Space19+

Presentation of the Programmes to the Belgian actors
Telecommunications and Integrated Applications
30/09/2019

ARTES Main Objectives

- Improve competitiveness of industry on global market
- Support space-based solutions in response to societal and general policy needs

ARTES -> ARTES 4.0 To remain relevant

- Seize market opportunities (digital economy/space connectivity, governmental security markets, …)
- Further develop programme's relevance to market and to Member States' policies, adding even greater efficiency and flexibility

What do we get with ARTES 4.0?

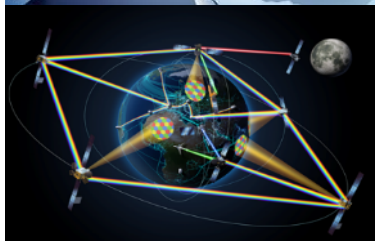
- **A higher total level of funding** to support innovation and industry transformation
- **Orchestration** of a multitude of activities ensuring coherency and efficiency
- **Reinforce support to industry** in maturing long-term, higher risk technologies and services

- **Fast** mechanism to **decide and implement** on new activities and changes
- **Streamline and optimise** decision making process, improve procurement process and extend digitalisation
- Provide **financial agility to Member States** in funding allocations

Strategic Programme Lines in ARTES 4.0

Covering highly visible societal/economic high impact objectives

- **Space for 5G (S45G)**
  - ✓ The new generation of communications is key to support the Digital Transformation with integration of satellite with terrestrial telecom networks
- **Space Systems for Safety and Security (4S)**
  - ✓ Innovative solutions to societal challenges and the security of European citizens; Aiming at coherence wrt EU GOVSATCOM as anchor customer
- **ScyLight - Optical Communication**
  - ✓ Cutting edge technology at the frontiers of knowledge and with technological challenges yet to be mastered. Foster Industry capabilities to answer to the upcoming markets and to provide solutions to European strategic needs.



ARTES 4.0

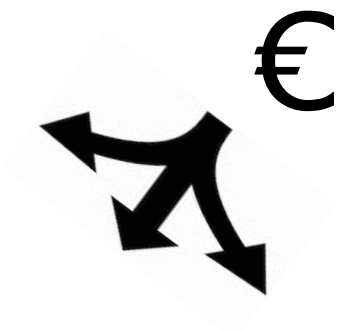
A Matrix with Strategic and Generic Programme Lines

Strategic Programme Lines
Responding to societal/economic objectives
Flexibility for MS/Subscriptions

Space for 5G

Space Systems for Safety and Security (4S)

Optical Communication - ScyLight



Generic Programme Lines
Maximum efficiency/Execution

Core Competitiveness

Partnership Projects

Business Applications Space Solutions

ARTES Strategic Programme Lines

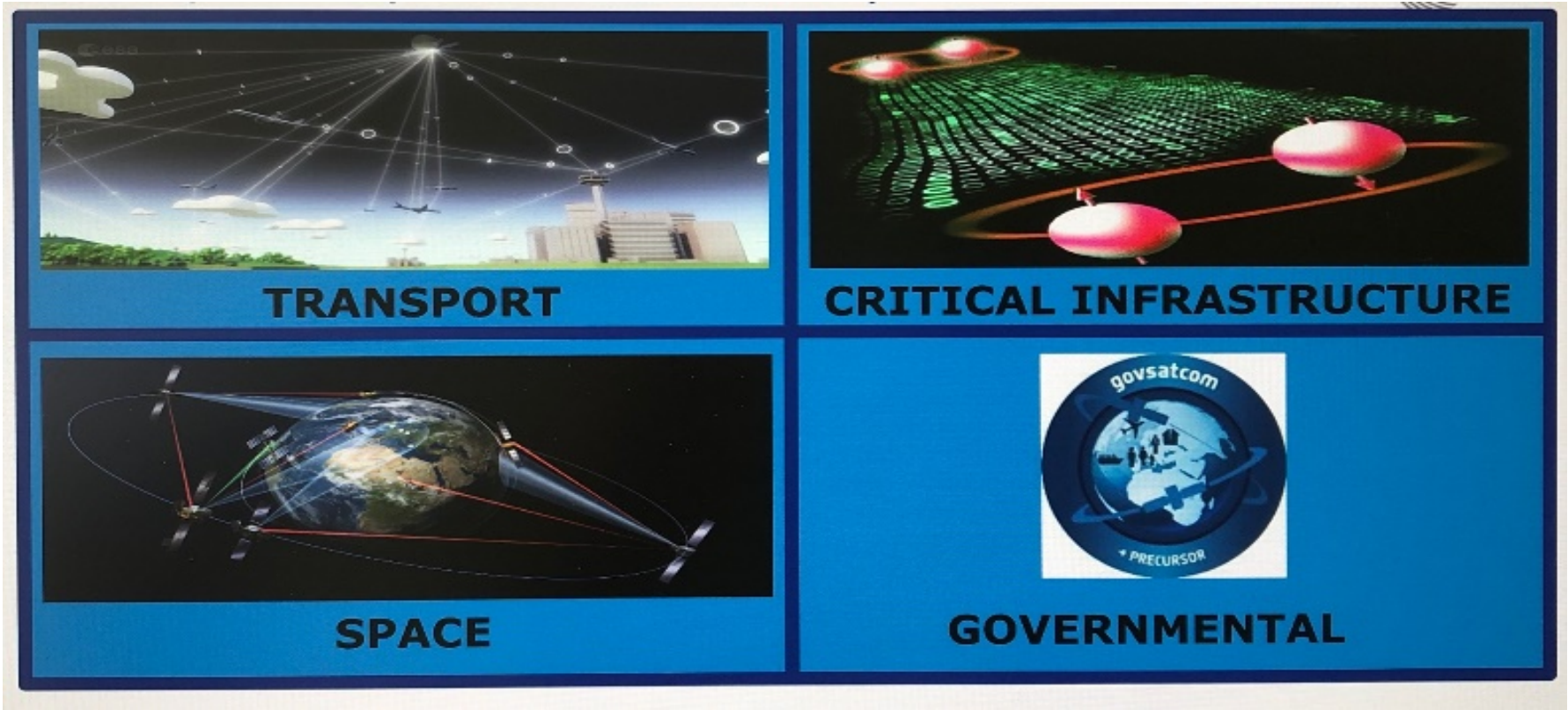
Space Systems for Safety and Security (4S)

