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
- 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

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
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
Space Safety and Security

exclusively peaceful purposes

Space Safety

Safety and Security Applications

Cybersecurity
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
    o Already “tagged” Partnership Projects: IRIS, SAGA, ERMIS, …
  – A mix of ESA-initiated activities and Industry-initiated activities:
    o ESA-initiated: WP and ITT
    o 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
4S
ESA-initiated activities

Focus: Next Generation 4S Systems Preparation
Preparing the 2030 European Next Gen SATCOM infrastructure - Road Map

2020 – 2022 Preparation phase

- Projects preparation
- System Phase 0A
- System Phase B1
- Pilots
- User needs consolidation
- Early Technology/BB development

Implementation

- Large scale projects
  - Projects consolidation
  - Projects implementation
- Small/Medium scale projects
  - System(s) development & validation
  - System(s) full scale deployment
  - Technology/BB development

A set of infrastructure projects ready to be decided

Projects consolidation
Projects implementation
System(s) development & validation
System(s) full scale deployment
Technology/BB development
Industry-initiated activities

Preparation through the 2019 “Announcement of Industrial Opportunity”
Roadmap to 4S ARTES Proposal for Space19+ and 4S Activity Creation

ESA 4S AO

Industry submits
NoI

ESA 4S workshop

Industry submits
4S Activity Prelim.
Definition

Industry submits
4S Activity
Proposal

Industry submits
4S ARTES Proposal

Industry submits
4S Full Proposal

Indication support
from Delegates

Iteration with
Delegates

Iteration with
ESA

Processing by
ESA

ESA - Industry
Interaction

Industry to Industry
Matchmaking

4S Activity
Initiated

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**
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

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
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.
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.

<table>
<thead>
<tr>
<th>5G id</th>
<th>Activity name</th>
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<tbody>
<tr>
<td>PRO</td>
<td>Promote 5G</td>
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<tr>
<td>GTB</td>
<td>Global 5G Testbeds</td>
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<tr>
<td>TEC</td>
<td>Fundamental 5G technology Devs</td>
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<td>TM</td>
<td>5G Techno Missions</td>
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<td>SM</td>
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<td>5G Business Applications</td>
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<tr>
<td>RP</td>
<td>5G Regional Partnerships</td>
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<td>IRS</td>
<td>Institution/Regulation/Standards</td>
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Flagship Missions:

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<th>#</th>
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<td>High Speed Trains</td>
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<td>Sunrise Phase 2</td>
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<td>8</td>
<td>LEO 5G</td>
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<td>9</td>
<td>GEO 5G</td>
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<tr>
<td>10</td>
<td>Global Testbeds and Ground Segment</td>
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</tbody>
</table>
ARTES Generic Programme Line
ARTES Core Competitiveness – 25 Years of Support 2014-2018

Based on 632 running & completed activities since 2014

**ARTES CC**

€533m
→ ESA FUNDING

More than 250
→ COMPANIES ENGAGED (including subco)

More than €320m
→ INDUSTRY CO-FUNDING

**ARTES CC Industrial Commitments per year**

**Doubled total Contract Value per Year**

→ EXPECTED REVENUES in 5 Years

€930m

→ FTE created and sustained

860

since 2017

**NEWCOMERS PER YEAR**

<table>
<thead>
<tr>
<th>Year</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
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<td>46</td>
<td>35</td>
<td>45</td>
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</tr>
</tbody>
</table>

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

€100m

31/09/2019 | Slide 25
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

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

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

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

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.

Involved Users:
- Port of Antwerp
- Oiltanking
- Blueline Shipping
New studies addressing needs of key stakeholders: "Port of the Future"

**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

Supported by Port of Antwerpen
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
EC-ESA Joint QCI Roadmap (under consolidation)

**SAGA**

- **SAGA G-EN**
  - Technology Developments
  - Phase A
  - Phase B
  - Phase C/D

- **SAGA L-PM / SAGA CON**
  - Technology Developments
  - LEO 1 Mission
  - LEO 2 Mission

**Validation Campaign & Integration in QCI**

**EuroQCI**

- 1st Phase: QCI “Pathfinder Mission”
- 2nd Phase: QCI demo and first deployment phase
- 3rd Phase: Full QCI deployment and operations phase

OPEN QKD TESTBED
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
THE IRIS PROGRAMME ENTERS IMPLEMENTATION PHASE
IRIS FUTURE MILESTONES

- Selection of ISP: Q4 2019
- Organisation of Iris Service Provision: 2019
- Certification of ISP: 2020
- Integration into SESAR framework, policy, regulation
- Early implementation: Mid 2020-2021
- Commercial Service Introduction: 2021

~20 aircraft to demonstrate performance and benefits
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

Timeline

2019

HydRON Project Setup and HydRON#1 and #2 Mission definition (incl. consultations with advisory/user group)

2020

HydRON#1 Mission Equipment Developments (parallel contracts)

Host Selection

Equipment Selection

Start of AIT

2021

Early developments under ScyLight

2022

HydRON#2 Mission Equipment Developments (parallel contracts)

Host Selection

Equipment Selection

Start of AIT

CMIN19

CMIN22

2023

HydRON#1/#2 Demo-Phase
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