



COPERNICUS in the Nut Shell

Agnieszka Lukaszczyk
European Commission



Follow us on:

 Copernicus EU

 CopernicusEU

 www.copernicus.eu

Space

 **Copernicus**
Europe's eyes on Earth

Copernicus in Brief

- ★ **The Copernicus programme** is a cornerstone of the European Union's efforts to monitor **the Earth** and its many ecosystems, whilst ensuring that its citizens are prepared and protected in the face of **crises** and **natural or man-made disasters**.
- ★ The Copernicus Programme is a tool for **economic development** and a driver for **digital economy**.
- ★ The Copernicus programme places a world of insight about our planet at the disposal of citizens, public authorities and policy makers, scientists, entrepreneurs and businesses **on a full, free and open basis**.

Introduction

- ★ The Copernicus programme entered its **operational phase** with the launch of Sentinel-1A in 2014 and its governance is based on the **Copernicus Regulation** adopted the same year which establishes the Commission as the Programme manager owning the infrastructure and data rights on behalf of the Union;
- ★ Copernicus services are based on information from a dedicated constellation of satellites, known as “**Sentinels**”, as well as tens of third-party satellites known as “**contributing space missions**”, complemented by “*in situ*” (meaning local or on-site) measurement data;
- ★ By making the vast majority of its **data, analyses, forecasts and maps freely available and accessible**, Copernicus contributes towards the development of new innovative applications and services, tailored to the needs of specific groups of users, which touch on a variety of economic and cultural or recreational activities, from urban planning, sailing and insurance to archaeology.

Objectives



"The Union Earth observation and monitoring programme"

