



In-Orbit Demonstration of Services

Unlocking the Potential of Small Satellites

CATAPULT

Satellite Applications

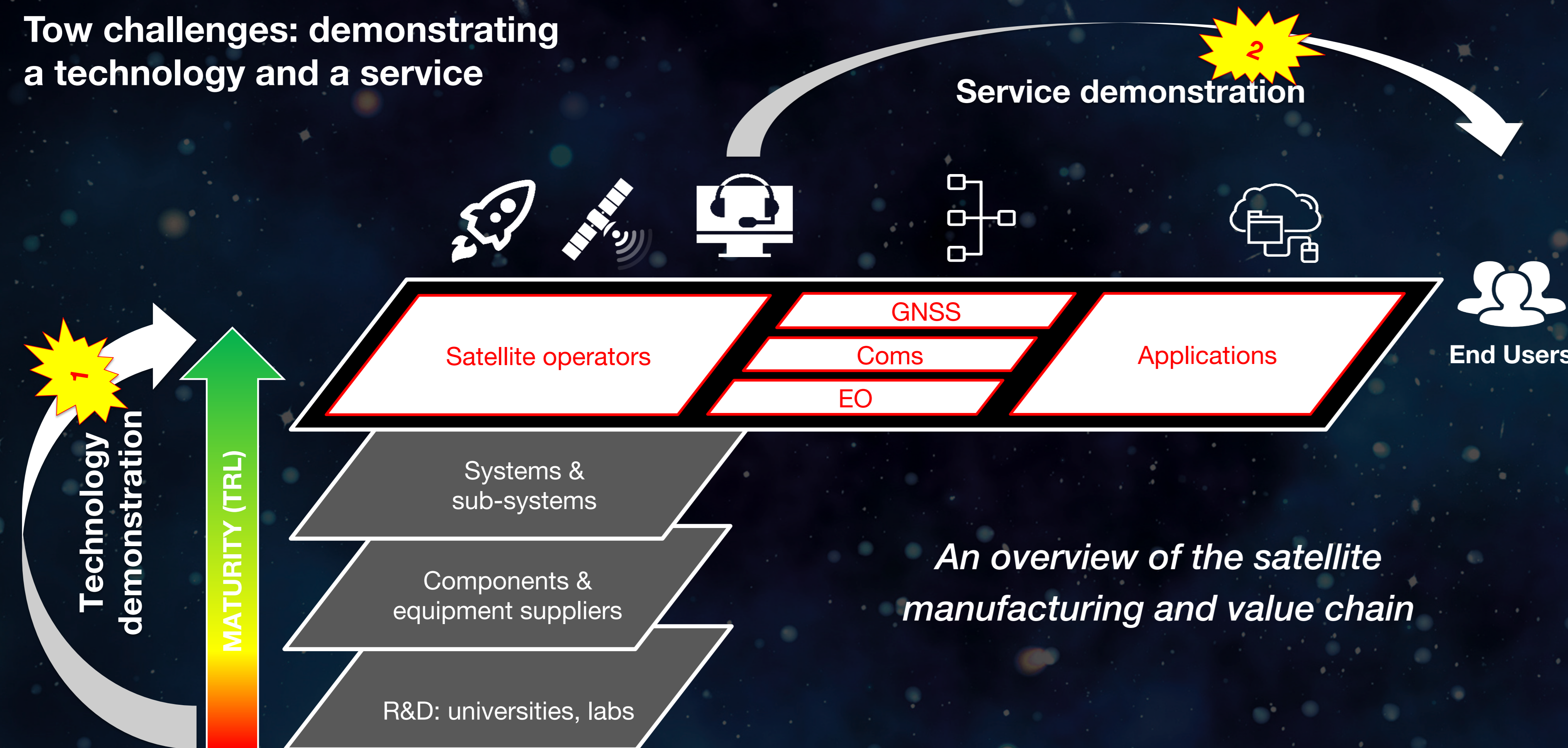
Potential of small satellites

Small satellites offer a new paradigm for space compared with the historical one. They enable the use of faster innovation cycles (3 years vs 15 years lifetime for Geostationary satellites), mass production (100+ vs 20 Geostationary satellites per year) allowing for economies of scale and redundancy at satellite level rather than subsystem level. The potential impact of a mature small satellite sector would be more affordable, frequent and diverse data enabling new services currently not exploited by bigger satellites. This potential is hampered by challenges that can

be summarised under two main categories. Firstly, a high entry cost and length of time to demonstrate the technology in space, secondly a complex value chain to demonstrate the service enabled by the technology.

Using mutualisation of infrastructure and access to skills along the satellite value chain, this concept enables access to space at lower cost and better visibility of the potential markets for applications.

Two challenges: demonstrating a technology and a service



Satellite value chain: defined here as the chain of services required to transform satellite capability into information. A simplistic approach would feature a satellite operator capturing Earth Observation (EO) imagery, transmitting it down to Earth for processing to be transformed into an image, finally integrated with other data sources, to provide added-value services such as

changed detection of an urban area. The services of the value chain make use of systems provided by the manufacturing chain. **Manufacturing chain:** defined here as the chain of manufacturing steps required to bring a technology from a concept until it is integrated and flown on-board a satellite. The Technical Readiness Level is an analogue when the satellite is taken as a system.

