An introduction to space infrastructures

New Space Economy

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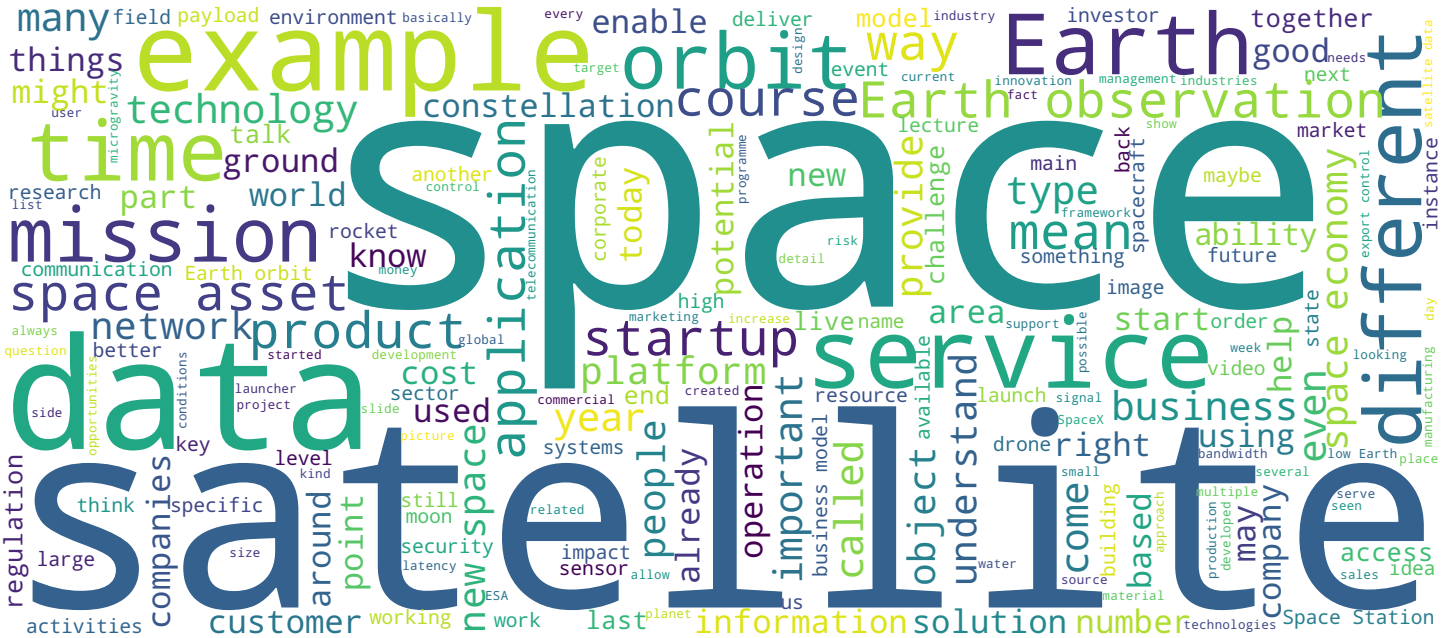

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Video

EPFL

Concepts: Overview of Space Assets

- **“any man-made uniquely identifiable asset in space or designed to be launched into space**, and comprising:
- A spacecraft such as a satellite, space station, space module, space capsule, space vehicle or reusable launch vehicle.
- A payload (whether telecommunications, navigation, observation, scientific or otherwise).
- A part of a spacecraft or payload such as a transponder… together with all installed, incorporated or attached accessories, parts and equipment and all data, manuals and records relating thereto.”

Unidroit Space Assets Protocol, Draft

My name is Andrea Alberti. What is a space asset? It is a man-made infrastructure placed into space to serve a purpose. We use the accounting term asset because it is a resource with an economic value that a corporation, an organisation, or country owns and controls with the expectation that it will provide a future benefit.

