

# **Communication Satellites for European Defence and Security**

## **Challenges and Opportunities**

### **Market, Innovation and Partnership**

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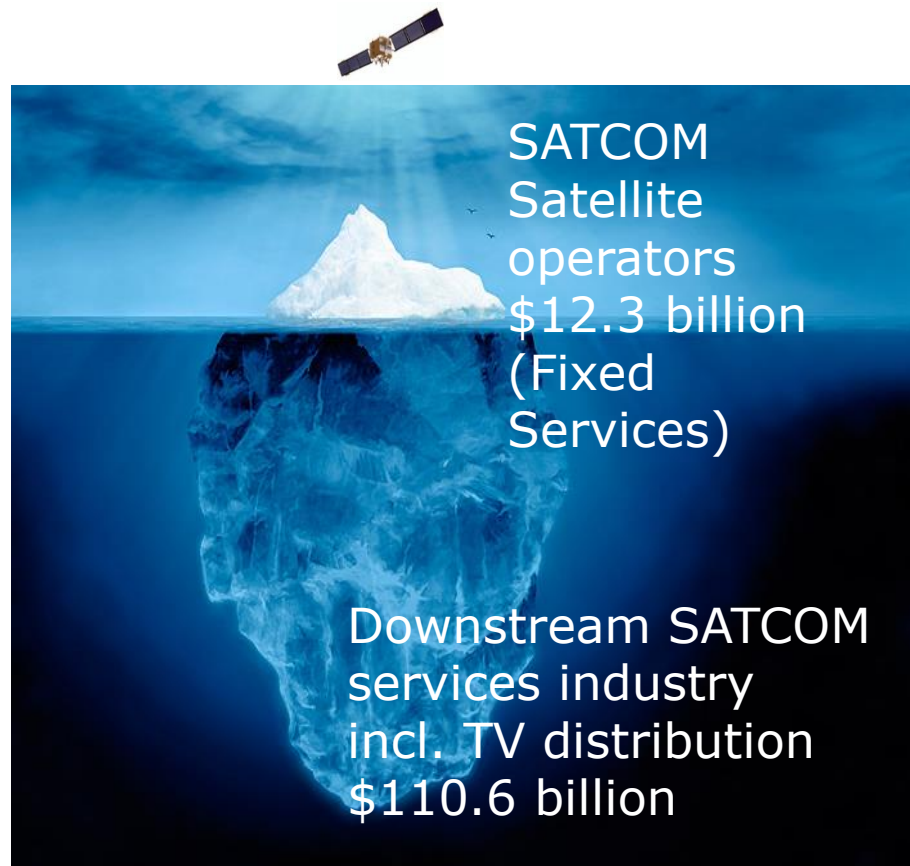
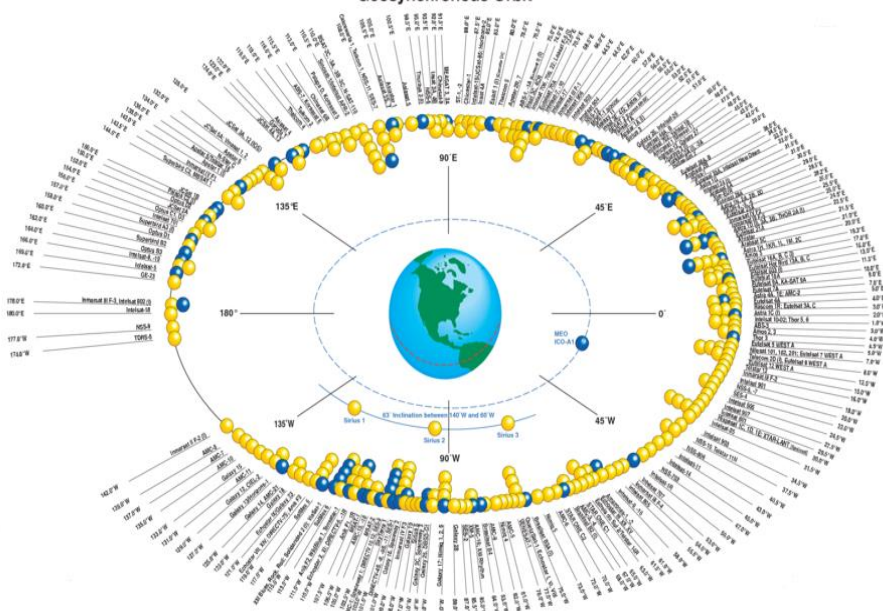
**1.**