Space 19+
One of the pillars :

Space Safety and Security

exclusively peaceful purposes

4S USER SEGMENTS in 4 main areas



4S Strategic Plan - Implementation

- 4S – TIA vision : Europe will need a new class of secure (regulated) satellite communications for governmental & institutional/regulated applications :
  - An important growth area for the Space Industry by 2030
  - 7 to 10 years timeframe to design and deploy (IOC) such innovative systems

- 4S SPL implementation :
  - Two time horizons : services offered before 2025, services by 2030 and +
  - Mobilizing the full ARTES toolbox : system studies, technology development, partnerships projects, business applications and services
    - Already "tagged" Partnership Projects : IRIS, SAGA, ERMIS, …
  - A mix of ESA-initiated activities and Industry-initiated activities :
    - ESA-initiated: WP and ITT
    - Industry-initiated : AO, and then always open CfP

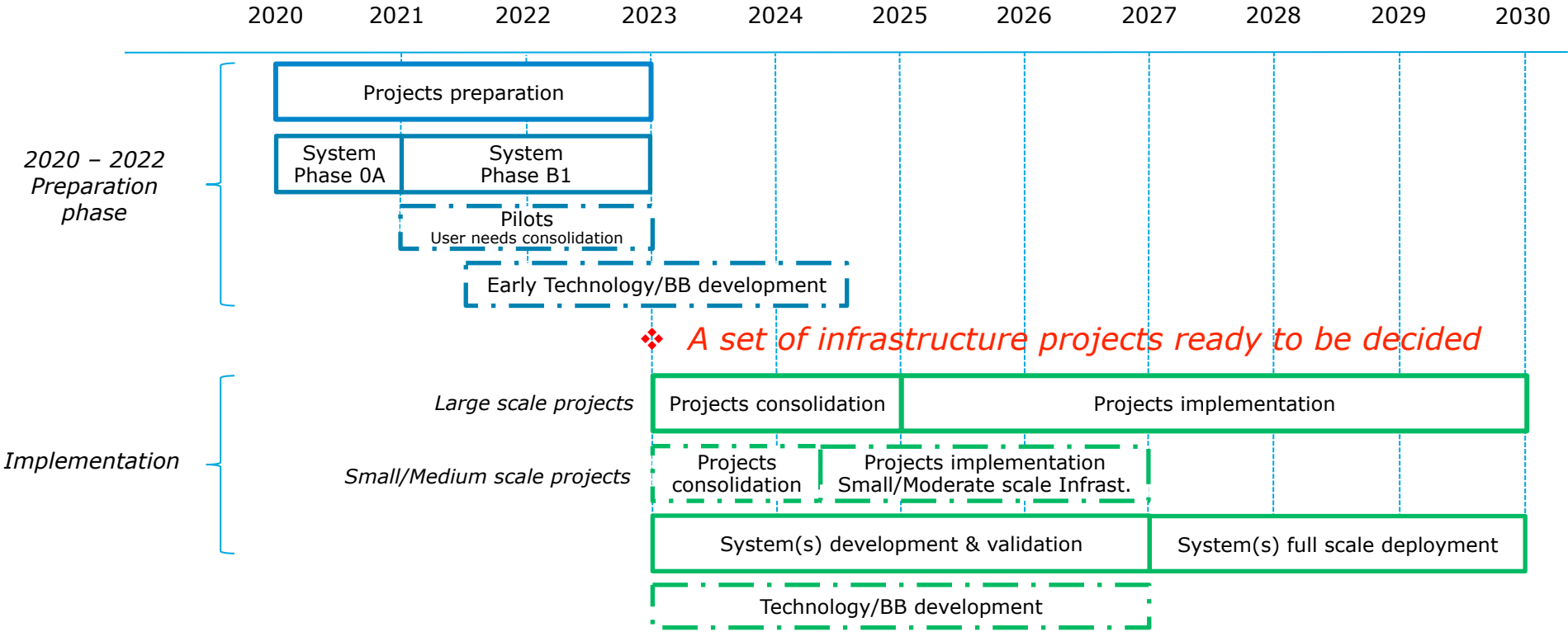
4S Strategic Plan - Projects and Activities - Status

- IRIS
- EDRS-Global
- SAGA & QCI Space Component
- National Initiatives

- 4S AO (Technology/Products, Applications) including potential projects including:
  - POLAR
  - GOVSATCOM Precursor Phase 2
  - Pooling & Sharing Platform
  - .....

