

- Pioneer
- GlobeNET
- Govsatcom

ARTES Opportunities

- Pioneer-

Providing Access to Space for
In Orbit Demonstration/Validation of
Satcom technologies, systems, services &
applications

ESA PPPs to ignite and facilitate the emergence of "Space Access Provider" entities

DEMO FLIGHT CUSTOMERS

New Satcom Service/Applications Provider

New Satcom Technology suppliers

ESA/National Programs (EO, Science, Nav, SSA, etc)

SPACE ACCESS PROVIDERS
(New) Private Entities

INFRASTRUCTURE SOLUTION PROVIDERS

Satellite Providers

Coms Providers

Ground Segment

Launch Service Providers

Minisats

Microsats

Nanosats

EDRS

BGAN LDR

O3B

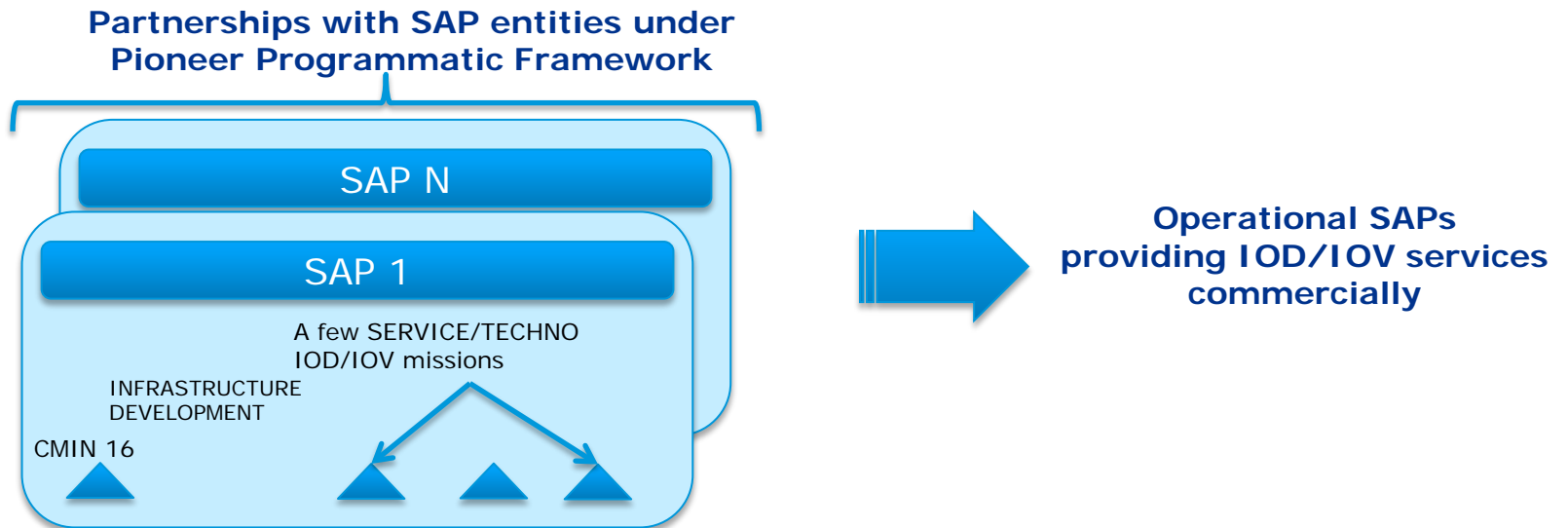
D/L G/S

Examples...