**... 'because we live in a material world' [Madonna] ....**

# Some 300 GEO SATCOM satellites in orbit 12.3BUSD SATCOM operators revenues



Commercial Communications Satellites  
Geosynchronous Orbit



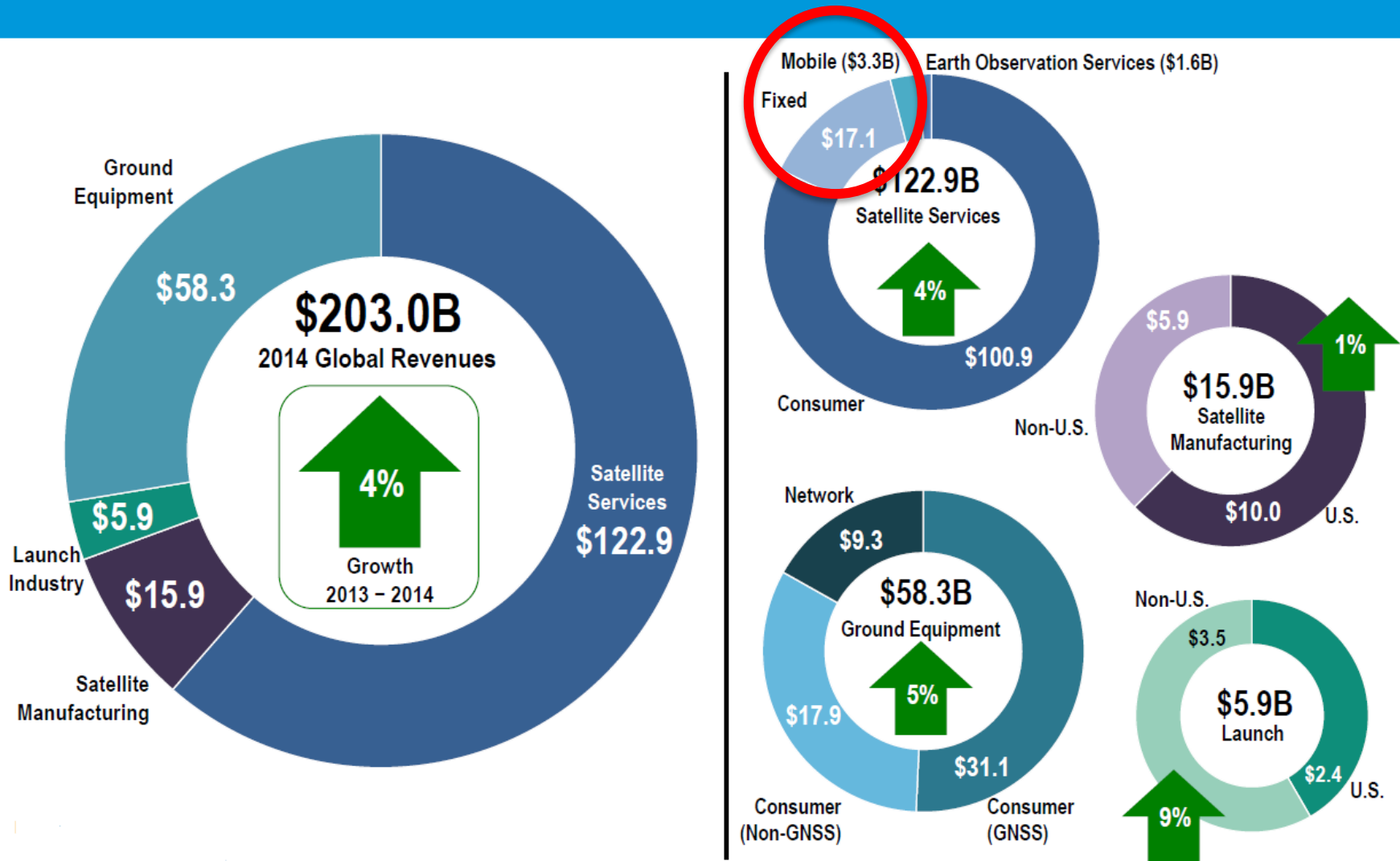
# Global satellite industry revenue 2014