- NG Future System Studies

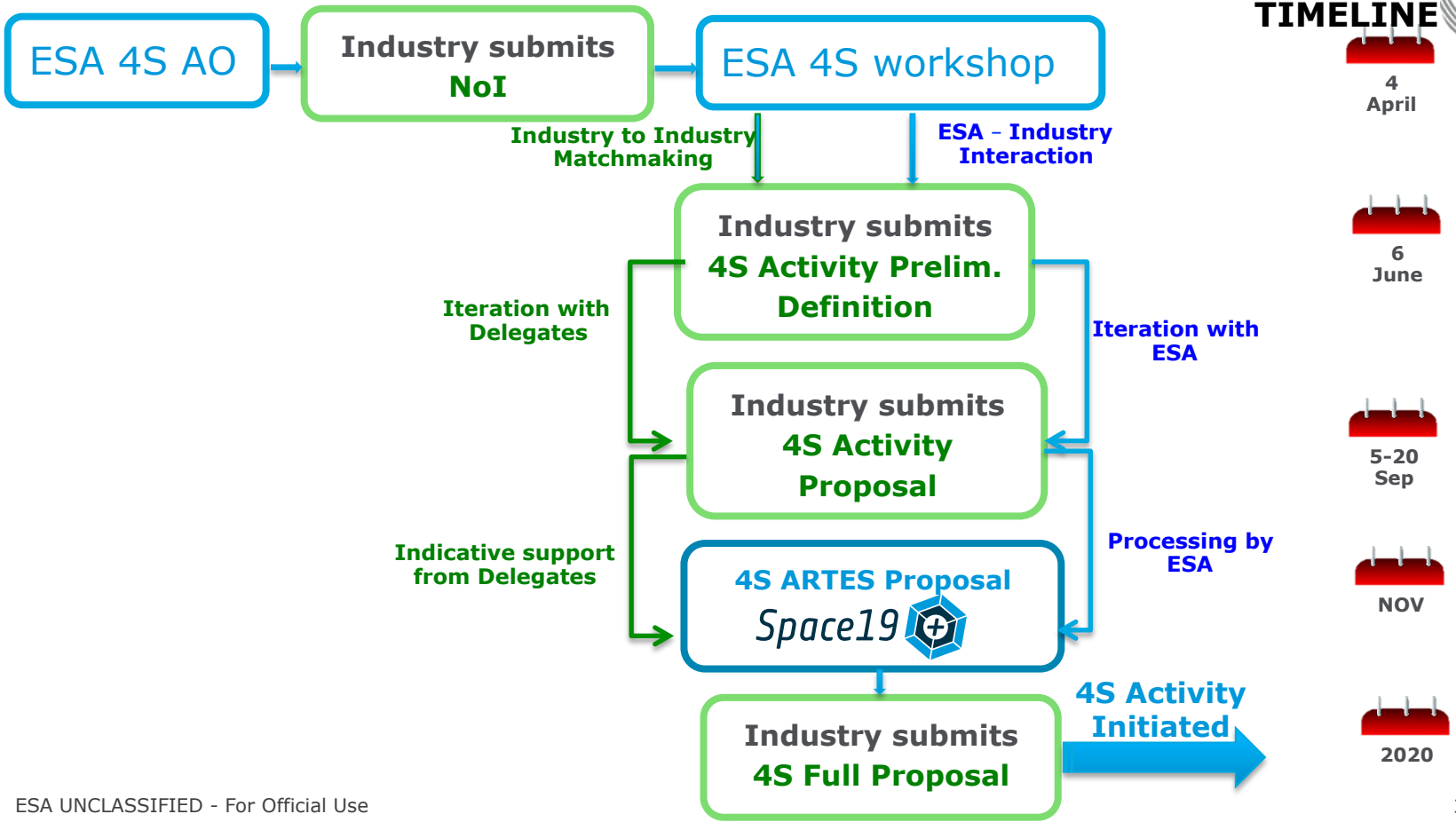
Preparing the 2030 European Next Gen SATCOM infrastructure - Road Map



4S
Industry-initiated activities

Preparation through the 2019 "Announcement of Industrial Opportunity"

Roadmap to 4S ARTES Proposal for Space19+ and 4S Activity Creation



TIMELINE

4 April

6 June

5-20 Sep

NOV

2020

Industry Reply to ESA AO on 4S : Major Topics

- Extending the current PACIS (global service integration and in field demo)
- Prelim design and optimisation of Commercial Pooling & Sharing platform solutions
- Secure & Reliable Arctic Communications for Institutional and Commercial users
- QKD techno development and system definition for commercial and institutional users
- Secure Satellite Operation Monitoring and Deployment
- Secure and flexible terminal, smart gateways, authentication and cloud developments
- Secure Space Infrastructure and Secure TT&C solutions
- Business Applications for safety and security for RPAS, Maritime Users, First Responders

Industry Reply to ESA AO on 4S :

Outline Proposals for ARTES 4S addressing:

- Partner Project Activities
- Technology & Product Development Activities
- Business Application Activities

Currently iterating to further define requested budgets, industrial consortia set up, type and timeline of proposed activities.

For topics where ESA identify a key technology gap that is not addressed by the industrial response to the AO or where ESA need to look ahead at future secure space infrastructure for solutions beyond 2025, the Agency might also initiate activities through 4S ITTs.

ARTES Strategic Programme Lines

Optical Communication
ScyLight Technology Development

Optical Communication – ScyLight

Satellites of the future need optical communication technology

- Optical Communication Technology is a **disruptive technology** which requires **strategic long-term investments**
- Commercial market is missing: **ESA and its Member States to take lead**
- Create right programmatic framework to address associated **high technical and commercial risks**

ScyLight
ARTES Strategic Programme Line

Industrial Excellence and Market Lead in Optical Communication Technology by 2025

Common System and Critical Technologies Activities

ESA-initiated implementation roadmap and to characterize the environmental drivers for the disruptive technologies.

Optical Communication

Industry-initiated developments & in-orbit validation

Optical Communication Projects

- ESA proposed & ESA led demonstration missions to foster the **build-up of industrial capabilities**

- Industry-initiated Projects

ARTES Strategic Programme Line

Space for 5G

,

5G enables the Digital Transformation of Business

The Download

What's up in emerging technology

US grocery giant Kroger has started making autonomous deliveries

The US grocer is trialing autonomous delivery vehicles in Scottsdale, Arizona with no human supervision.

Data is the new gold

Connectivity is the new electricity

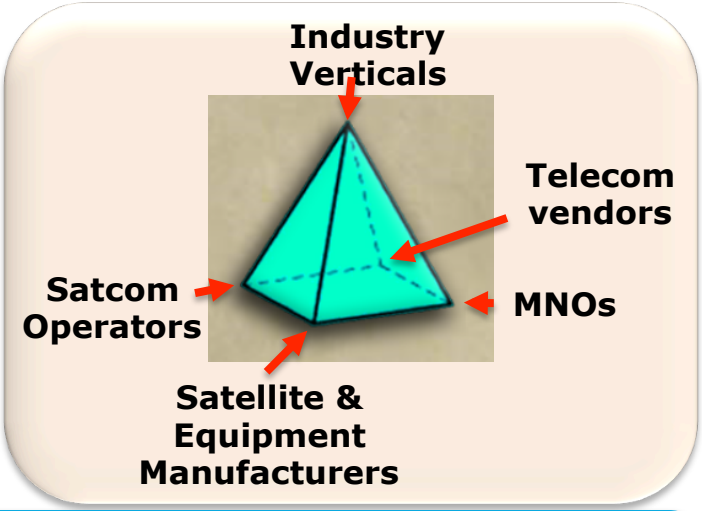
Satellites are needed to provide 100% territory coverage

Convergence cellular/ satellite is key

Standard guarantees multi-vendor multi-technology

5G and the Interconnectedness of All Things

With the integration of satellite networks, 5G provides the connectivity to enable digital platforms to collect share and act upon data from multiple sources, everywhere.