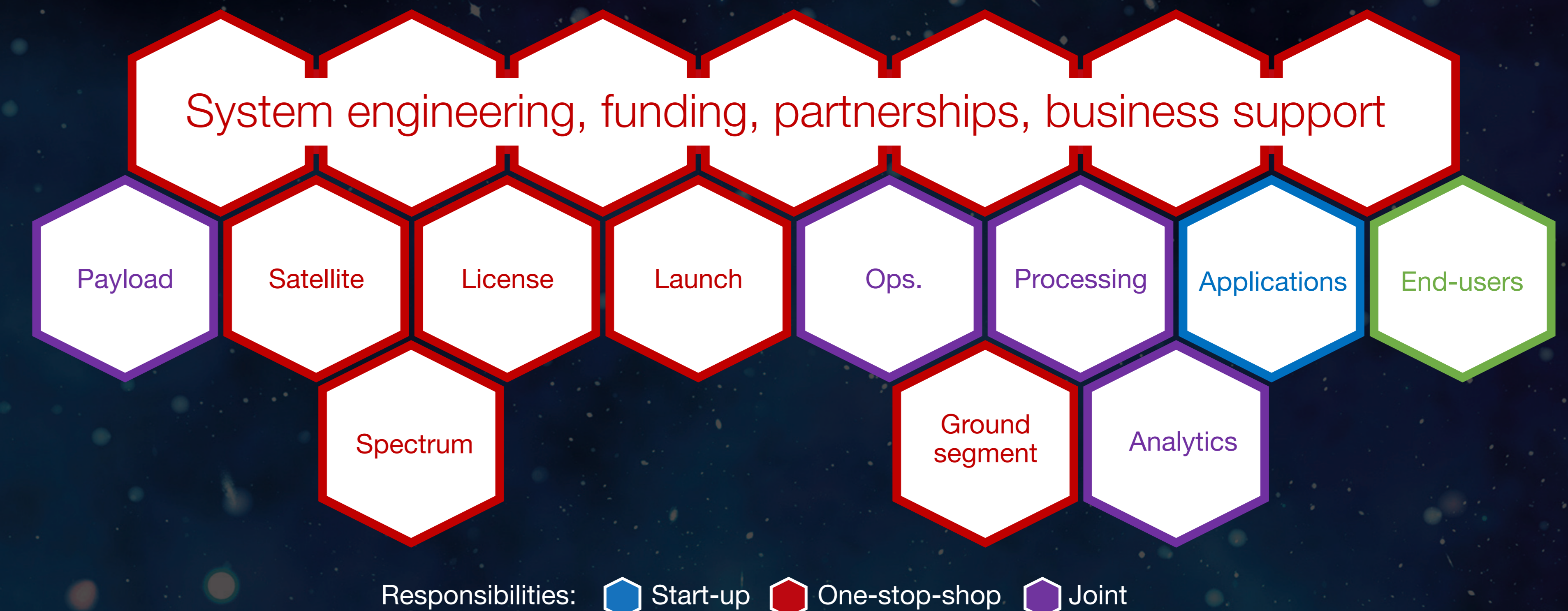
1 Challenge to demonstrate the technology: while the cost of nanosatellites has decreased over the past 3 years (50%), the estimated cost of a mission is still high, with around \$1.2m/kg of payload for a mission of at least 6 months, and the time between payload FM ready and launch around 1 year due to availability of launch and licence procurement. This in addition to the number of skills required to develop a mission (payload, satellite, launch, operations, licensing).

2 Challenge to demonstrate the service enabled by the technology: the complexity and number of steps (3 of 4 intermediary) between the satellite operations and value-added services, are all different depending on the type of capabilities (Earth Observation, Communication or Navigation at high level) the satellite is offering.

A one-stop-shop for the demonstration of space services

The purpose of a one-stop-shop is to support business ideas aiming at demonstrating services using new space assets. This will help explore which services are enabled by small satellites.

As such it is mainly addressed at SMEs with a business opportunity that an application will fulfil. This model would enable SMEs to focus on their unique selling point.



The In-Orbit demonstration programme from Innovate UK and Catapult

A reduced instance of this model is being tested, where Innovate UK (the UK Innovation Agency) provided funding for 4 launches by Nanoracks and 4 3U platform provided by Clyde Space. The Satellite Applications Catapult manages the programme.

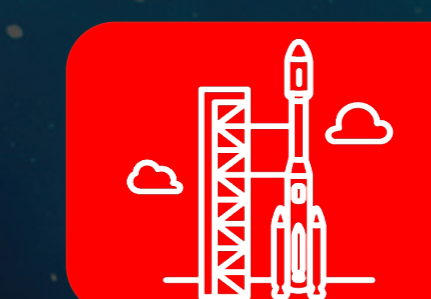
The organisation (typically a start-up) contributes with a payload, collaboration on the satellite integration and operations, and leads the exploitation of the satellite capability. The mission is delivered by the Satellite Applications Catapult running the satellite operations.



Partner



Define & Build



Launch



Operate



Exploit

This mechanism provides a mission for a fraction of the typical cost, a time to launch of less than 9 months after payload FM delivery and a reduction in mission complexity. The expected

outcome of the programme is an increase in service demonstration missions together with the creation of sustainable entities delivering satellite missions.

The Satellite Applications Catapult

The Catapult is an independent, non-for-profit, innovation and technology company, created to foster growth across the economy through the exploitation of space. The Catapult helps organisations

make use of and benefit from satellite technologies, and brings together multi-disciplinary teams to generate ideas and solutions in an open innovation environment.

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