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Directorate General of Energy and
Transport
European Commission



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GALILEO DEFINITION PHASE RESULTS



DEFINITION PHASE

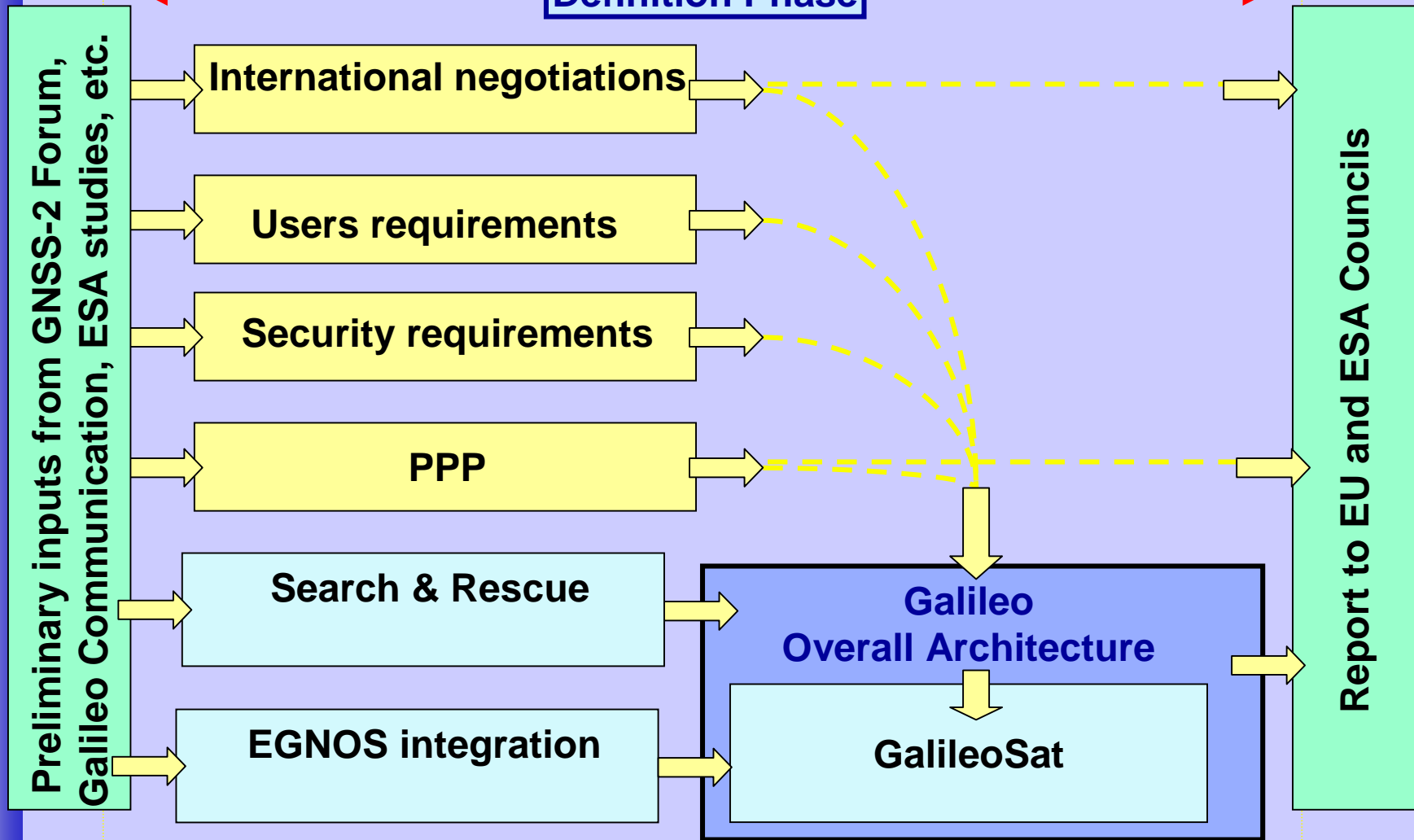
ACTIVITIES

Dec 99

Dec 2000

Definition Phase

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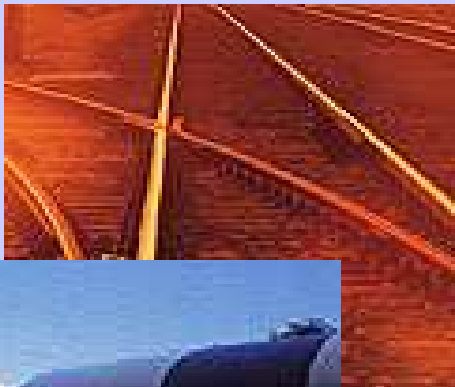