Seamless connectivity offering the required quality of service across domains, applications and geographies relies on the alignment, coordination and cooperation of SatCom Operators, Mobile Network Operators, industry manufacturers and Vertical market stakeholders.

5G Programme and Flagship Missions

The creation of a dedicated 5G Strategic Programme Line is the best approach to serve the satcom industry of the Member States and provide the required strategic coordination.

	5G id	Activity name
1	PRO	Promote 5G
2	GTB	Global 5G Testbeds
3	TEC	Fundamental 5G technology Devs
4	TM	5G Techno Missions
5	SM	5G Service Missions
6	BA	5G Business Applications
7	RP	5G Regional Partnerships
8	IRS	Institution/Regulation/Standards

#	Flagship Missions
1	Maritime
2	Aviation
3	Autonomous Vehicles
4	Public Safety
5	High Speed Trains
6	Media and Broadcasting
7	Sunrise Phase 2
8	LEO 5G
9	GEO 5G
10	Global Testbeds and Ground Segment

ARTES Generic Programme Line

ARTES Core Competitiveness – 25 Years of Support 2014-2018

ARTES CC

€533m

→ ESA FUNDING

More than

250

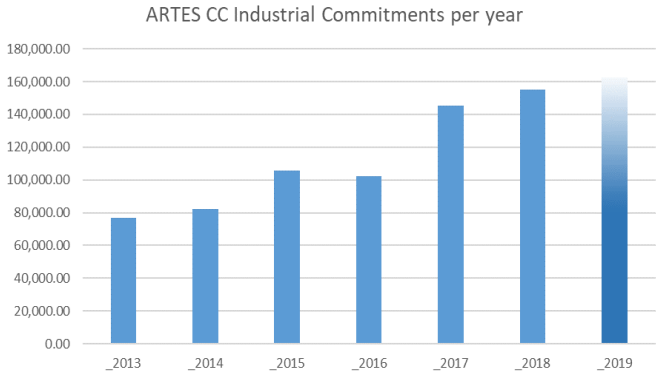
→ COMPANIES ENGAGED (including subco)

More than

€320m

→ INDUSTRY CO-FUNDING

Doubled total Contract Value per Year



→ EXPECTED REVENUES in 5 Years

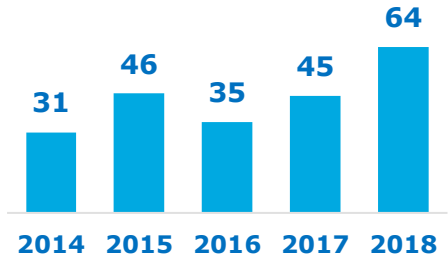
€930m

→ FTE created and sustained

860

since 2017

NEWCOMERS PER YEAR



→ OVERALL INVESTMENT IN NEWCOMERS (including subcontractors) -> ESA funding

€100m

Based on 632 running & completed activities since 2014

ARTES CC Socioeconomic Impact in Belgium

92%	Activities resulting in new/improved products
2.1	Average number of products developed per activity
100%	Companies who are in a position to answer RFQs today
>8	Average number of potential customers per activity
53%	Activities attracting new customers
>20%	Export sales outside of the ESA Member States
9.2	Importance of ARTES CC in achieving the business objectives (mark out of 10)

Generic Program Lines in ARTES 4.0
Partnership Projects

- Federate industry around large scale programmes achieving competitive leaps forward and economic impacts.
- De-risk partners' investments to answer market needs
- Develop sustainable end-to-end systems up to in-orbit validation
- Trusted partner for investors, operators and industry
- Efficient co-management approach, tailored to commercial best practices, maximizing benefits to industry

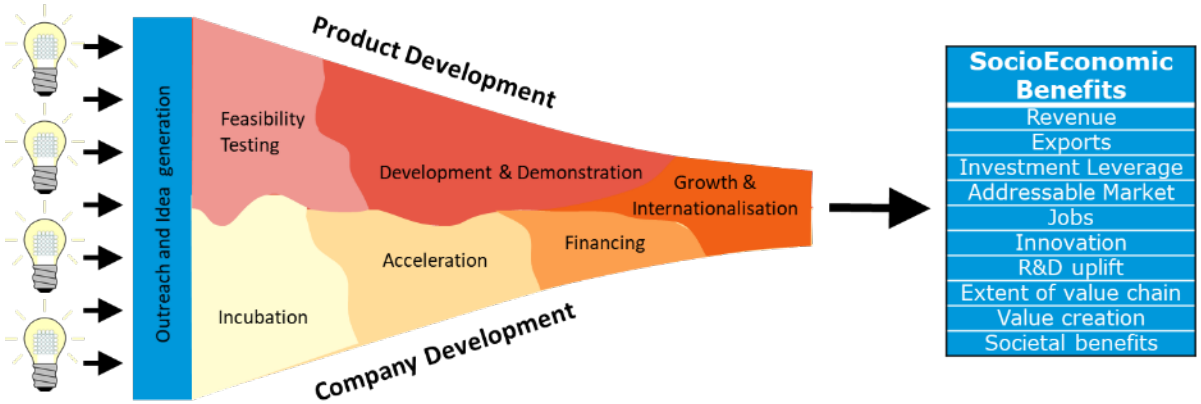
Generic Program Lines in ARTES 4.0
Business Applications Space Solutions

Supports commercialisation of space applications and technology into non-space markets

Two parts:

Project support to develop services and applications

Company support for businesses in sector



Kick Start as tool to support Newcomers

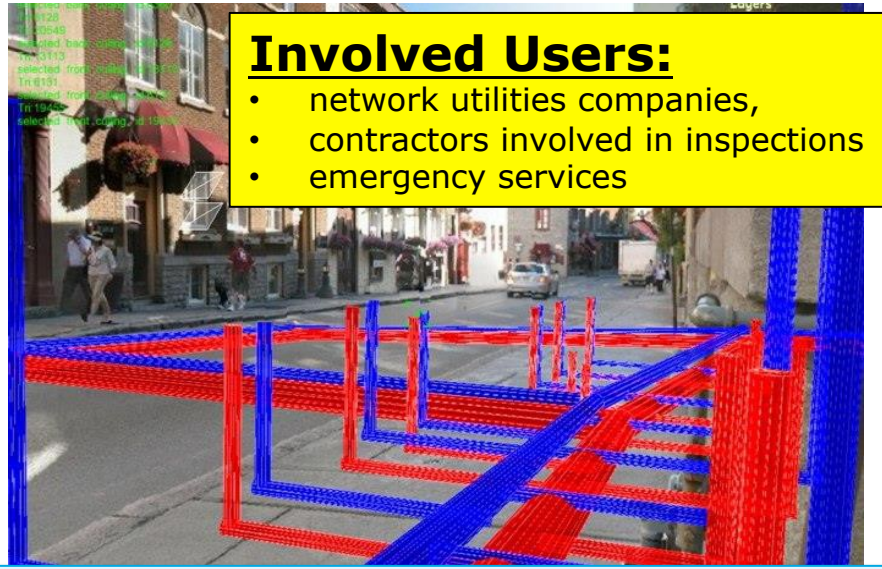
SenTAct Project – GRAVITENCE (BE)

Involved Users:
- Ghent firefighters
- BE Red Cross/Civil protection

AI-based platform for civil protection and emergency response operators to increase operational effectiveness

Virtual Reality/augmented reality Underground Network Asset viewer – HydroScan (BE)

Involved Users:
- network utilities companies,
- contractors involved in inspections
- emergency services



Accurate localisation and VR visualisation of underground network assets in the urban environment

Feasibility studies as first step towards new services

High Altitude Platforms Feasibility Study
SONACA, BE

Objective: investigate technical and commercial feasibility of Maritime Security and Terrestrial Border surveillance services based on HAPs

Involved Users:
- European Maritime Safety Agency (EMSA);
- Frontex;
- SATCEN

Unmanned Maritime System GALENE Feasibility Study– WestRay, BE

Objective of the study is to investigate technical and commercial feasibility of UMS based services.

WESTRAY GALENE

Involved Users:
- Port of Antwerp
- Oiltanking
- Blueline Shipping

New studies addressing needs of key stakeholders: "Port of the Future"

Supported by Port of Antwerpen

Automation

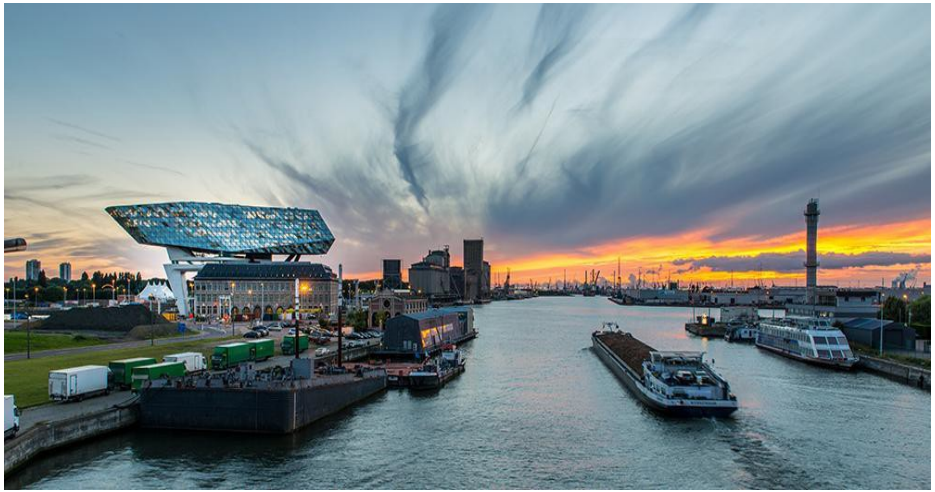
- **Technology AI, 5G, IoT and data analysis** to increase automation, communication, efficient management of operations
- **RPAS** for surveillance, container terminal inspection, oil spill inspection, crane and terrestrial port inspection

Environment

- **Environment strategies** to increase energy efficiency, reduce the CO2 emission, local pollutants and other emissions, reduce the water footprint, reduce waste and monitor air quality

Safety & Security

- **Safe and secure logistics movements** within the ports
- **Safety of the workforce** within the ports
- **Blockchain** for secure exchange of docs



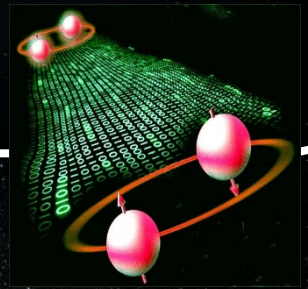
Projects under preparation

ARTES Strategic Programme Lines

Space Systems for Safety and Security (4S)

SAGA project

SAGA - Security And cryptoGrAphic missions
Space Component proposal for EC QCI



EC EuroQCI – Quantum Communication Infrastructure

EC proposing a pan-European Quantum Communication Infrastructure (QCI):