-  Airbus DS TAS-F
-  QinetiQ
-  SSTL
-  LuxSpace
-  Astro
-  ISIS
-  GomSpace
-  ClydeSpace
-  Tyvak
-  ASV
-  Inmarsat
-  O3B
-  Ksat
-  SSC

- ✓ **Stimulate IOD/IOV Flight opportunities** allowing Satcom industry to win/enable future market opportunities in services, applications and technologies
- ✓ Boost the **development of new ESA MS Industry and attract new players for the infrastructure needed by SAP(s)** (eg: emerging small satellites providers, ISL technologies, ground segment elements,)
- ✓ **Wide impact on all Satcom Upstream and Downstream domains:** Ground, Payload, System, Platform, Service, Applications
- ✓ **Synergies across domains within and beyond Satcom**
 - with on going ARTES programs (e.g. EDRS, Mega Const., future PPPs)
 - with other ESA directorates EO, NAV, Science, Space Situational Awareness, etc.
 - and outside the Agency

- ✓ Pioneer is a **time limited** initiative aiming to support the emergence of Space Access Provider(s).
- ✓ Each potential SAP and associated consortium is **supported** under the Pioneer framework by ESA for putting the necessary **infrastructure** in place and for **a few IOD/IOV missions**.
- ✓ Once the Pioneer initiative is completed, SAPs are fully operational and able to provide IOD/IOV services commercially to any entities (private/public)



ARTES Pioneer Funding scheme



| Main Activities | Objective | ESA (co-funding level) |
|---|--|---|
| <p>Development of Innovative Satcom Infrastructure Elements required by SAP => Sat Platforms, Comms functions and technologies (eg ISL), Ground Control Segment elements, end to end system engineering capabilities, etc</p> | Design and develop/improve innovative products and services tailored for the targeted SAP IOD/IOV service commercial offer | up to 50% |
| <p>A batch of Satellite Platforms => for the batch of IOD/IOV missions</p> | Validate the infrastructure development and support the IOD/IOV missions | Up to 50% (possible variable scheme depending on number of satellites) |
| <p>IOD/IOV missions specific development => Innovative Satcom Technology / service / Application services development</p> | Support the IOD/IOV missions showcases | up to 50% / 75% depending on “proximity to market entry”(*) |
| <p>IOD/IOV missions deployment and operations => AIT, Launch, IOT, x months of IOD/IOV mission data gathering, decommissioning</p> | Support IOD/IOV missions showcases Will also validate the infrastructure development | up to 50% / 75% depending on “proximity to market entry” (*) |

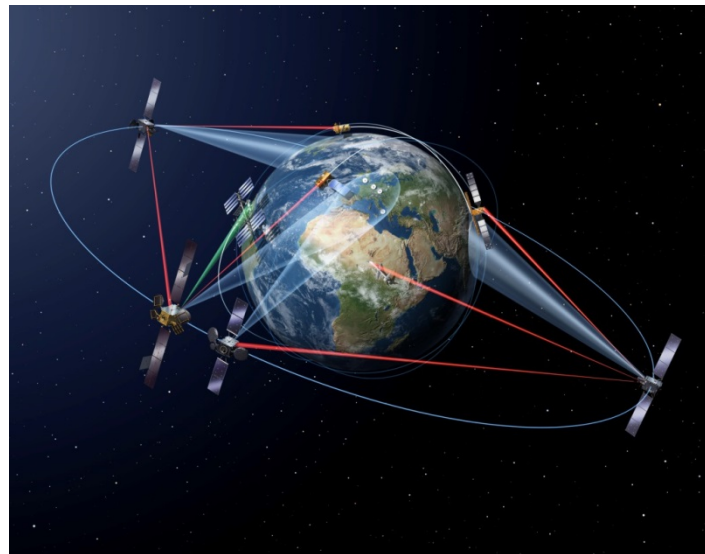
*Pioneer completed and **SAP(s)** will run commercial operations by providing access to space to private and public entities.*

- ✓ ARTES will make use of the SAP services for Satcom technologies/system/service/application IOD/IOV missions through ARTES C&G element
- ✓ ...at conditions agreed at the time of the Building and Validation Phase in the form of ESA <-> SAP(s) SLAs
- ✓ ARTES will support the maintenance of solution providers' building blocks (next generation/advances etc..) through ARTES C&G.