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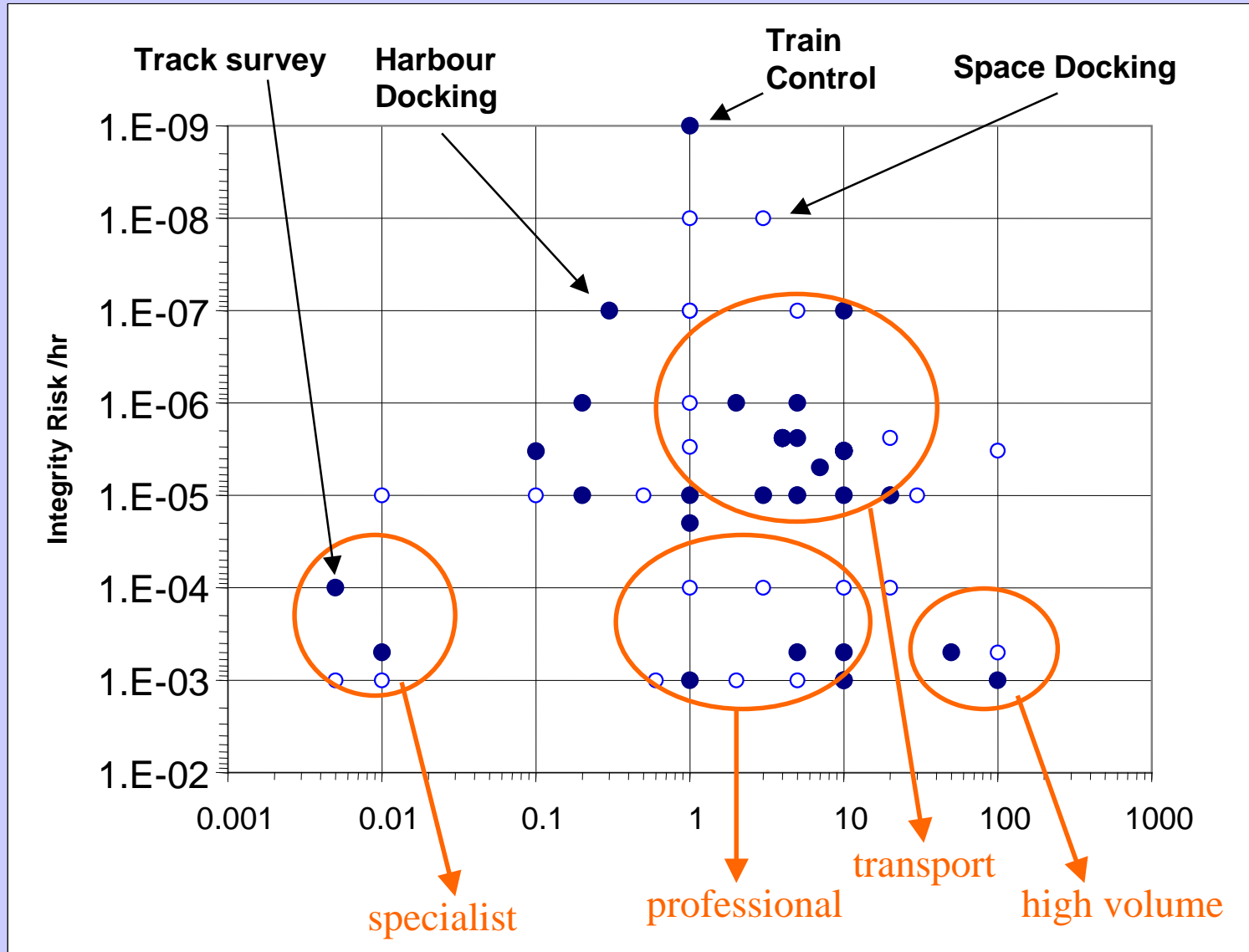
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Position accuracy and integrity

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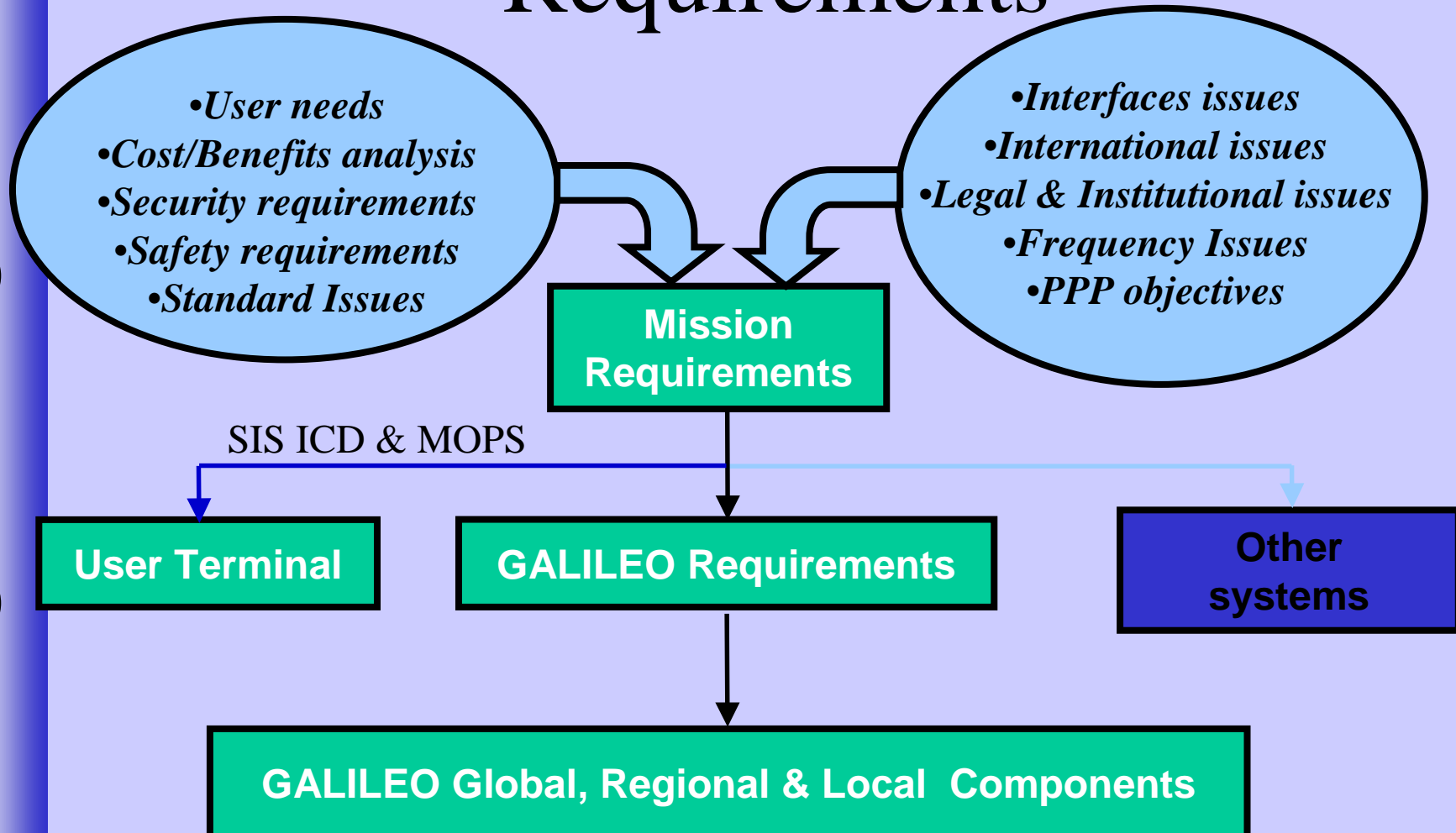
Key performance needs