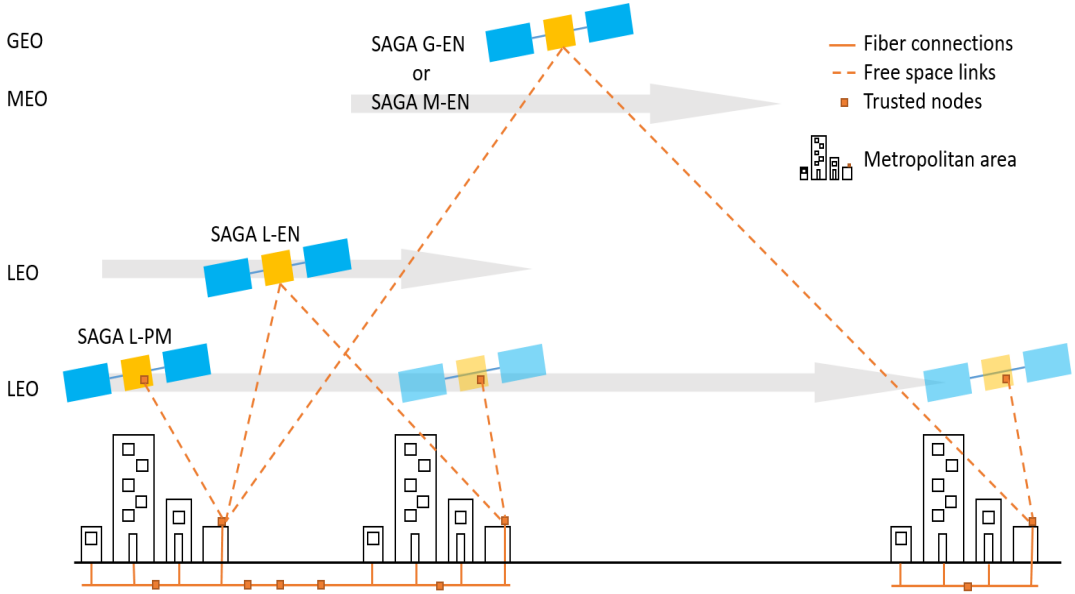
- Secure interconnection
- Links critical public communication assets all over the EU
- To be deployed in the next decade.

ESA SAGA Project: QCI Space Segment

QCI Space Segment:

- LEO, MEO and GEO Satellites,
- Optical Ground Stations
- Mission Operating Centres.

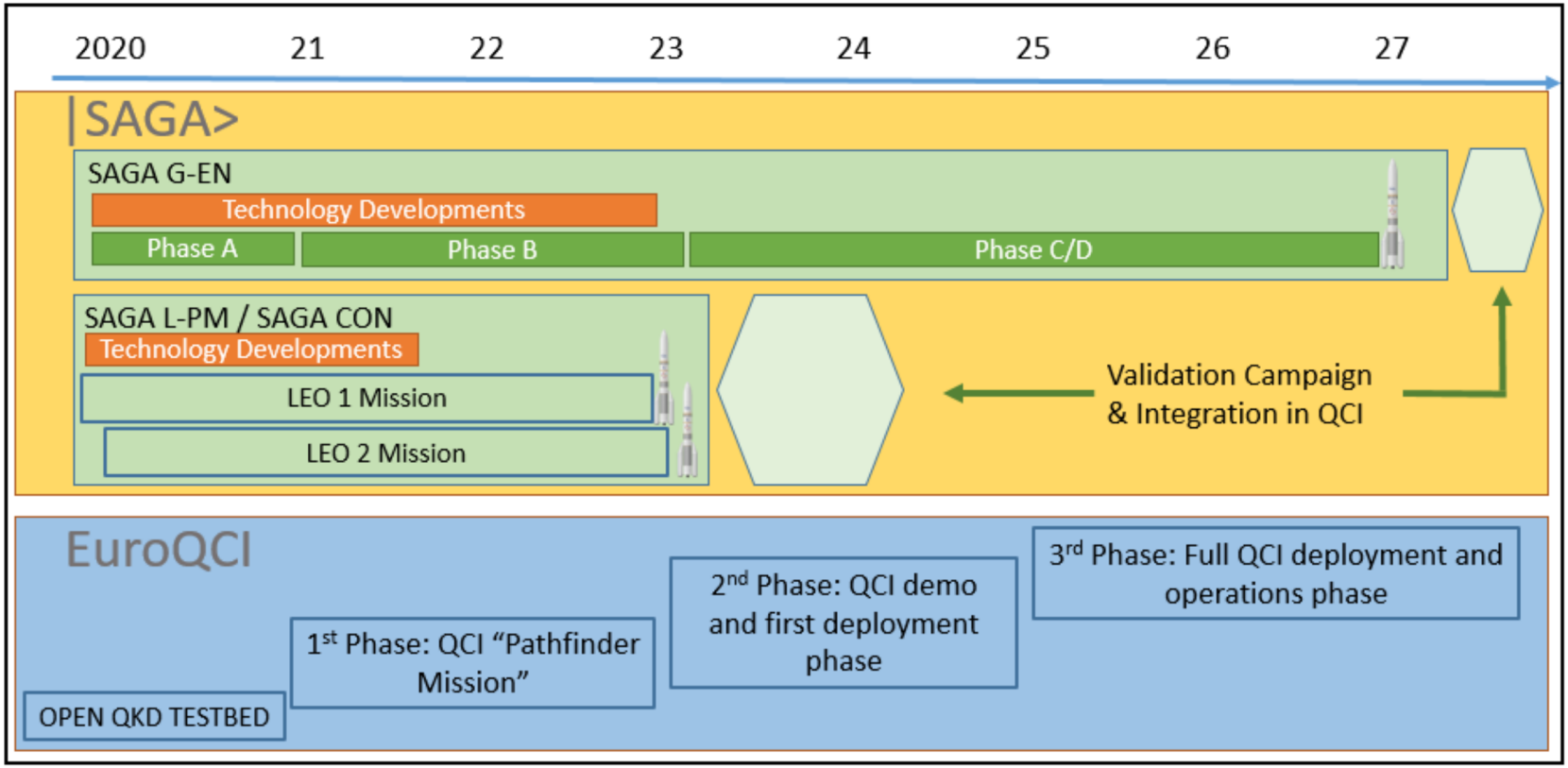
Commercial Contributing Missions foreseen for early service demonstration



|SAGA> = (SAGA G-EN, SAGA M-EN, SAGA L-PM, SAGA L-EN, SAGA CON)

GEO based Entangled QKD Satellite(s)
MEO based Entangled QKD Satellite(s)
LEO based Prepare & Measure QKD Satellite(s)
LEO based Entangled QKD Satellite(s)
Contributing Mission QKD Satellite(s)

EC-ESA Joint QCI Roadmap (under consolidation)