- ✓ Approach potential SAPs and Infra solution providers: on going discussion with more than 15 entities across ESA member states
- ✓ Identification of potential IOD/IOV missions
- ✓ Announcement of Opportunity issued on ESA TIA website on 23rd March
- ✓ May TBC workshop on Pioneer with interested delegations for a dedicated iteration on Pioneer
- ✓ SAPs consortium to submit Outline Proposals: deadline end of May
- ✓ Pioneer draft Program Proposal in May JCB
- ✓ Pioneer draft Declaration and Implementing rules in June JCB

ARTES Opportunities

- Globenet -



GlobeNet shall allow for growth on

Global Coverage – Large volume of data gathered by satellite or airborne systems to ground back in European territory.

Quasi-Real-Time Services – Improving timeliness of data by minimizing latency, providing the basis for new types of Value-added Services on data gathered by satellite or airborne systems – globally and well beyond line of sight

UAV/RPAS Communication Services – Providing operational capabilities enabling customers to perform their missions beyond line of sight communication means.

Agile Tasking Services – Optimising operational scenarios for satellites and airborne services by “remote” tasking around the globe

Furthermore GlobeNet shall allow for **Technology/Service Demonstration** preferable on optical communication, like Optical Feeder Links, Quantum-Cryptography, etc.

GlobeNet System Concept

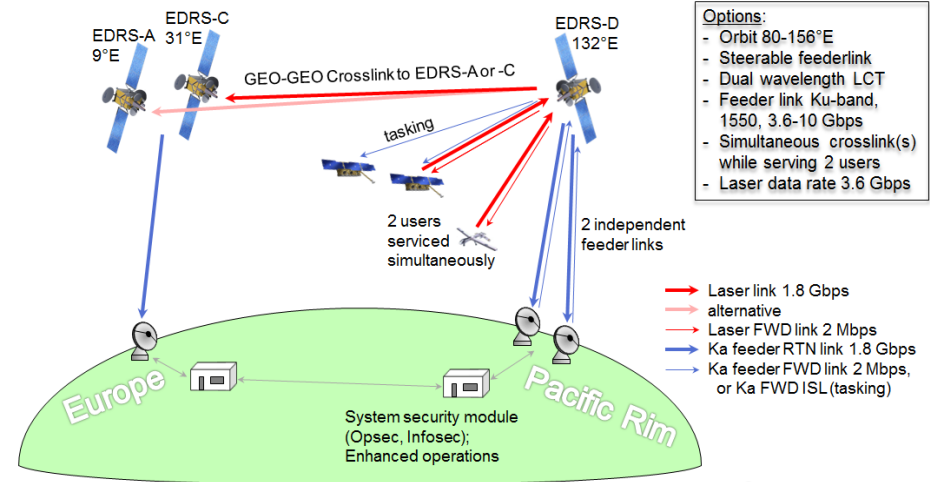
GlobeNet shall complement the EDRS Constellation towards a global, continuous data relay coverage of the Earth. It shall consolidate the sustainability of the EDRS Services and to further stabilize the overall EDRS PPP Programme.

Features:

- “Security-certified” GEO node in
- Service capabilities to UAV/RPAS
- Dual-wavelength capacity for optical communication
- GEO-to-GEO link for independent and secure Asia-Europe data transfers

Opportunities:





































- secure MOC and upgrades on (secure) Ground Segment/Antennas
- P/L PrimeShip and P/L equipment
- Development and potential flight opportunities for user terminals
- TDP Concept for new technologies/service based on optical communications proposed (e.g. optical Sat-Grd)



- Secure LCT as world standard & support competitiveness of European industry
- Establish EDRS as European strategic asset improving European independence (e.g. by GEO-to-GEO Intersatellite links back to European territory).
- Foster User/Optical Terminal Developments (reduce cost of ownership, by adapting the performance = Low Cost Terminals)
- Provide world-wide Real-Time communications to maritime surveillance, disaster monitoring and other time-critical user applications (e.g. COPERNICUS)
- Respond to requirements of security applications and governmental SATCOM including RPAS (e.g. GOVSATCOM)