- Accuracy:
 - 50% of applications are satisfied by ~4 m,
 - 80% of applications satisfied by ~1 m.
- Availability:
 - 30% of applications are satisfied by 99%,
 - 80% of applications are satisfied by 99.9%.
- Integrity:
 - 35% of applications are satisfied by an integrity risk/hour of 1×10^{-4} ,
 - 90% of applications are satisfied by an integrity risk/hour of 1×10^{-6} .



Overview of Mission Requirements

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GALILEO ARCHITECTURE



GALILEO ARCHITECTURE (1/2)

- **Constellation: 30 MEOs (“Walker 27/3/1 + 3 in-orbit spares”)**

- **Best solution in terms of robustness, performance homogeneity including northern latitudes**

- **Global Navigation Service including integrity.**

- **Ground Integrity Channel concept.**
 - **World-wide coverage disseminated through MEO broadcast**
 - **Galileo and GPS/(GLONASS) satellites integrity**
 - **Channels available for non-European States/Regions wishing to generate their own integrity information (up to 8)**



GALILEO ARCHITECTURE (2/2)

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- **Local Components investigated for various types of applications**

- **Mandatory for some applications performances**
- **Multimodal use enhancement**

- **User Segment**

- **User Segment concept covering hybridisation, use of other systems and use of GPS/GLONASS.**
- **Design to cost approach to be implemented during the development phase to ensure the competitiveness on the user market**