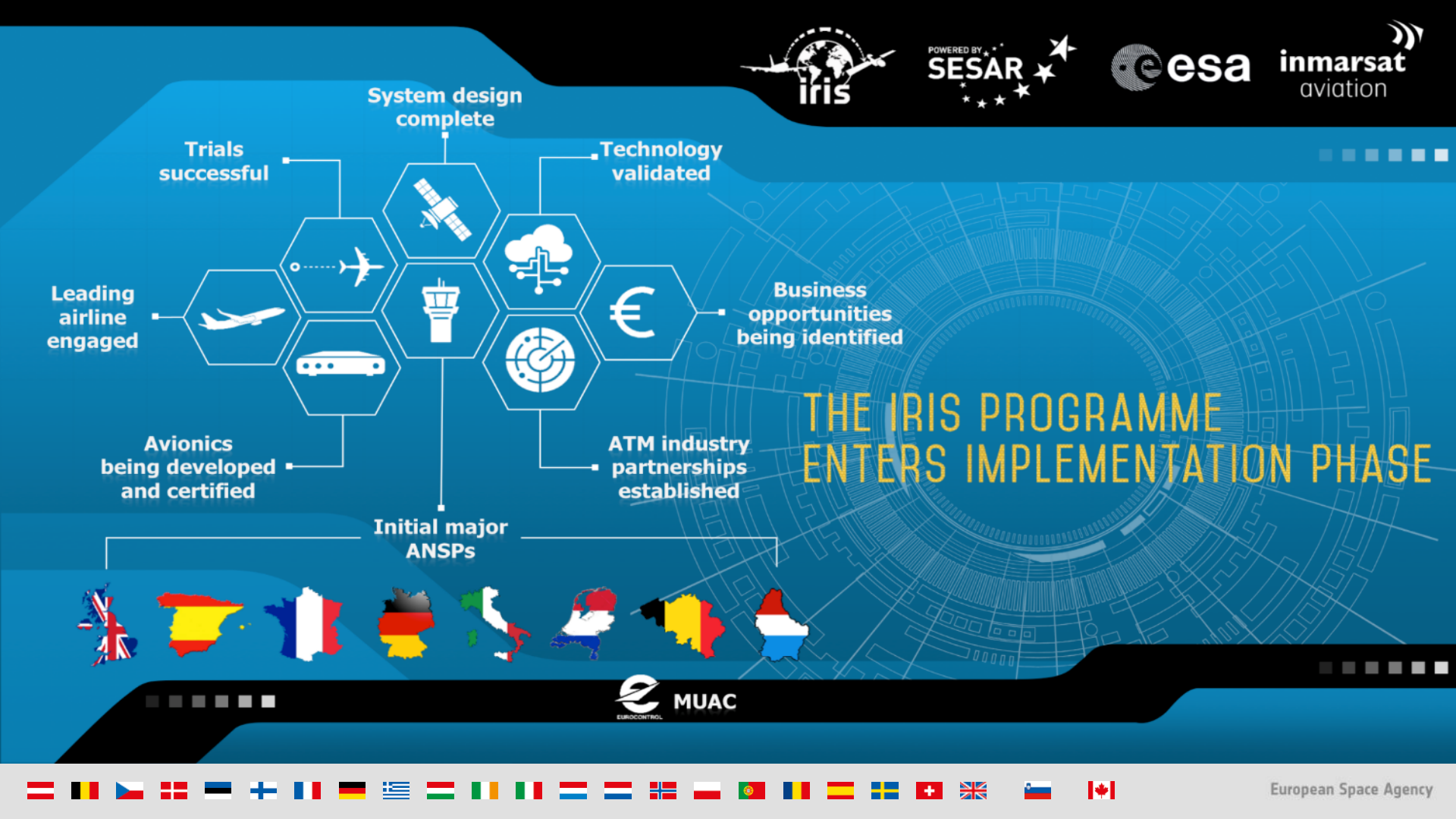


ARTES Strategic Programme Lines

Space Systems for Safety and Security (4S)

Iris Global Services Project

IRIS IOC & FOC
Initial Operational Capability Evolution
and Full Operational Capability


iris
POWERED BY SESAR
esa
inmarsat aviation
System design complete
Trials successful
Technology validated
Leading airline engaged
Business opportunities being identified
Avionics being developed and certified
ATM industry partnerships established
Initial major ANSPs
THE IRIS PROGRAMME ENTERS IMPLEMENTATION PHASE
EUROCONTROL
MUAC
European Space Agency

IRIS FUTURE MILESTONES

Iris Satellite Global Solution
Future steps as part of Space 19+

System FOC development	• **Develop additional Technology and System for FOC Iris global solution in line with performances ATM needs**
Full System integration	• **Full integration of Iris FOC System in Common European ATM network**
Service provision	• **Expand Iris service provision and ground network to efficiently support full Iris service deployment**
CNS service integration	• **Integrate in Iris system the capability to provide CNS services**

ARTES Strategic Programme Lines

Optical Communication
ScyLight Technology Development

Hydron Project

HydRON Vision – Fibre in the Sky

- Terabit Optical Transport Network in Space
- Terabit Space-Ground Links
- High-speed optical routing
- Collection and distribution of end user data on ground
- Seamless integration in terrestrial networks

HydRON–Impacting the future of SatCom

Mission and Vision Statement:

- ***"Fibre in the Sky" at Terabit capacity demonstrated by European and Canadian Industries by 2025.***

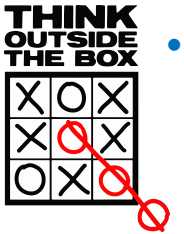
Strengthen role of satellite by Optical Coms:

- **Seamless integration of Space and Terrestrial Networks essential for many applications** (e.g. 5G).
- **HydRON – due to its network concept - will provide means to:**
  - ✓ **Overcome the atmospheric dependencies** of optical feeder up/downlinks
  - ✓ **Re-route traffic by switching capabilities on board**
  - ✓ **Share optical infrastructure** on ground and therefore ease use of optical for space

HydRON Objectives

- Foster the **implementation of the Optical Roadmap to ensure European and Canadian industrial capabilities** in areas of:
  - ✓ Intra-Satellite Photonics
  - ✓ Optical terminals (Space ***and*** Ground)
  - ✓ Optical Network Concepts
  - ✓ Platform-Enhancements
- Provide **Framework** for Developments up to PFM/FMs **to ensure strengthening of industrial capabilities**
- Provide **End2End Flight Opportunities** to ***demonstrate maturity*** **of** ***technology AND*** **the** ***Industry***
- **Integrate end users** (primes, operators) at an early stage