GlobeNet Industrial Opportunities



| Item | Comment | Nation | |
|--|---|---|------------------------------|
| Enhanced P/L architecture | Integrate multiple LCTs, dual wavelength, enhanced fwd tasking |   | CAN, DE |
| Security Module/Encryption unit | New State-of-the-art protection methods (OpSec, InfoSec), supports Copernicus concept |      | UK, BE, FR, CH, DE |
| Modulator | Development and Implementation of new modulation- and encoding schema (e.g. QPSK) |        | IT, FR, ES, UK NO, BE, DE |
| P/L Control Computer | Enhanced processing unit including interaction with satellite platform |      | FR, ES, IR, SE, DE |
| Data Processing Unit | Support ≥ 2 LCTs |       | UK, CAN, FR, ES, IT, DE |
| Fixed&Steerable antennas | Feeder downlink, GEO => LEO |    | CAN, E, IT |
| MPM CAMP TWTA 120W | Feeder downlink data rate ≥ 3.6 Gbps |    | FR, BE, DE |
| LCT Upgrade: Additional 1550 RX/TX Modules | GEO-LEO/Airborne and/or GEO-Ground |     | FR, UK, CH, DE |
| LCT upgrades | dual wavelength, reliability improvement, GEO-Ground, Enhanced FWD link (ASK) |  | DE |

GlobeNet: Potential Areas for Technology Demonstrators



- ✓ Quantum-Cryptography Demonstration: Upgrades and tests services for applications using Quantum Cryptography
- ✓ 1550 Terminals: GEO-LEO/Airborne and/or GEO-Ground Feederlinks
- ✓ (Transportable) Optical Ground Station: Optical Feederlinks Demo (GEO to Ground and Ground to GEO in 1064 and 1550nm)

- ✓ Mission Requirements Document and System Requirements Document in preparation. Both will serve as baseline for a Draft Programme Proposal.
- ✓ Payload Concept and Hosting Opportunities under evaluation
- ✓ Selection of Hosting Partner (multiple options exist for required orbital slots)
- ✓ Bi-Lateral discussions scheduled between now and May JCB to define
 - industrial opportunities in all areas of interest for GlobeNet Mission
 - potential technology demonstrators for optical technologies
- ✓ Business Case Trade-Offs in order to secure Industrial co-funding
- ✓ In parallel, coordination between TIA and EC DG-GROW in order to
 - define further user requirements at EC level
 - Identify benefits for Copernicus Downstream Services and QRT
 - Increased EC involvement or partnership approach

ARTES Opportunities

- GOVSATCOM -

- Dec 2014, the EU Council underlined the need to avoid fragmentation of demand and to foster civil-military synergies for the preparation of the next generation of governmental satellite communication, through close cooperation among Member States, EDA, the EC and ESA
- Recently the EC - as one of its priorities - included GOVSATCOM in its European Defence Action Plan 2016



Crisis
management



Infrastructure
Monitoring



Border
surveillance



Security Solutions
Independence

GOVSATCOM will potentially mobilise substantial institutional budget to implement a Satcom infrastructure and provide associated services



A Highly attractive opportunity for Satcom industry

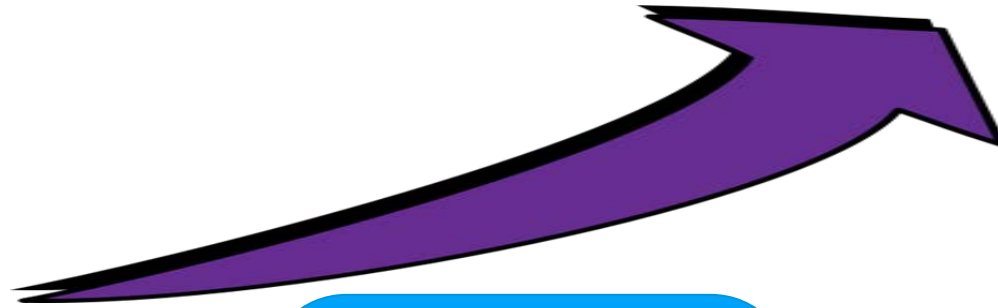


ESAs role focused on enabling the emergence of Secure Satcom segments and positioning ESA MS Space industry for this market