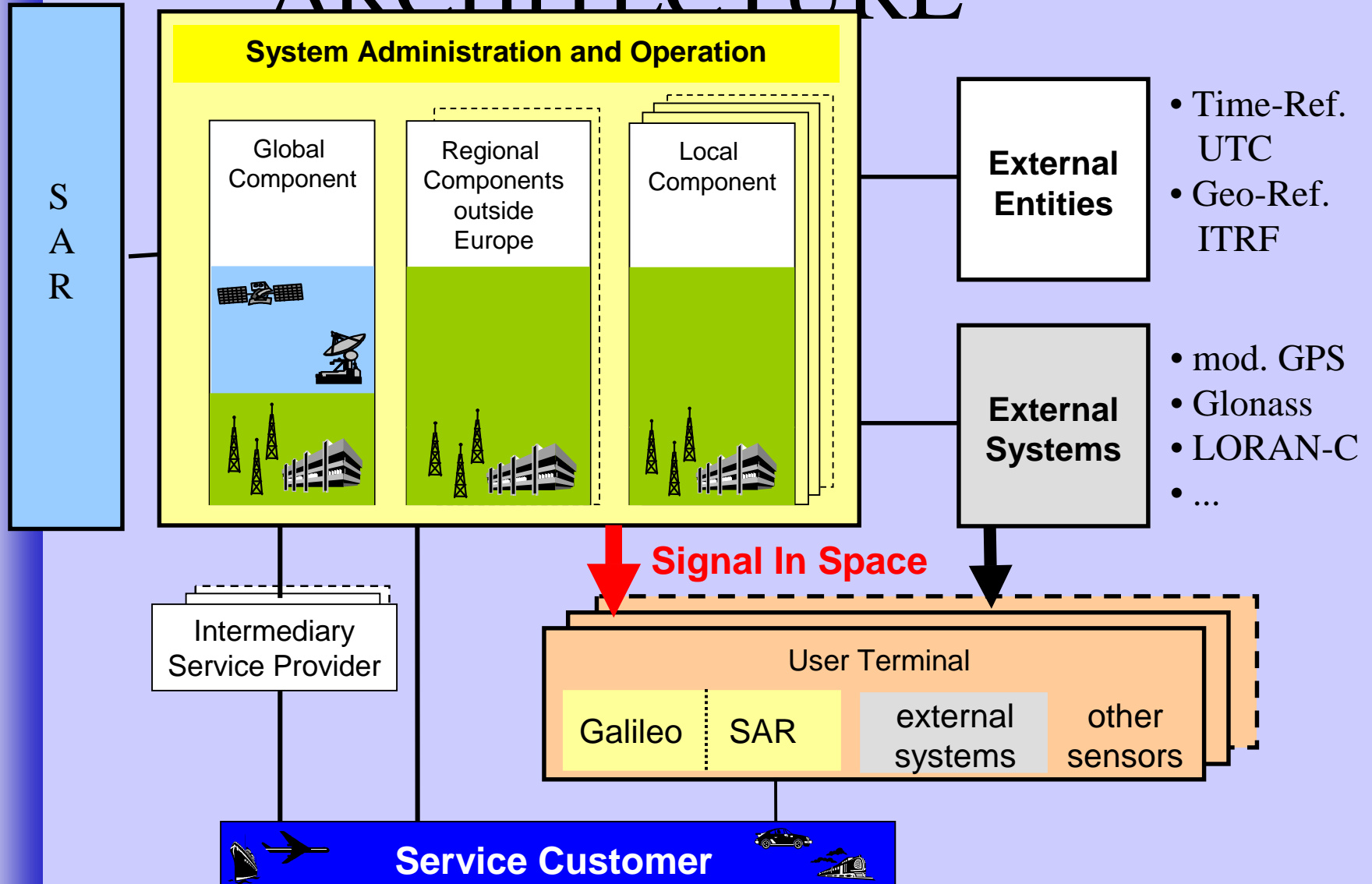
- **SAR service Implementation**

- **RAMS and Security analyses to comfort the design choices in the early steps of the design phase**



GALILEO OVERALL ARCHITECTURE

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LOCAL COMPONENTS

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- Implementation of Local Components
 - Galileo System design
 - *Local Components as integral part of the Galileo System*
 - *LC service will be provided by Galileo Service Centres*
 - External Service Provider
 - *use Galileo global SIS (e.g. Open service)*
 - *can be part of a package to provide value added services*
- Local Component Techniques
 - **Differential Satellite Positioning Techniques**
 - **Ground Based Integrity Monitoring**
 - **Ground Based Ranging Sources (Pseudolites)**

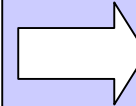


EGNOS mission and future evolution.

EGNOS first mission: provide GPS integrity in Europe.

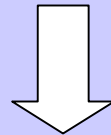
Evolutions of EGNOS:

1 Integration into GALILEO.
2 Adaptation to the GPS modernisation.



Preliminary
assessment
in the definition phase.

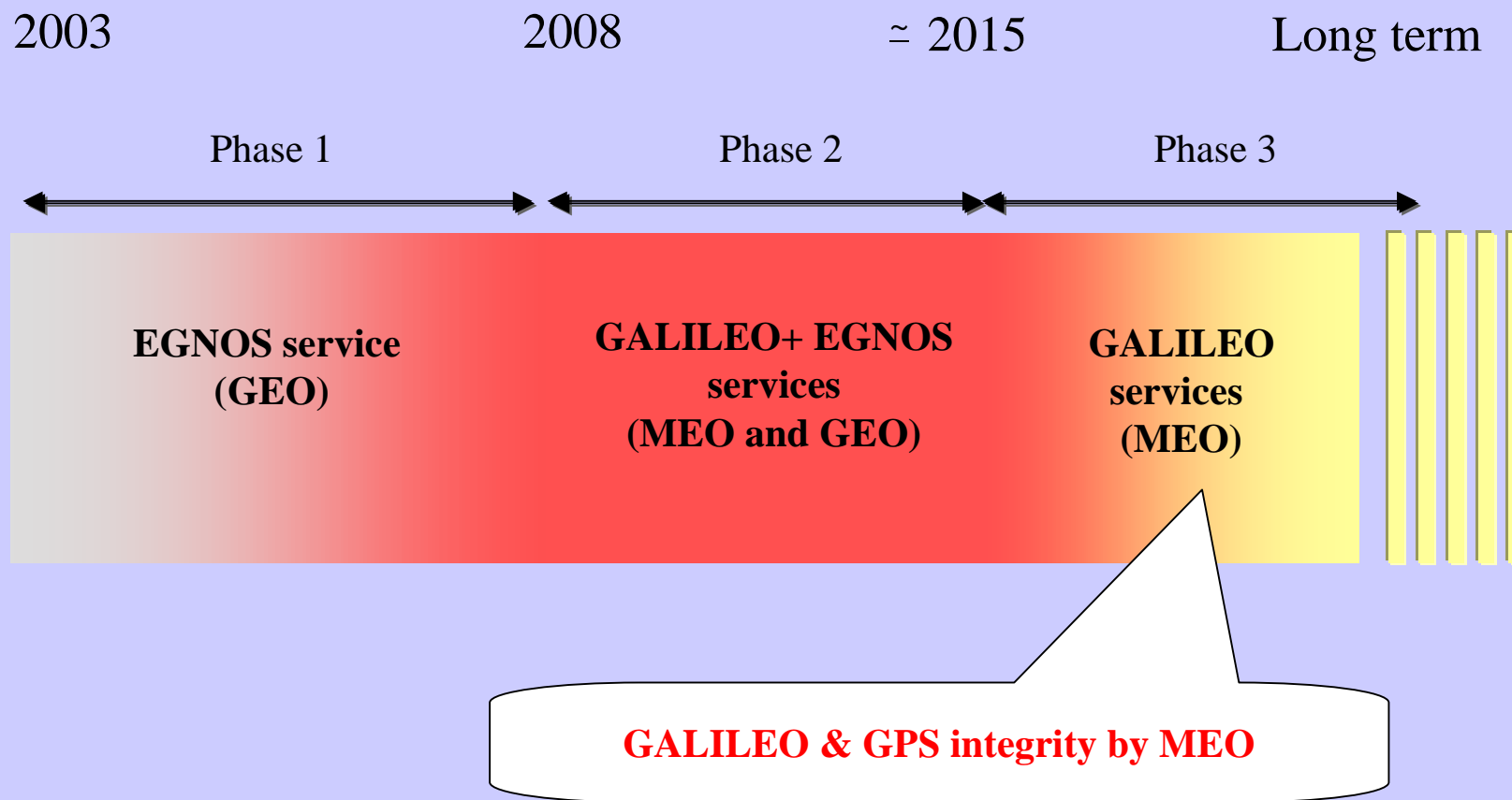
3 Extensions outside Europe.