Monitor the environment

Foster downstream applications in a number of fields

Protect people and assets

Increase general knowledge on the state of the Planet

Improve environmental policy effectiveness

Facilitate adaptation to climate change

Help managing emergency and security related situations

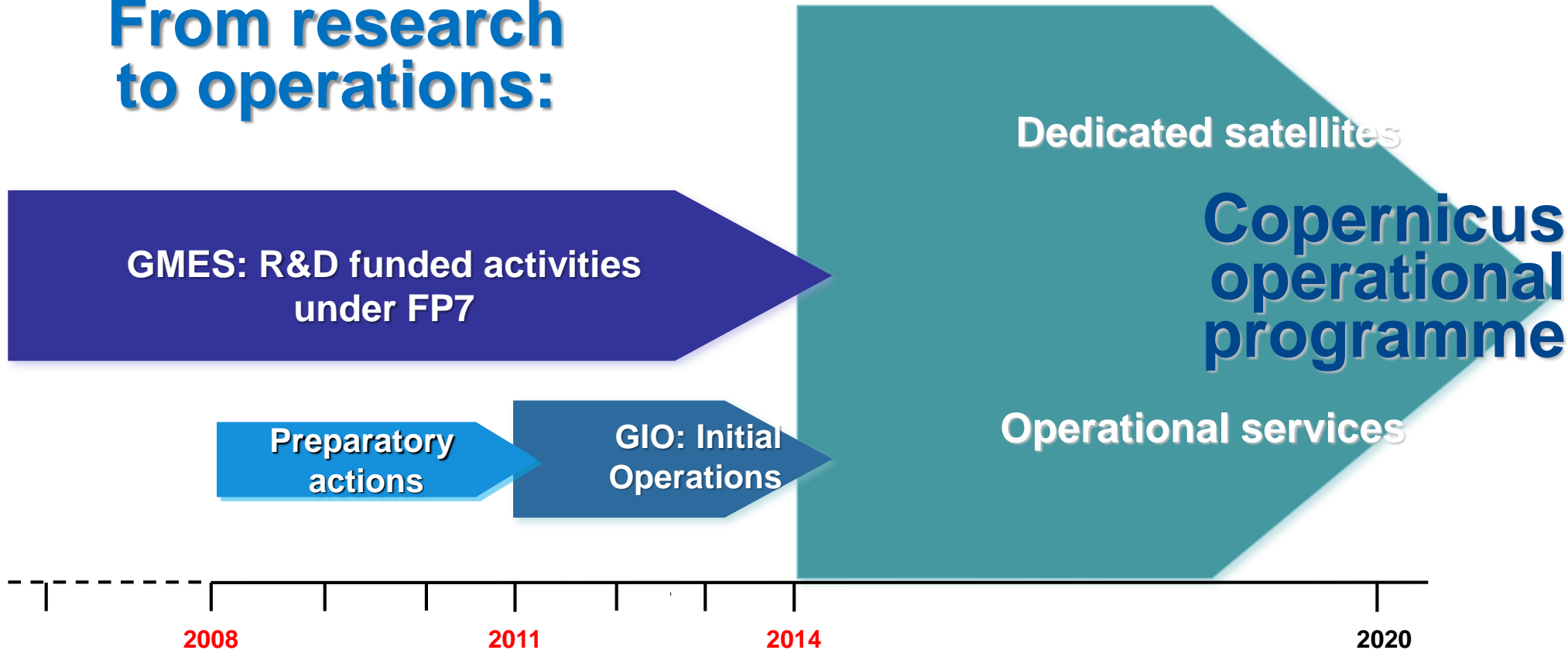
Budget and Governance

★ The current MFF period **2014-2020 will see the full operationalization** for the Copernicus infrastructure and Services.

★ Adequate **budgetary provisions** have been made to reach the key milestones by 2017, **to ensure the smooth running of the programme on a 24/7/365 basis**, and to lay the necessary groundwork for the future.



From research to operations:



€ 1.3 Bn



€ 4.3 Bn

Copernicus Sentinels



Sentinel 1 – radar imaging
All weather, day/night applications



Sentinel 2 – Optical imaging
Land applications: urban, forest, agriculture,..