- ✓ **Ensure ESA MS industry are taking the initial steps to be able to respond to the GOVSATCOM requirements (technology and services) from EC/EDA and potential other secure Satcom worldwide demand**
- ✓ **Proof of concept to the GOVSATCOM stakeholders via Precursor**
- ✓ **Demonstrate a model of cooperation with the Commission in establishing and implementing partnerships in the institutional domain in particular in a future GOVSATCOM operational programme**

ARTES Opportunities

- GOVSATCOM - in 3 steps



1

2015-2016

Preparatory Studies

(ESA/EDA/EC)

EC/EDA: User requirements

ESA: Assessment of

- system architecture, techno

- Implementation scenarios

- Existing/planned Satcom systems as

possible future elements of GOVSATCOM ESA precursor

ESA-DTIA-HO-2016-0017 | 06/04/2016 | Slide 108

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C-MIN 16

2

2017-2019

**GOVSATCOM
ESA Precursor**

In parallel: EDA Initial Operating Capability 2018-

3

2020/2021 ...

**European Commission
GOVSATCOM
implementation**

ARTES Opportunities

- GOVSATCOM - ESA precursor (Step 2)



2017-2019 GOVSATCOM ESA pre-cursor activities



- ✓ early R&D, IOV and demonstrators, in support of the specification and operational concepts validation in preparation of the GOVSATCOM system
- ✓ early support to European industry to develop technology as well as applications solutions
- ✓ demonstration of pre-cursor services relating to the development of future GOVSATCOM services, which may be provided under commercial service level agreements.

ARTES Opportunities

- GOVSATCOM - ESA precursor

Announcement of Industrial Opportunity



Precursor Announcement to Industry issued 26.2.2016

Two phases

- ✓ Notification of Intent by 23.3.2016 with outline of intended precursor and description of innovative elements
- ✓ Outline proposal by 6.5.2016 following classical ARTES scheme of Outline Proposals and including cost and funding plan



13 Notifications by industry received with one or more project outlines each

- ✓ Good share between Operators & Manufactures (8&5)
- ✓ Good distribution over MS (BE; DE(2); ES(2); FR(3); IT; LUX; NO; UK(2); NO)
- ✓ Good share of use of existing assets (innovation in GS and services) and new space assets (6&7)

Next Steps

- Industry WS 5.4.2016 incl. large MS participation; Bilateral meetings scheduled
- Consolidation, incl. potentially merging towards Outline Proposals Report to May JCB including draft Programme Proposal and roadmap towards CMIN

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ARTES Opportunities

- GOVSATCOM - ESA precursor

Announcement of Industrial Opportunity



5th April 4 Workshop Summary and Main Conclusions

- ✓ EC and EDA main messages
- ✓ NoI summary
- ✓ OP planning
- ✓ Main Q&A



ESA GOVSATCOM Precursor Industry Workshop

Reporting to JCB CMIN Preparatory WS





Very high level of participation, >80 participants from industry (13 consortia [6&7]), member states (10), EDA and EC

Objectives: support industrial opportunity & show Europe working together:

1. Very cooperative, positive and active participation by EDA and EC

- EDA confirmed plan to submit program proposal to MS end '16/ early '17 including plans for IOC (2017+)
- EC confirmed next steps for further programme preparations, e.g. definition of policy options, stakeholder consultation, impact assessment
- ESA Precursor (2017-2020/21) considered timely
- future cooperation considered key

2. 14 bilateral meetings same day (MS, industry), further planned

- Industry partners looking for GS expertise & pooling assets <-> GS Industry partners offering GS expertise and assets to pool → **ESA match-making support as required**
- Industry turning to ESA (and EC, EDA) to identify MS interested in supporting demonstrations with users (e.g. MS with focus on usage rather than technology)
→ **MS may identify interest to ESA; ESA work with EDA on PT SATCOM & potentially with EC User Experts Group**