Will have to be harmonised
with the provision of a global service by GALILEO.
Applying the European 2 steps approach outside Europe.



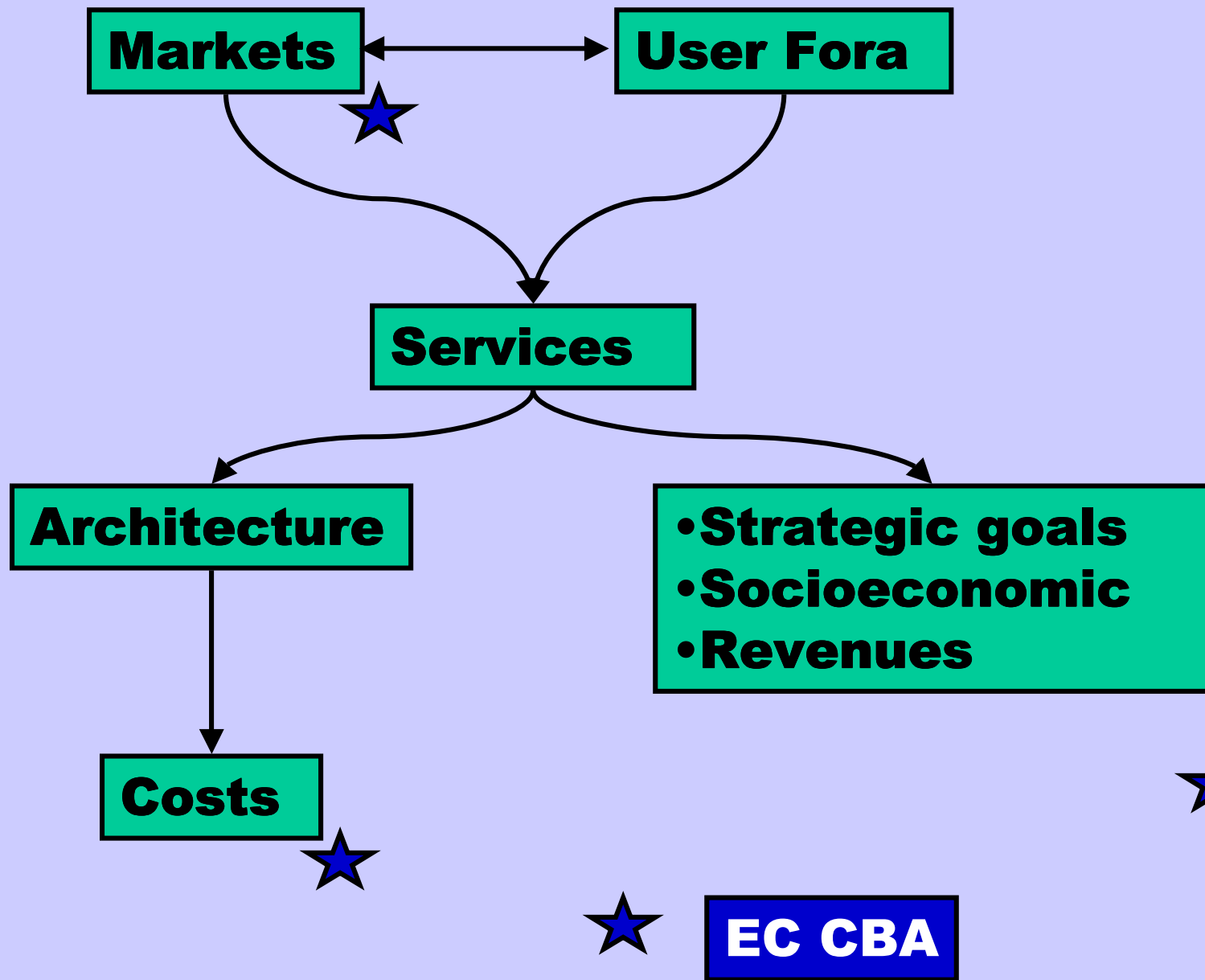
A vision for services evolution: 3 phases.



This transition plan will be flexible to accommodate long term market demands and user needs.