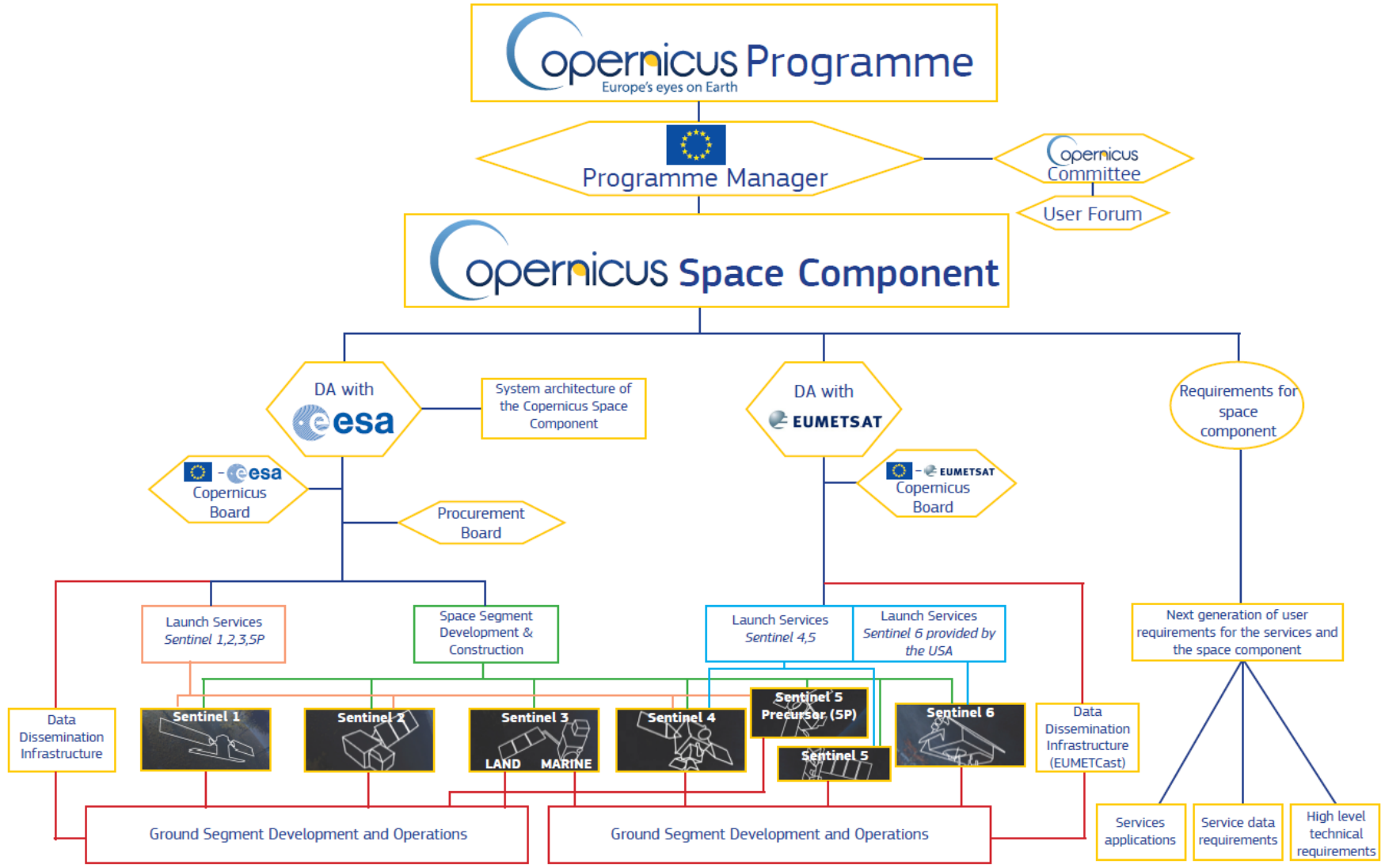


Sentinel 3+6 – Ocean and global land monitoring, high precision
ocean altimetry



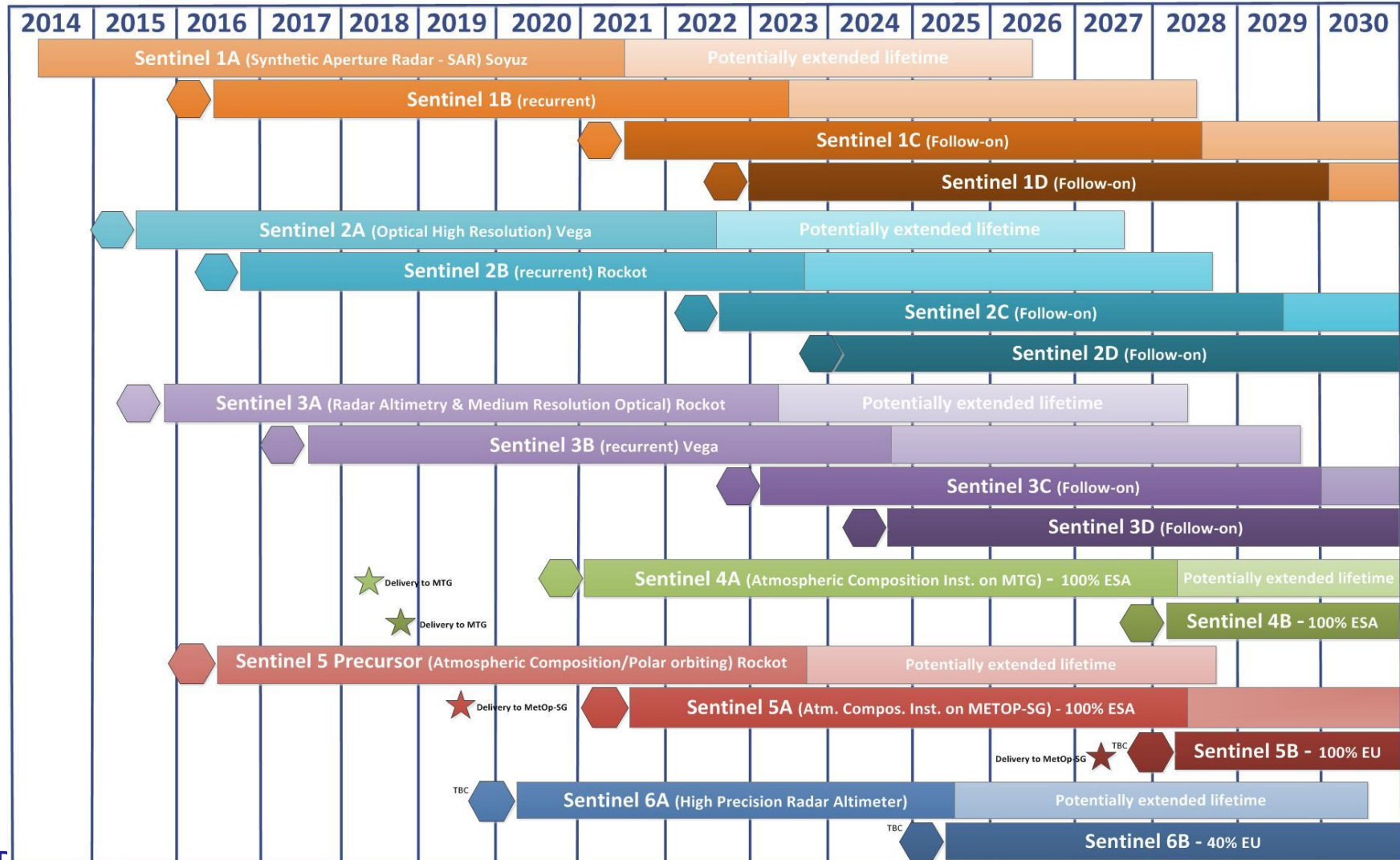
Sentinel 4+5 – Atmosphere composition monitoring, from a
geostationary (-4) and a polar orbit (-5)