Notes

Summary

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Concepts: Overview of Space Assets

- **Earth-Orbiting Assets**
  - Space Stations
  - Global Positioning Systems
  - Telecommunication Satellites
  - Earth Observation Satellites
- **Non-Earth-Orbiting Assets**
  - Exploration spacecrafts
  - Moon infrastructure
  - Asteroid mining spacecrafts
  - …

We can identify four main types of space to Earth assets or assets orbiting around the Earth. The manned space stations like the most famous ISS, but also the Chinese Tiangong or the future commercial station Axiom. There are the Global Positioning Systems and not only the American GPS, but also the European Galileo, the Russian GLONASS, and the Japanese [inaudible 00:01:07], or the Chinese Baidu. Then there are the two categories on which we will focus together two: telecommunication satellites and Earth observation satellites. Are there other types of space assets? Yes, there are plenty of other space assets. Just consider all the exploration spacecrafts, and Mars Rover, Lunar Rovers that we can consider traveling laboratories or observatories. Let me mention, for example, the moon infrastructure onto which many agencies and industries are working upon, looking at the moon like a gateway to reach farther into our solar system and as a touch base for asteroid mining spacecraft.

Notes

Summary

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Concepts: Space Economy Enablers

- Inspiration:
  - Blue Origin (Bezos), Virgin Galactic (Branson), SpaceX (Musk)
- Technology:
  - Technology spillovers
  - Standardisation and Reuse
  - Moore's law

Like most of the businesses in the world, space assets, products, and services are enabled and leveraged onto a framework of opportunities and regulations. In previous lectures, it was introduced how billionaires like Jeff Bezos with its Blue Origin, or Richard Branson with its Virgin Galactic, or Elon Musk with the SpaceX launchers and the Starlink, create a vision, inspiration, and generate role models for new space entrepreneurs. Technology is a key enabler of space economy. The technology spillovers between different fields and between different industrial verticals lead to standardisation, to characterisation and ability to reuse components, methods, and algorithms in an unprecedented way. The result of all this is that much of the technology that we use nowadays in modern space assets was most likely created or designed for non-space use. For example, technology created for medical products or services, energy production, the automotive. These are successfully reused into space, but also the opposite is happening, the vice versa. Technologies that are created for space use have been successfully deployed and applied in other fields, in other industries. The ability to reuse products and services across different and large markets lead ultimately to the ability to create space assets that deliver higher offering at lower costs within time, basically reaffirming more slow.

Notes

Summary

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Concepts: Space Economy Enablers

- US Policy framework
  - 1984 Commercial Space Launch (Reagan) Act
  - 1988 Commercial Space Act (Reagan) Act
  - 1990 Launch Service Purchase Act (Bush) Act
  - 2001 GPS Selective Availability discontinued (Clinton) Law
  - 2004 Commercial Space Launch Amendments Act (Bush, G.W.) Act
  - 2015 Commercial Space Launch Competitiveness (Obama) Act
  - 2020 Encouraging International Support for the Recovery and Use of Space Resources (Trump) act

But inspiration and technology cannot make the job alone. The injection of infrastructure into space of assets that are created to orbit around the Earth would not be made possible by passion and vision alone or by substantial investments. A framework of laws, policies and regulations is required. I don't want to enter into the details of each and any of the regulations, but here we can find a list of the US policy acts that various US governments have been producing over the years to enable and promote a space economy. The political framework that enables these acts, together with other policies like research and development policies create an inspirational conjunction, creating what we nowadays call new space economy.

Notes

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Now, let's bring together some definition about the space supply chain. The upstream market encompasses those activities that are related to the creation of the space asset itself, basically, the launchers and the satellites. The midstream entails those activities related to the remote management and the maintenance of the space assets and the management of the stream of data that is generated thereof. Finally, we have the downstream market. The downstream segment is the key to enable the new space economy.

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It is what, we as final users, start to perceive as space technology in our pockets or innovation from space like for other industrial sectors, it is the upstream market would provide the glossy picture, the front page, the rocket launchers, the high tech payloads, and the huge satellites. But when it comes to the provision of services that affect the people, that influence society, when it comes about the real economic and social impact of space, it is the downstream that sign where the action is. The downstream market affects and impacts our lives in ways that we might not even anymore realise we are leveraging and we are leaving space technologies.

