perofrmance of the LoRa and LoRaWAN connection under the rapresentative environment condition (doppler and link attenuation simulator) :



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#### **Results and conclusion**



) LoRaWAN connection tested in the simulated rapresentative environment



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Using of the LoRaWAN protocol, designed to provide a low-power wireless connectivity

) Terrestrial and Satellite IoT connection in a single device



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# **Thank You** for your attention!

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2-4 July 2024 - L'impegno italiano nel settore dei CubeSat: tecnologie e missioni future Slide N°14







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