## In Context

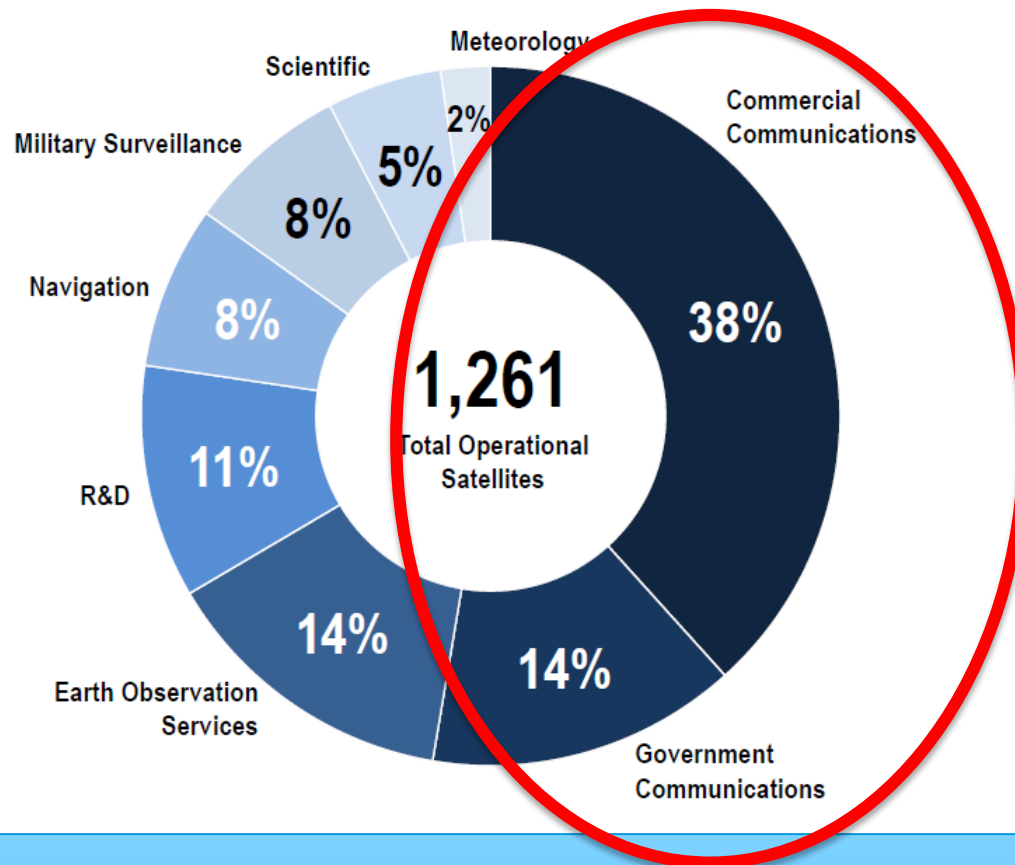


<b>1. Satellite industry total</b>	<b>\$203.0 billion</b>
2. Apple	\$182.8 billion
<b>3. Satellite services</b>	<b>\$122.9 billion</b>
4. Amazon	\$89.0 billion
5. Google	\$66.0 billion
<b>6. Satellite ground equipment</b>	<b>\$58.3 billion</b>
7. Coca Cola	\$46.0 billion
8. McDonald's	\$27.4 billion
<b>9. Satellite manufacturing</b>	<b>\$15.9 billion</b>
10. Facebook	\$12.5 billion
<b>11. FSS satellite operators</b>	<b>\$12.3 billion</b> (included in satellite services)
12. Avis	\$8.5 billion
<b>13. Satellite launching</b>	<b>\$5.9 billion</b>