ESA GOVSATCOM Precursor Workshop

Reporting to CMIN WS

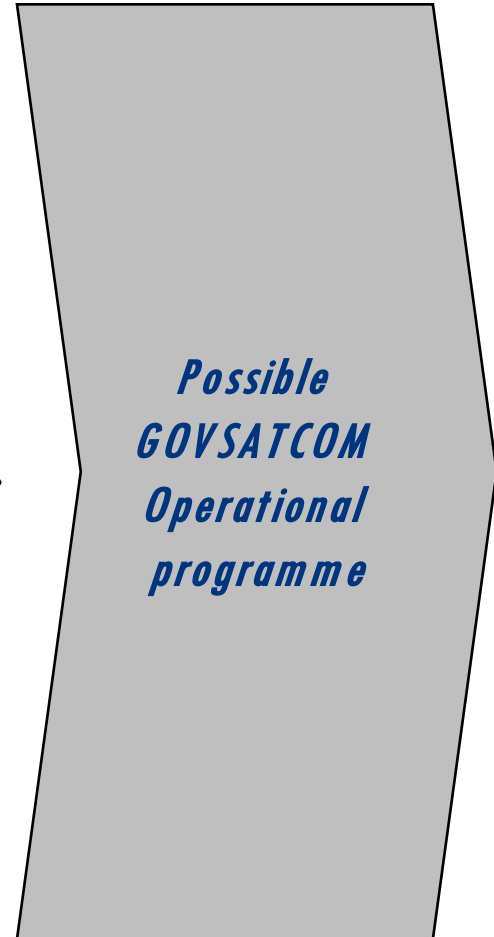
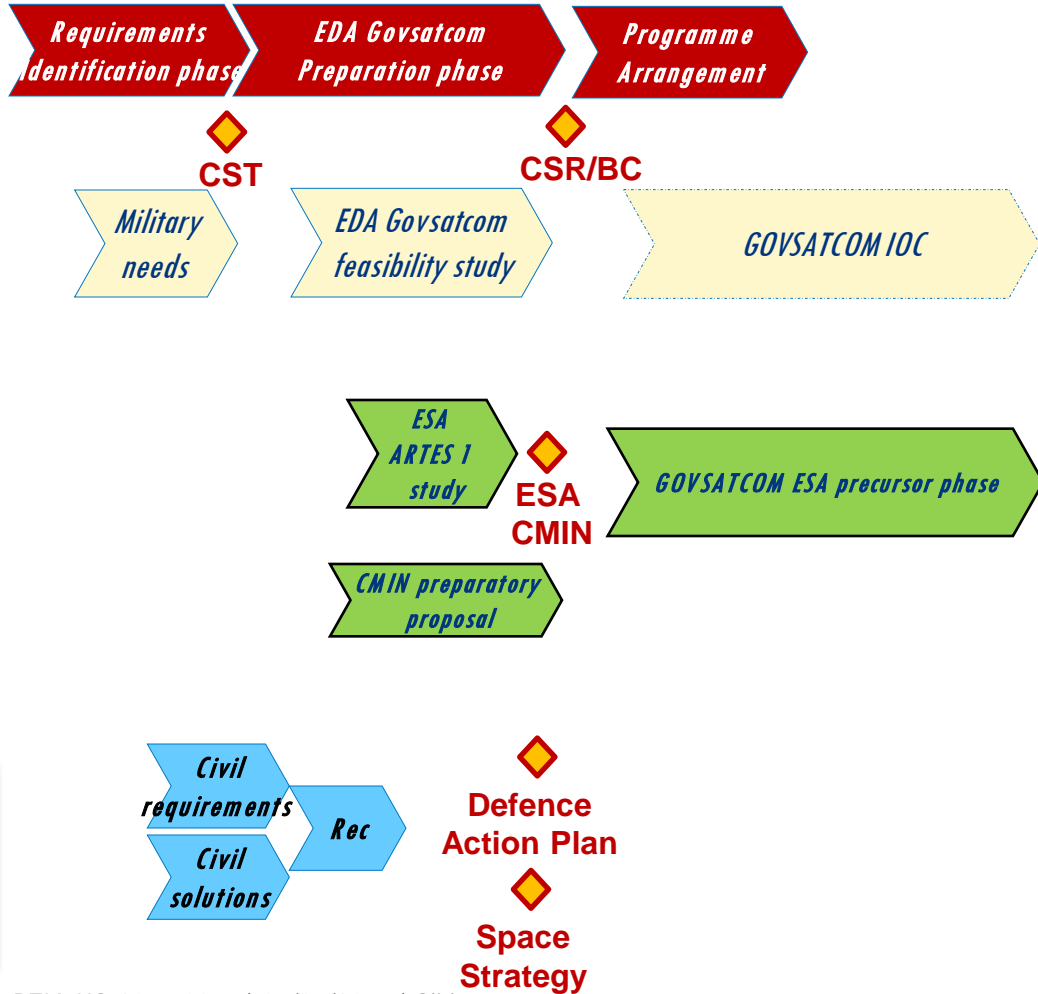