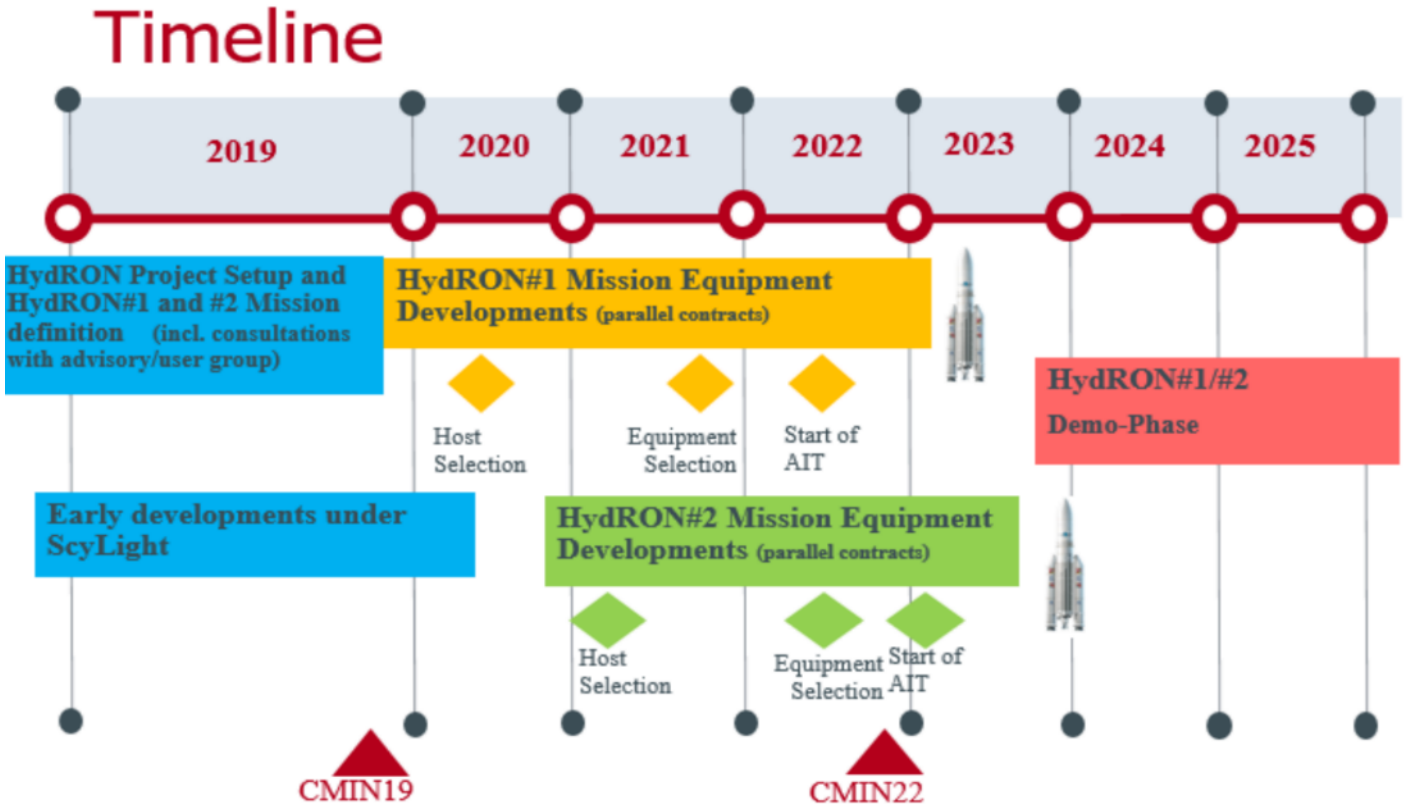
ESA Implementation approach



- **HydRON** is **beyond single Operator's** planning horizon and **maturity of technology is low** => **ESA as System Architect**

- HydRON to be implemented by **multiple but self-standing *"HydRON Demonstrator Missions"*** *(HydRON DM#1 [GEO], DM#2 [LEO]).*
- **Multiple implementations by multiple vendors/companies** by means of parallel place contracts
- **Advisory/user group** to be established to support ESA in definition and use cases
- **Integration into** the hosting platform of the **commercial mission.**

HydRON Proposed Schedule



ARTES Generic Programme Line

Partnership Projects

Novacom projects

Rationale for Novacom

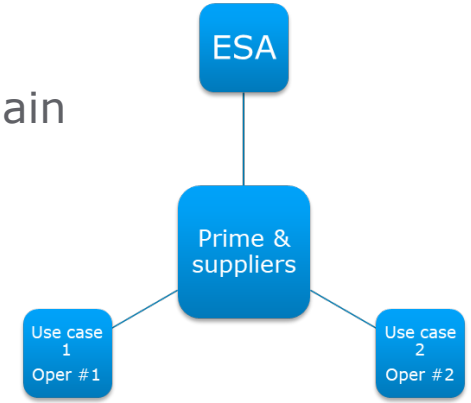
- The satcom sector is undergoing a **profound transformation**
- **Satellite Operators** are forced to innovate their business models and infrastructure. They are passing the **risk and responsibility for innovation development to satellite manufacturers**
- At the same time, the market needs in terms of flexibility and price require the development of **standard solutions that can be produced in larger series**

Novacom - Objectives & Motivation

Direct Support to Industry (Primes/Integrators & Supply Chain) developing the next gen solutions for core commercial satcom

A dedicated ARTES action to support the transition from customised satellite development approach to generic/ reconfigurable satellite systems developments

- **Partnership with Prime Contractors** and their supply chain
  - ✓ Exploitation of synergies between product lines and newspace
  - ✓ Specific developments for different (Operator) use cases



Novacom - Opportunities

Expected MS participation for

- ✓ Lead: Primes
- ✓ Contributors: Platform, Payload and Ground Segment equipment's from supply chain

Opportunities

- ✓ Discussions underway with Primes on identified new product line developments