Infrastructures Governance



Legend:
 - Implementation mode still to be defined
 - Commercial contracts
 - Grants
 - Copernicus component
 - Copernicus Service Provider
 - Made of implementation (direct/indirect)
 - Indirect Management
 - Direct Management
 - Contribution to MS
 - DA - Designation agreement
 - DS - Designation agreement
 - MS - European Space Agency
 - EUMETSAT - European Organisation for the Exploitation of Meteorological Satellites
 - ESA - European Space Agency
 - EUSC - European Union Satellite Center
 - SENTES - The European Agency for the Management of Operational Cooperation at the Global Scale of the Member States of the European Union
 - EDWAF - The European Centre for Medium-Range Weather Forecasts

Copernicus Constellations Deployment Schedule



Next Generation of Satellites

- ★ The goal of Sentinels is to have a state of the art constellation of satellites providing timely and high quality services.
- ★ It is of crucial importance that the space component of Copernicus evolves with the current technological trends in order to be relevant and useful. The attraction of Earth observation and the use of small/cube/nano satellites and perhaps drones to achieve this has become very evident.
- ★ The use of small satellites used in large quantities to provide frequent revisits and current images of our planet, is changing the Earth observation industry as we know it.
- ★ Innovative and entrepreneurial start-ups want to change the way we use space. This is Earth observation for the masses, not the restricted few.
- ★ **Copernicus needs to be an added value among the competitors.**

6 operational Services



Monitoring the State of the Earth System Environment ...