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Summary

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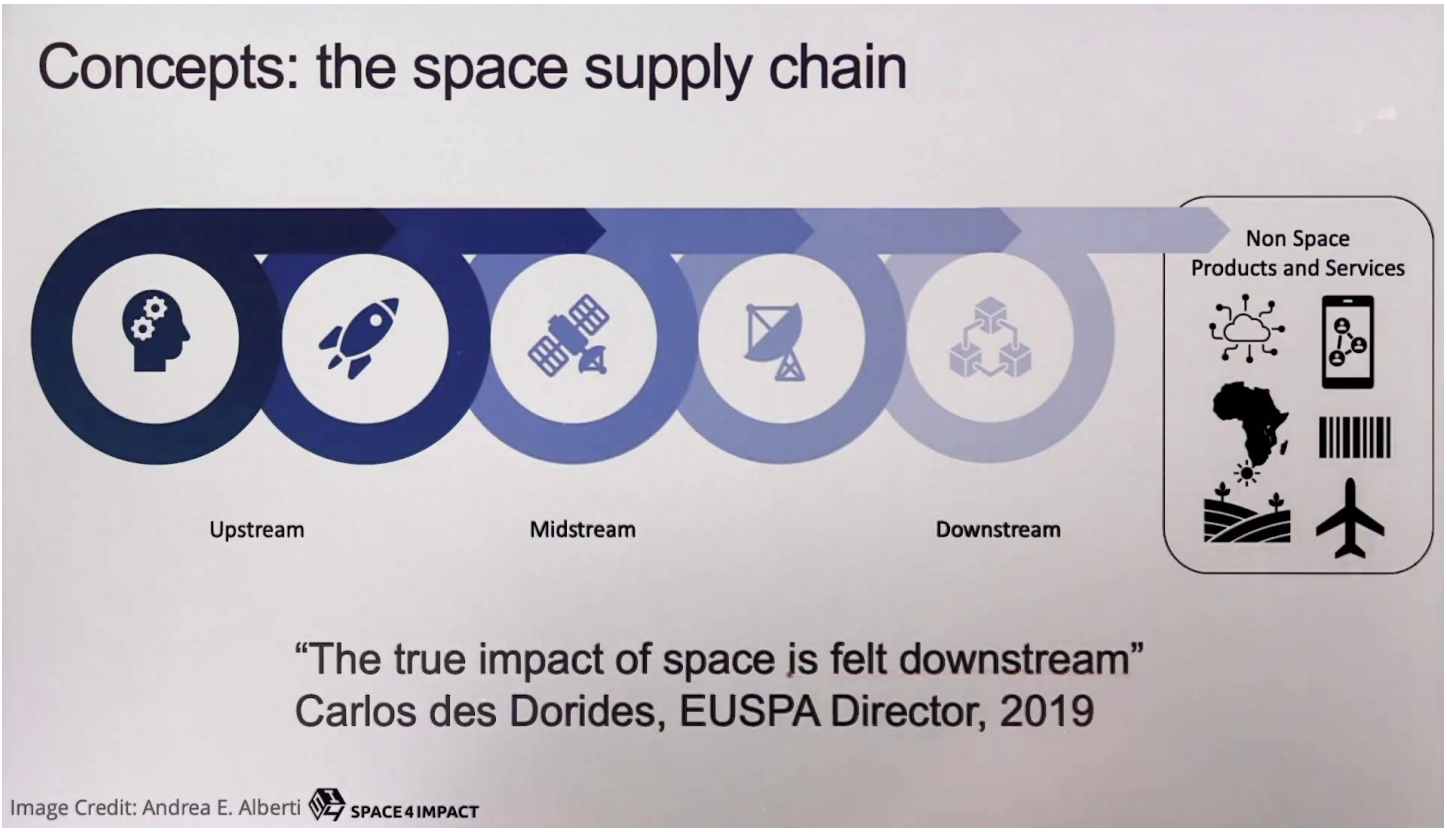

When our lives are affected by lifestyle changing innovation, by technology that is changing the way we live and perceive the world, this is what an economy is called as a general purpose technology. In the words of Carlos de Dorides, the Director of the European Agency for Space Programs, "The true impact of space is felt downstream."

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