# Global satellite industry revenue 2014 Breakdown



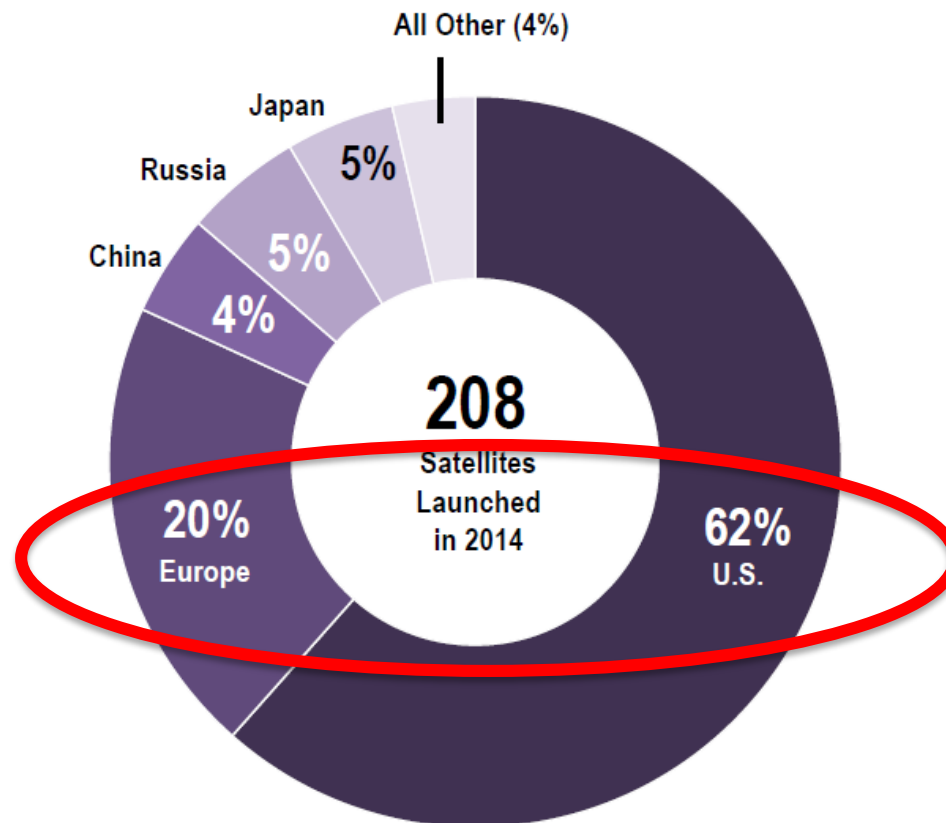
# Commercial & Governmental SATCOM Number of Satellites



2014 data

Proportion of Commercial and Government Communications Satellites remained broadly stable over recent years at >50%

# Satellite manufacturing revenues 2014



3:1 ratio of US-to-Europe manufacturing revenues broadly equal to ratio of US-to-Europe public funding of R&D (US~\$1.4 billion, Europe ~\$400 million)

## Findings

- SATCOM is a major commercial market place
- Operators, Satellite manufacturers, ground segment developers and downstream service providers with revenues from 10 - 100BUSD
- SATCOM fleet accounts for more than 50% of all satellites
- Commercial SATCOM vs. GOVSAT-like ratio about 3:1
- US vs. European # of satellite launched ratio about 3:1
  - → Likely link to US vs. European public funding level of 3:1

## Challenge

- leverage from market forces
- do not distort the market
- yet, provide public support to governmental requirements and **innovation** and towards a better global balance/ level playing field for European industry



2.



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““You can’t ask customers what they want and then try to give that to them. By the time you get it built, they’ll want something new.” [Steve Jobs]’

Governmental SATCOM Innovation Baseline and TBDs:

1. Baseline: Identification of core security technologies on P/F, P/L and GS level
    - E.g. secure TMTC, access control and protection of planning data, European certification, optical communications, anti-jamming capabilities
  2. To which extend shall innovation include generic P/F, P/L and GS technologies, e.g. thermal, power, propulsion?
    - Ka/Ku/Q/V phase array antennas
    - In-flight reconfigurable on-board processor
    - Flexible capacity management GS solutions
  3. To which extend shall non-European available solutions be replaced by European to ensure security of supply, e.g. system/sub-system level vs. component level (potential significant cost driver)
- **ESA is identifying level of required innovation in response to EC & EDA requirements**
- **Innovation is expected to be introduced in an **incremental** approach as user requirements consolidate and evolve**

3.

**“Rome wasn’t built in a day”**

... it can be really easy to overestimate the importance of building the Roman empire and underestimate the importance of laying another brick.

**[John Heywood]’**

1. First Step: ESA is already conducting studies including the identification of innovative technologies based on EC/EDA requirements and possible system architectures by 2016 (two parallel ESA ARTES studies being initiated)
  2. Second Step: ESA has started with further preparatory work for a potential ESA proposal to its Ministerial Council end 2016 in coordination with EC, EDA and EEAS for a secure SATCOM/possible GOVSATCOM pre-cursor element and focused on
    - Implementation of first selected innovative security technologies
    - In-orbit-testing/validation and
    - possible options for demonstration of pre-cursor services
  3. Third step: ESA would be available to support a GOVSATCOM programme in leading the necessary R&D efforts and the technical implementation of any new space elements providing additional capacity and enhanced capabilities
- **ESA is proposing to leverage from experience in partnership with industry**

4.