Copernicus Land Monitoring Service



Copernicus Marine Environment Monitoring Service



Copernicus Climate Change Service



Copernicus Atmosphere Monitoring Service



Copernicus Emergency Management Service

Mapping Component
Early Warning Component

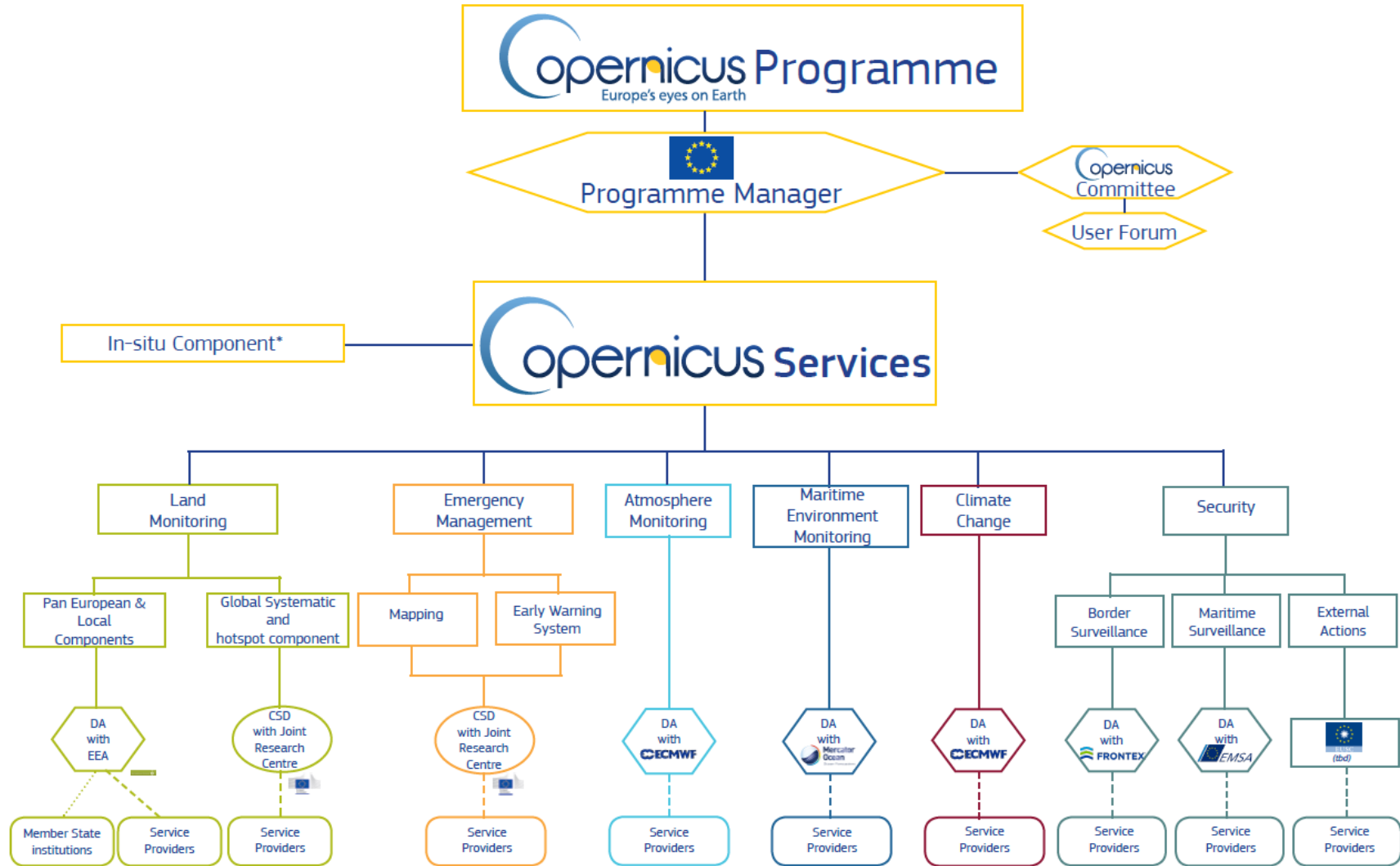


Copernicus Security Service



... cross-cutting Thematic Services

Services Governance



Legend:
 Implementation mode still to be defined
 --- Commercial contracts
 Grants
 [] Copernicus component
 [] Service Providers
 [] Indirect Management
 [] Direct Management
 * Contribution by MS
 [] Delegation agreement
 [] Own knowledge
 [] European Space Agency
 [] IMM/IMM - European Organisation for the Investigation of Meteorological Satellites
 [] ESA - European Environment Agency
 [] EUSC - European Union Satellite Center
 [] FRONTEX - The European Agency for the Management of Operational Cooperation at the External Borders of the Member States of the European Union
 [] ECMAF - The European Centre for Medium-Range Weather Forecasts

