ANNEX A: SPACE FOR INFRASTRUCTURE - DIGITAL

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1. INTRODUCTION

This document lists the use cases to be used as part of the “Space for Infrastructure – Digital” thematic area within the umbrella of the “Space for Infrastructure” thematic call for proposals.

The use cases presented result from the cooperation between the European Space Agency
(ESA) and key stakeholders/customers of the digital infrastructure sector. It aims at developing sustainable services leveraging space assets to address the needs for modern day digital infrastructure.

Digital infrastructure refers to technologies that provide the foundation for an organisation's information technology and operations by bringing together physical and virtual technologies such as compute, storage, network, applications, and IaaS, PaaS and SaaS platforms. Examples of digital infrastructure include telecom networks, cloud computing and data centres. According to recent reports from Global Market Insights (GMI), digital infrastructure is projected to grow from $90 billion USD in 2020 to $120 billion USD in 2027. The demand for future generation services and devices, such as 5G and smart technologies, is expected to exceed $50 billion USD over the next five years. Digital infrastructure and rapid connectivity bring new opportunities. Satellite-based communications have a critical role to play in increasing connectivity to improve access to the online world as well as to enhance network resilience backing up the terrestrial infrastructure. Cybersecurity techniques and solutions should also be

updated to reflect the substantial advancements in attacker capabilities, which can jeopardise availability of essential digital services (e.g. health, energy).

2. ANNEX A: SPACE FOR INFRASTRUCTURE – DIGITAL

ESA invites applications which address needs within the digital infrastructure sector which use at least one (or more) space asset(s) (Satellite Communications, Earth Observation and/or Satellite Navigation). The following areas are of key interest to the agency and the partners included within the Space for Infrastructure – Digital thematic call for proposals. Please note that applications do not necessarily need to address one of the use cases below; other related use cases can still be accepted to the call on a case-by-case basis. These key areas of interest are:

1. Digital Network Resilience and Recovery against Cyber-Attack
2. Improving Connectivity in Digital Dark Areas
3. Planning of New Networks

2.1. Partner - Plexal

Plexal is committed to achieving the potential of emerging technology through strategic collaboration with the government, industry, startups and academia.

Plexal drives national security progress, economic growth and social prosperity by building physical places for innovation, delivering innovation services through programmes and consultancy and establishing regional clusters of excellence nationwide.

The business has delivered innovation programmes for organisations including the Department for Science, Innovation and Technology, the National Cyber Security Centre, IBM and Amazon. Additionally, this year, Plexal delivered the inaugural Airbus UK Space Accelerator. Of the companies supported by Plexal-run programmes, 141 have received funding and collectively raised £898m in investment and £69m in innovation grants.

Plexal is proud to support ESA with validation of the presented use cases and corresponding applications.

2.2. Use Cases

2.2.1. Use Case 1: Digital Network Resilience and Recovery against Cyber-Attack

With cyber-security becoming essential to modern information communication systems, a robust strategy for a successful cyber-security policy is to have redundant channels available if the primary method of communication comes under attack. In addition, once a system is compromised, rapid network recovery is paramount to minimise disruption and the potential of large economic losses. A hybrid network utilising satellite communications which is activated when a cyber-attack is detected could provide the necessary redundancy needed to keep the flow of information fluid. For example, in the retail banking sector, constant communications is key to providing a good service to the consumer. Any disruption to service can lead to negative impacts to the bank e.g. fines, a lack of trust, defamation of image/brand, etc… and having a robust network which can quickly adapt would be a method of mitigating this risk. Benefits of this approach include continuous network availability, enhancement of cybersecurity measures, and the support of rapid recovery efforts. Therefore, a system which can detect and respond to cyber attacks by utilising a hybrid terrestrial-satellite network would be of interest.

Although this use case can be applied to many sectors, it is expected that the bidder will provide specific industry and example in which a hybrid terrestrial-satellite network would be of commercial benefit.

2.2.2. Use Case 2: Improving Connectivity in Digital Dark Areas

As the world is becoming more reliant on digital technologies through the increasing presence of automation in the aim to find efficiencies, reliable internet connectivity is a must for a modern future-proof operation. In areas in which terrestrial coverage is poor such as in ‘urban canyons’ or remote locations, satellite communicate can bridge the digital divide, ensuring that businesses and residents in these areas have access to the same online resources and opportunities as those with high speed connectivity. For example, in the majority of cases self-driving vehicles or logistic operations require constant access to high-speed digital networks as it is key in providing a safe and timely service. However, they are most likely to operate in areas in which an ‘urban canyon’ effect can occur. I.e. Signals are blocked by building or other

large metal objects such as shipping containers. Another example is that of providing access to the network for IoT devices. These are key in helping operate an efficient harbour operation, but also provide data points which can be used in digital twin applications. In this case, typical operations use a hybrid 5g-SatCom network in which the satellite component takes over when the terrestrial network is not available.

High-speed internet access fosters economic development by enabling local businesses to reach broader markets, access e-commerce platforms, and utilize digital tools to improve their operations. It also attracts new businesses and investments to the area, creating job opportunities and stimulating economic growth. Furthermore, internet connectivity empowers individuals by providing access to information, government services, and social networks, thereby enhancing their quality of life.

2.2.3. Use Case 3: Planning of New Digital Networks

Leveraging satellite navigation and satellite Earth observation data can revolutionize the planning and deployment of new digital infrastructure networks. Satellite Navigation provides precise geolocation data, which is essential for mapping out the most efficient routes and locations for infrastructure such as fibre optic cables, cell towers, and data centres. By integrating this with Earth observation data, which offers detailed imagery and environmental information at a regional scale, planners can gain a comprehensive understanding of the terrain, land use, and potential obstacles. This combination allows for highly accurate and informed decision-making, ensuring that the infrastructure is deployed in the most optimal locations for ease of installation and future maintenance. For instance, planners can avoid areas prone to natural disasters, identify the best routes that minimize environmental impact, and ensure that the infrastructure reaches underserved regions.

The benefits of using satellite navigation and Earth observation data in digital network planning are substantial. Primarily, enhanced precision in planning leads to significant cost reductions, as it minimizes the need for costly rework and adjustments during the deployment phase. Additionally, it also ensures the efficient use of resources, as planners can optimize the placement of infrastructure to achieve maximum coverage and performance with minimal investment. Additionally, this approach supports sustainable development by reducing the environmental footprint of new infrastructure projects. Overall, the integration of SatNav and SatEO data not only streamlines the deployment process but also contributes to the creation

of robust, resilient, and future-proof digital infrastructure networks that can support the growing demands of the digital age.