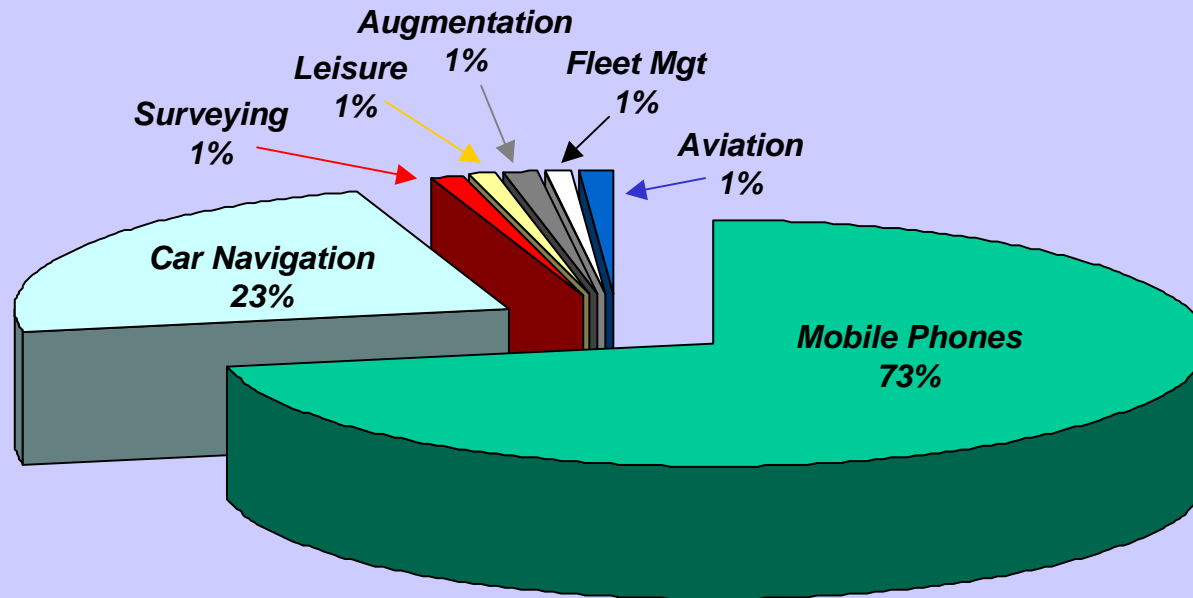
**GALILEO MARKET
&
COST BENEFIT ANALYSES**





European GNSS Market 2005

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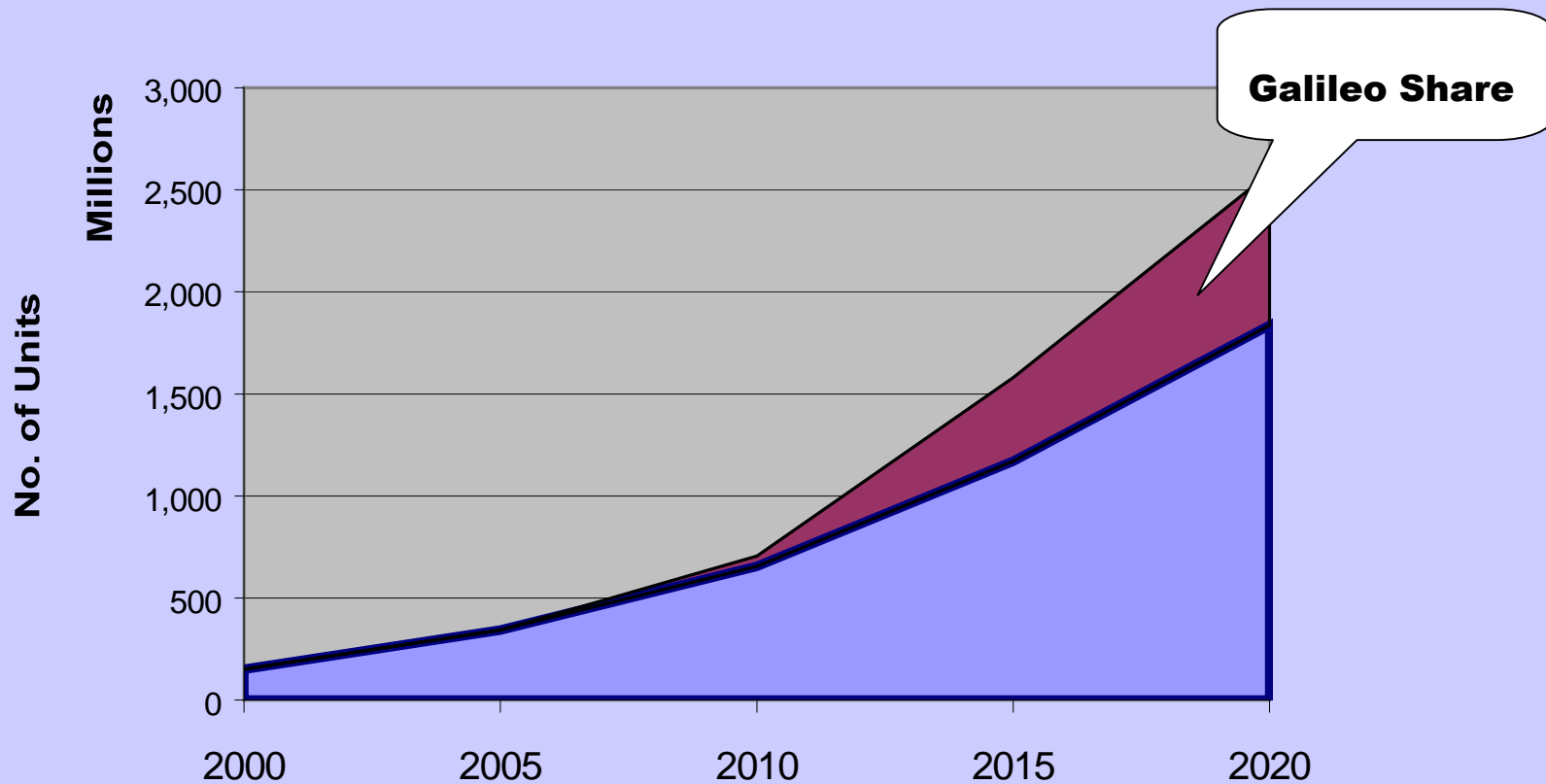


Market Size €6Bn



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Global GNSS Market Size





GALILEO discriminators

GPS alone: 55% urban coverage

GPS+GALILEO: 95% urban coverage

**GALILEO: liability and
guarantee on quality of service**

GALILEO: certification for Safety of Life

GALILEO: local elements

etc.