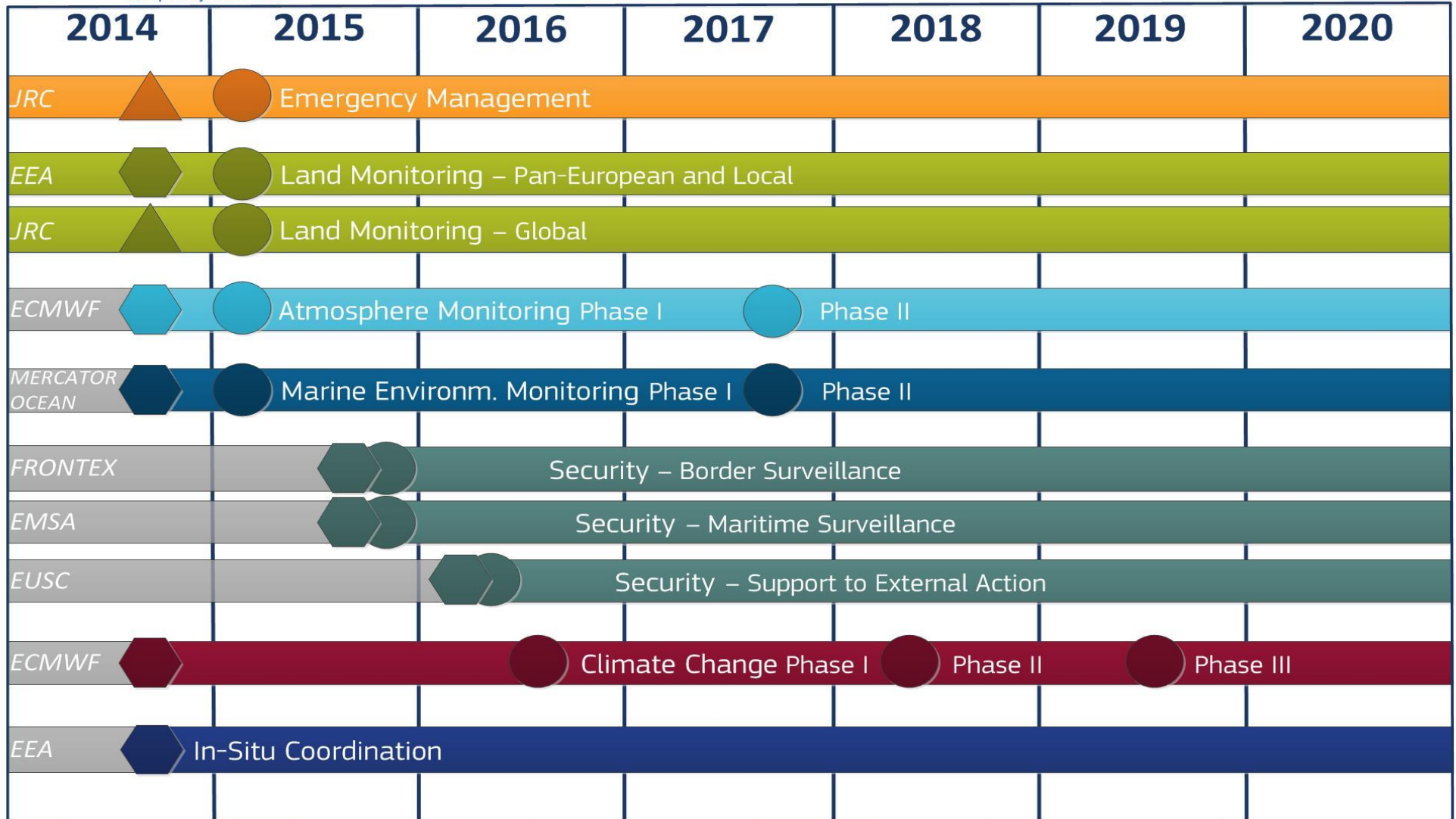
Services Governance



Status 07/09/2015



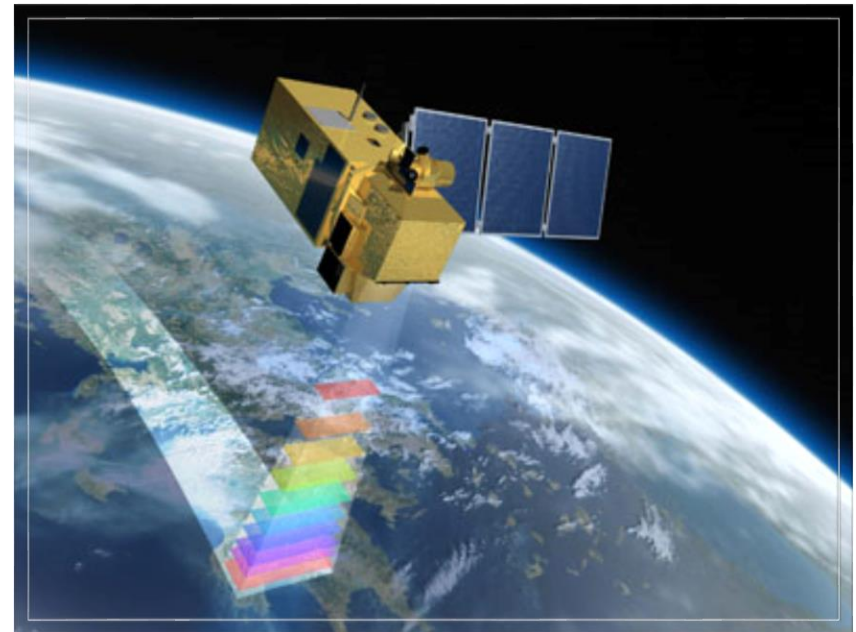
Copernicus Services Implementation Schedule



Legend: ◆ Delegation agreement ▲ Direct management ● Operational phase

Copernicus Data

- ★ Copernicus collects, processes, and archives **massive amounts of data** (approx. 8 Terabyte/day or almost 3 Petabyte/year when Sentinels-1, -2 and -3 are fully operational).
- ★ Dedicated **Sentinel-data** and **Copernicus information** are being made available on a **full, open and free-of-charge** basis.