**... “I think the discovery of supersymmetric partners for the known particles would revolutionize our understanding of the universe.”  
[Stephen Hawking]’**

1. Undertake the development and operations/service provision of a new space infrastructure over its lifetime
  - In-flight validation of new product (e.g. SGEO; Neosat)
  - Support to introduction of new services (e.g. EDRS)
  - Industry initiated partnerships (e.g. Quantum)
2. Risk sharing with ESA mainly covering the R&D risk/ innovative aspects in line with strategic innovation themes at technology, system and service level (for P/L; P/F; G/S)
3. Industry mainly covering the market risk
4. New space activities not yet commercially available in Europe but with potential of commercialisation/ governmental need
5. builds on private sector efficiency, crucial to efficiently and cost effectively execute a project (schedule, risk, cost)

ESA/Industry SATCOM PPPs can be

- ESA initiated, e.g. European Data Relay System (EDRS)
- Industry initiated, e.g. Quantum

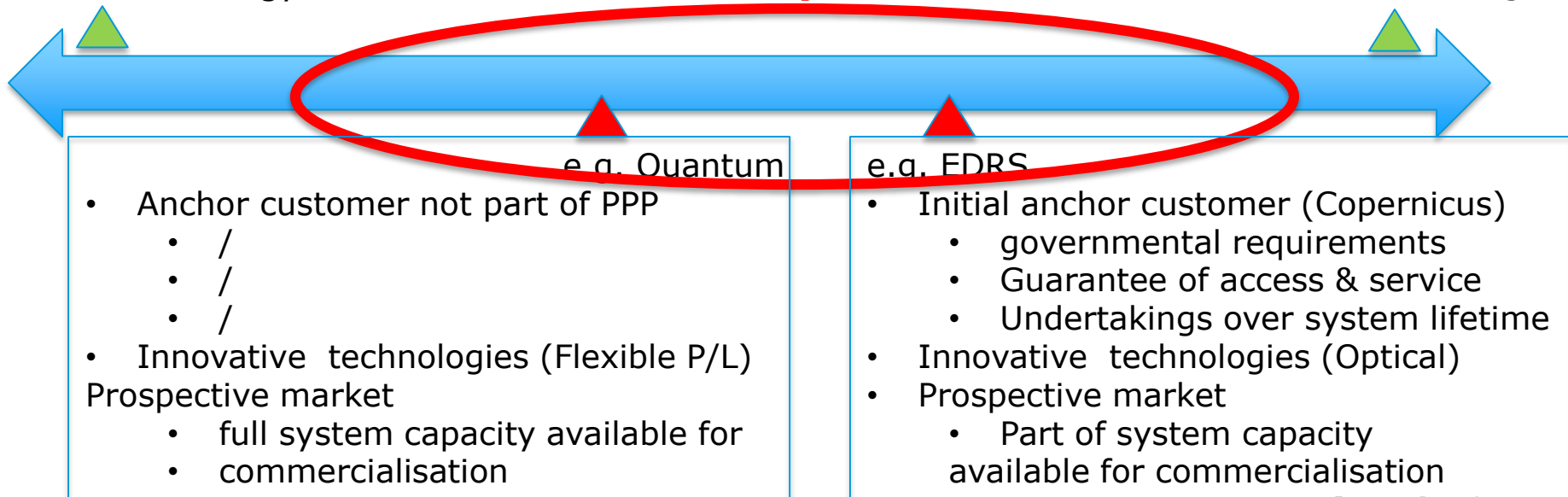
Fully commercial  
Procurement

- Mature market
- Mature technology

Fully public  
procurement

- No market
- Innovative technologies