OVERALL PROGRAM COSTS

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DEFINITION PHASE COST

- € 80 M
(EC and ESA)

DEVELOPMENT AND DEPLOYMENT COSTS

- **B€ 3,25B** overall programme cost over 2000-2007
- Development and validation phase :
B€ 1,1
- Deployment phase :
B€ 2.15

RECURRING COST

- assessed M€ **220** yearly beginning in 2008



GALILEO Benefits to Users

	2001-2005	2006-2007	2010	2015	2020
Annual averages					
Net user benefits	0	0	1,990	4,740	7,630

New Services:

- Aviation,
- Rail,
- S&R,
- Inland waterways,
- Robotics, etc.

Complementary GPS + GALILEO:

- Route guidance for all road vehicles,
- Advanced road driver assistance,
- Land survey,
- GIS mapping, etc.

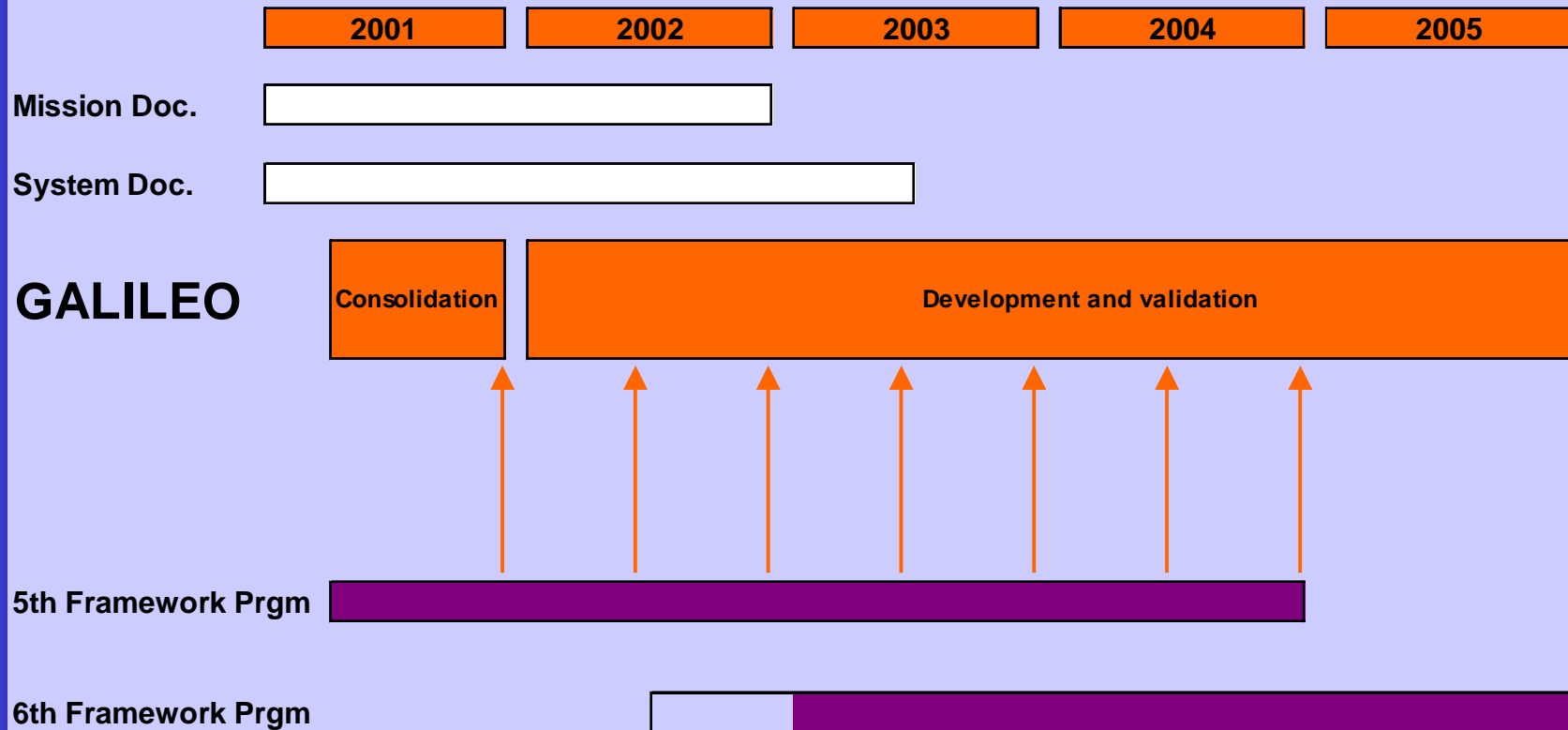


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Validation and Development Phase



General Roadmap Logic



+ Important milestones :

- **System Test bed availability,**
- **World RadioConference (WRC-2003)**
- **Flight model(s) availability**
- **EGNOS availability**
- **Agency**
- **International discussions, Enlargement**



Development and Validation:

- **Consolidation of Mission and System requirements**
- **Components, Equipment, subsystem and system developments for**
 - **Space Segment**
 - **Ground Segment**
- **Local Elements prototyping and wide scale demonstration**
- **Generic Receivers development**
- **Early positioning, navigation and timing marketing**
- **Mapping and Synergy with other systems (GMES)**
- **European Radionavigation Plan**
- **Enlargement**



Development and Validation:

- **Maximum use of Ground simulations**
- **Early experiments on a test satellite (till 2003)**
 - **Atomic clocks**
 - **Signal Characteristics**
- **First flight model launch: 2005**
- **Constellation deployment: 2006**
- **Progressive services provision**
 - **General service**
 - **Commercial service**
 - **Public service**



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Studies Activities



- 1. Local Elements Definition**
AM, 18 months, mid-2001
- 2. Impact of Interoperability on system definition**
AM, 18 months, end-2001
- 3. Frequencies allocation and protection, Certification and Standardisation**
AM, 36 months, end-2001
- 4. Development and optimal use of satellite navigation for all modes of transport**
SC, 36 months, end-2001
- 5. Detailed Service Analysis**
Sub-Task 1: AM, 36 months, mid-2001
Sub-Task 2: SC, 36 months, mid-2001
- 6. Legal, Institutional and Regulatory framework**
AM, 24 months, end-2001

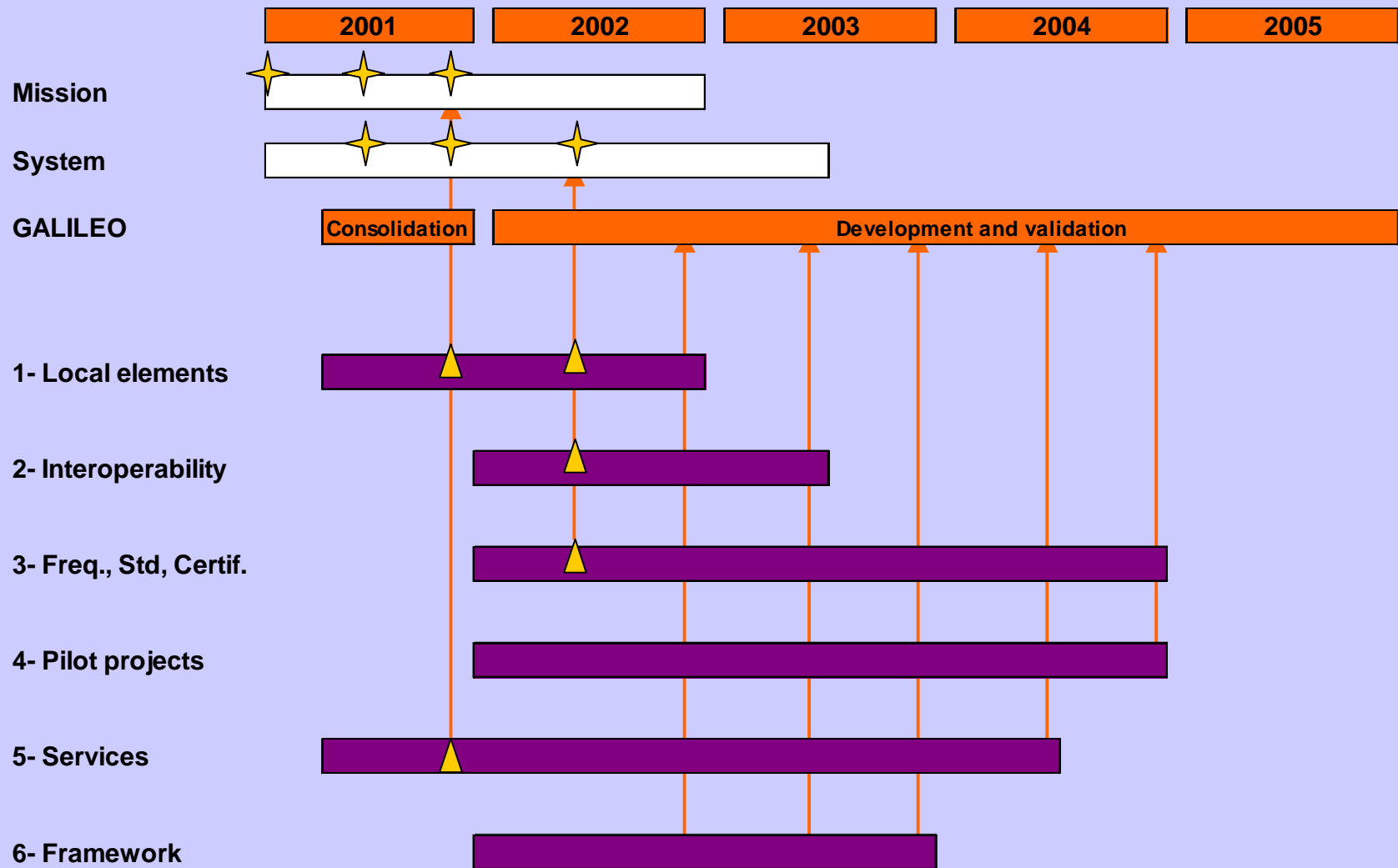
- 1 Local**
- 2 Interoperability**
- 3 Freq. Std. Certif.**
- 4 Pilot projects**
- 5 Services**
- 6 Framework**

AM: Accompanying Measure
SC: Shared Costs



Fifth Framework Program: Roadmap Logic

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EGNOS System Test Bed (ESTB) Ready for Application Demonstrations