The Big Data Challenge

- ★ Different types of dissemination infrastructures for Copernicus data and information.
- ★ New technology developments in many segments, ICT and EO cross-fertilisation
- ★ Cross-fertilisation/interoperability with non-EO datasets
- ★ Competitive environment in EO worldwide
- ★ Growth and jobs in the downstream sector

The Big Data Challenge

- ★ Efforts will have to be devoted on setting up a flexible environment, capable of:
 - ★ collecting existing assets and coordinating synergic initiatives, and
 - ★ opening up possibilities for the future, this meaning establishing an architecture that will allow for integration of innovative tools as long as these are developed in the area of dissemination, archiving and computing technologies.
 - ★ These possibilities will have to provide for conservation of past data, information and processes, as well as exploit forward looking technologies as much as possible.

The Big Data Challenge

- ★ Two complementary approaches:
 - ★ Bringing the data to the user:
web portal, mirroring of the data – high bandwidth connection needed (e.g. Géant)
 - ★ Bringing the user to the data:
cloud computing ('hosted computing') – upgrade of the Copernicus core ground segment needed
- ★ Commission needs to decide on scale, financial and legal set up of the initiative
- ★ Provide the conditions for the best exploitation of Sentinel and Copernicus service information by the European downstream services for the benefit of EU citizens

Economic and Societal value added

- ★ Copernicus constitutes a **cornerstone of the broader EU space and industrial policy**, and will generate **significant economic and social benefits**.
- ★ **Driver** for research, innovation and the creation of highly skilled jobs, with direct and indirect **benefits for the EU economy**.
- ★ The bottom-line can be summarised as follows:
 - ★ Cost per EU citizen = $\sim\text{€}1,07/\text{year}$;
 - ★ Every $\text{€}1$ spent generates a return of $\sim\text{€}3,2$;
 - ★ Expected minimum financial benefits by 2030 of $\sim\text{€}30$ bn. on Europe's GDP;
 - ★ An estimated 50.000 jobs will be maintained or created over the next 15 years.



User Uptake Challenge

- ★ The next generation of satellites and instruments must take account of the evolution of **user needs**, of the technological progress, and of the lessons learned from the first operational period.
- ★ Need to define already in 2017/2018 the user requirements for new Earth Observation satellites that will be flying in the 2020's and 2030's.
- ★ Greater coordination between space activities of the EU, the European Space Agency (ESA) and the Member States is necessary in order to avoid duplication of structures and to achieve synergies.
- ★ Europe's industry – with support from European political decision-makers – should concentrate on those sectors where there is already considerable potential for growth and innovation now.

User Uptake Challenge

- ★ The objectives of the user and market uptake will be to foster the development of the EO downstream sector (applications, data-processing platforms...) and to boost uptake from end users (both from the public sector and private sector).

- ★ The actions will be divided in 3 pillars:
 - ★ Dialogue with users and improvement of users' experience;
 - ★ Economic and policy analysis, in particular understanding of the EO value chain;
 - ★ Industrial policy measures, both supply-side (e.g. clusters) and demand side (e.g. innovative public procurement).

Internationalisation of Copernicus

- ★ Copernicus international relations will support the **EU's role as a global actor** and will constitute a growing element in the EU's bilateral relations with international partners.
- ★ The current priority is the cooperation with the United States, Australia and the participation in the GEO and CEOS multilateral frameworks.
- ★ Discussions with partners who could potentially contribute to Copernicus - Switzerland, Turkey, Serbia, Israel, etc. - have been initiated.
- ★ The operational evolution of Copernicus, and in particular our "full, open and free-of-charge" data policy, will provide additional impetus to international cooperation with third countries, regional groupings like ASEAN, and international organisations such as the UN.

Conclusion

It is quite evident that Copernicus can produce significant **socioeconomic**, as well as **strategic and political benefits** for Europe.