## PPP spectrum

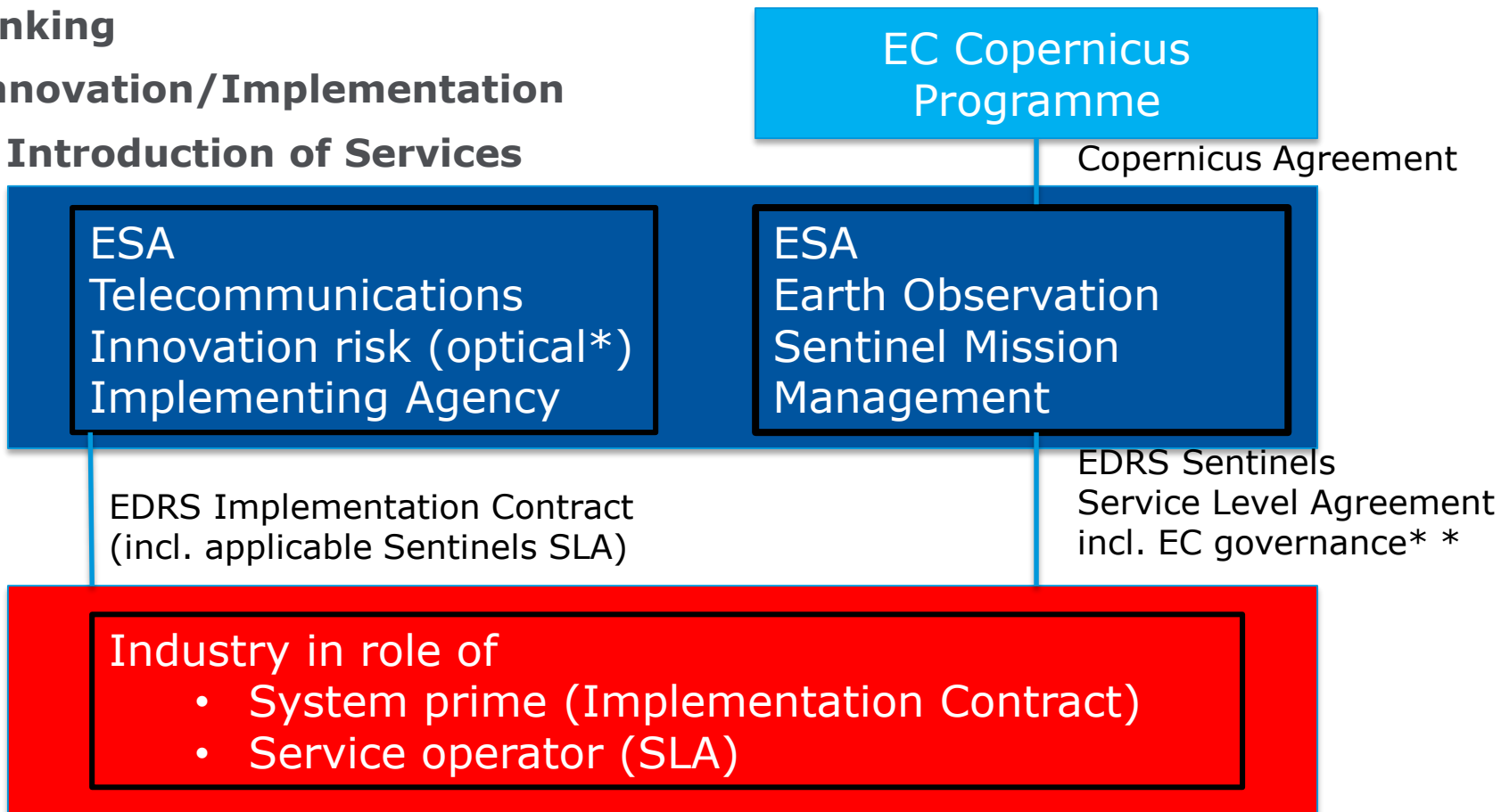


European Space Agency

# Example of EDRS PPP

## Linking

## Innovation/Implementation & Introduction of Services



\*risk mitigation via Alphasat/TDP1 IOT

\*\*via SLA provisions and Joint Steering Committee incl. industry, ESA and chaired by EC



- SATCOM operates in a highly commercial market
- We face the challenge
  - to leverage from market forces
  - not to distort the market but
  - yet, provide public support to governmental requirements and innovation and towards a better global balance/level playing field for European industry
- The scope of the required innovation is still TBD, incl. possible significant cost drivers while user requirements are expected to consolidate and evolve (e.g. today, end 2016, 2020, ...)

- ESA proposes a three step approach including
  - preparatory studies
  - pre-cursor element(s) and
  - full GOVSATCOM implementation
- ESA proposes to leverage from PPP schemes with industry in particular in a service-type PPP including
  - The system implementation incl. R&D risk mitigation as well as
  - A Service Level Agreement providing guaranteed access and control of the service to the GOVSATCOM mission authority