- Some industries expressed concerns on how to best ensure coherence of MS support which may rely on different ministries incl. MoDs → **ESA available to support MS dialogue as requested**
- Consolidation of # of consortia expected e.g.
 - consolidation around pooling & sharing of existing space assets (8+ different assets being proposed)
 - Merging of existing assets proposed for pooling & sharing
 - Merge proposal focused on GS innovation, e.g. scheduling systems
 - Aim at limited # of Pre-Operations facility(ies)/e.g. one hub
 - Synergies for validation & demonstrations
 - merging of specific GS expertise into other consortia;
 - possible consolidation of # of new space assets, e.g. around lead or flagship projects
- Coordinate ESA 2016 preparations & Precursor with EDA/EC schedule

ESA GOVSATCOM Precursor Workshop

Reporting to CMIN WS

EDA/ESA/EC Overall High-Level Schedule



ESA GOVSATCOM Precursor Workshop

Reporting to CMIN WS

Initial Considerations for Programme



Taking into account industry proposals, the WS, Q&A, EDA and EC feedback and bi-lateral discussions a possible structure of a GOVSATCOM Precursor Program is under consideration towards May JCB:

Specific ESA GOVSATCOM Precursor program (Draft)

- acknowledging role of EU institutional partners (new to ARTES)
- ensuring coherence with EC and EDA program activities (2017+)
- in preparation of possible joint European Operational Program (2021+)

Interest in MS Workshop prior June JCB with MS interested in GOVSATCOM Precursor?

- *ESA further consolidation with EC, EDA (e.g. H2020; IOC)*
- *MS may aim at national consultation with PoC MoDs and EC Expert Group*
- *Consolidation/Merge of Outline Proposals in line with MS interest*

ESA GOVSATCOM Precursor Workshop

Reporting to CMIN WS

Initial Considerations for Programme



Including elements allowing to structure I/F to EC, EDA and targeted industry/MS support:

- for Pooling and Sharing (Ground Segment Innovation & Development of Demonstration Services) incl. cooperation with possible EDA IOC for 2017+
- for implementation of new innovative space assets including possible flagship project(s)
- for supporting R&D incl. possible coordination with H2020 Space SATCOM (2018+)
- for support to 'Third step' i.e. with ESA MS and industry for EC/EDA GSC operational programme preparations incl. possible PPPP approach for 2021+

ESA GOVSATCOM Precursor Workshop Reporting to CMIN Preparatory WS Initial Considerations for Programme



Initial Operations
Capability (IOC)



H2020 Space
SATCOM
2018-

Operational
Programme
Preparations

Operational
Programme
Preparations

Pooling & Sharing
(existing assets)

Implementation
(new space assets)

Security
Technology
Development

Operational
Programme
Preparations

GS development

Operations Facility

Validation and
Demonstration

Example
Flexible GEO

Example
LEO Constellation