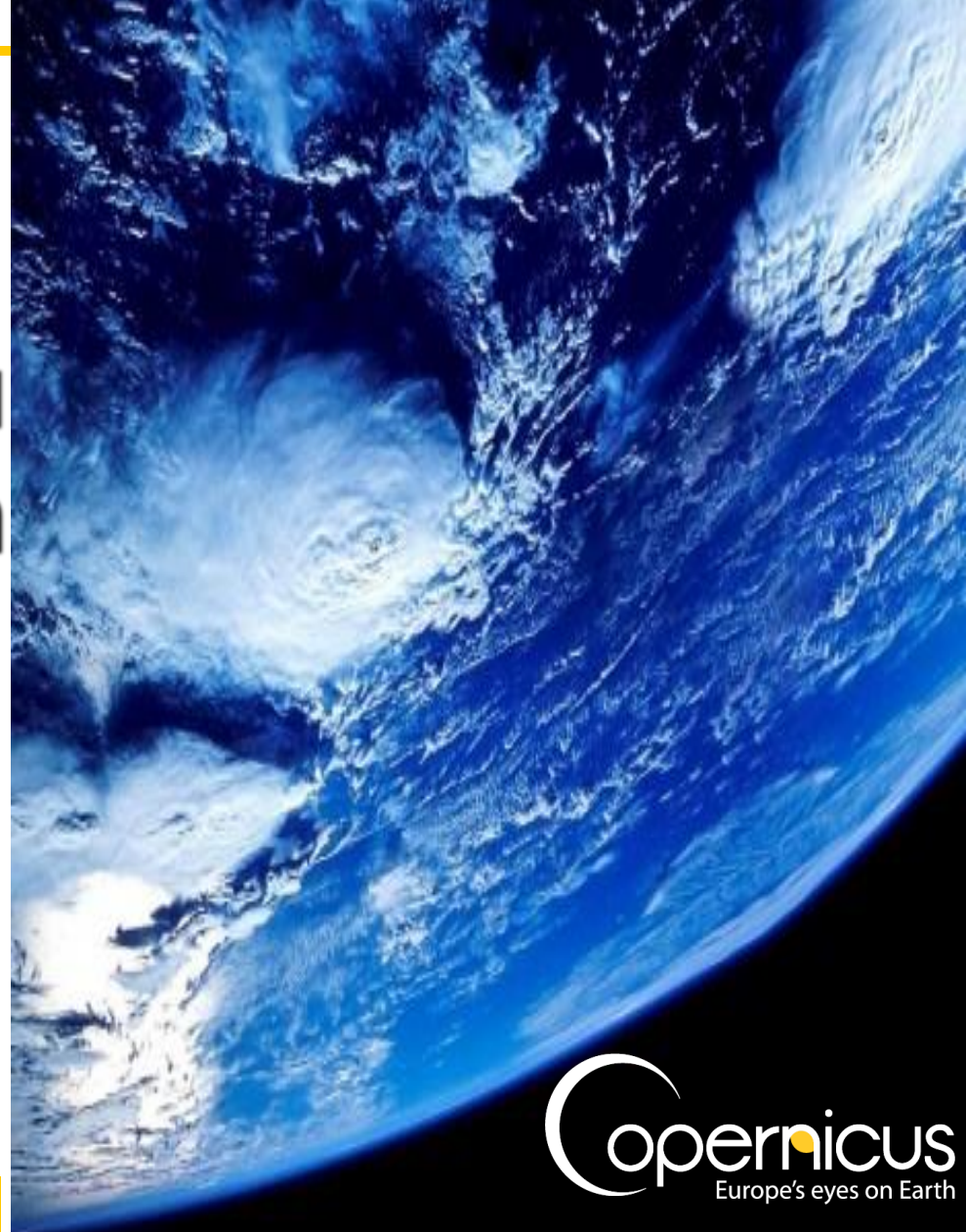
Due to its services decision makers and citizens today are provided with **better, more complete, consistent, timely and reliable information**.

It puts Europe at the forefront globally in having credible space systems and initiatives, which provide bargaining power and more successful implementation of external policies in areas such as **climate change mitigation and adaptation; humanitarian aid; conflict prevention and sustainable development in Europe and beyond**.



European
Commission

**Thank you
for your attention**



DD/MM/YYYY, Brussels

Space

Copernicus
Europe's eyes on Earth