GALILEO
Opportunities

- **Market and CBA**
- **Business**

P. Flament

EC DG TREN

GALILEO

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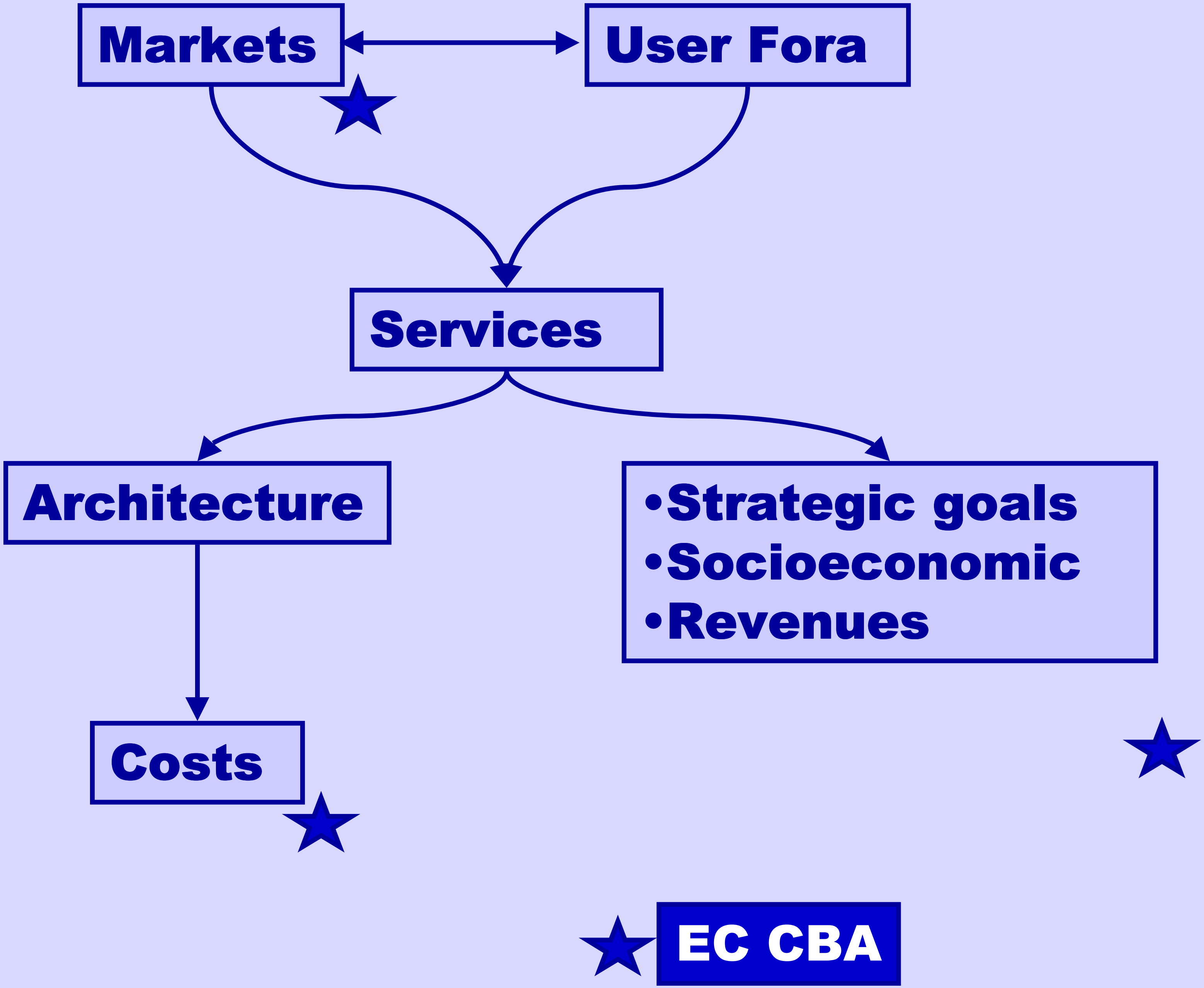
Markets
User Fora
Services
Architecture
•Strategic goals
•Socioeconomic
•Revenues
Costs
EC CBA

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Markets

- VAST

(FDC, FR)

(NEI, NL)

- TESSYN

(Alcatel Space, FR)

- ESA Comparative System Study

(KPMG, UK)

- Structural Analysis

(Technomar, D)

- GEMINUS

(Racal, UK)

- GALA

(Astrium, MMS, UK)

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Markets

Professional market

timing, scientific, precision survey, oil and gas, construction and civil engineering, asset management, precision agriculture, etc.

Mass market

personal navigation,
land navigation, river navigation, etc.

Safety of Life and Security Market

transport of goods and passengers, emergency services, security, etc.

Some 100 applications

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User Fora

Road (Corporate)
Road (Consumer)
Rail
Maritime
Aviation
Science, Survey and Timing
Security

- Some 50 organisations contacted by forum
- Each forum met at least twice

WHO IS CONCERNED IN EUROPE ?

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Market Sizes

26 000	General Aviation Aircraft
4 000	Commercial Aircraft

12 000	Self propelled craft
10 000	Dumbs and Pushed barges
4 000	Tugs and pushers

25 000	Locomotives
78 000	Coaches
30 000	Automotive train sets
425 000	Wagons

WHO IS CONCERNED IN EUROPE ? (Contd)

Market Sizes

513 000	Buses and Coaches

21 000 000	Lorries and Vans

155 000 000	Passenger Cars

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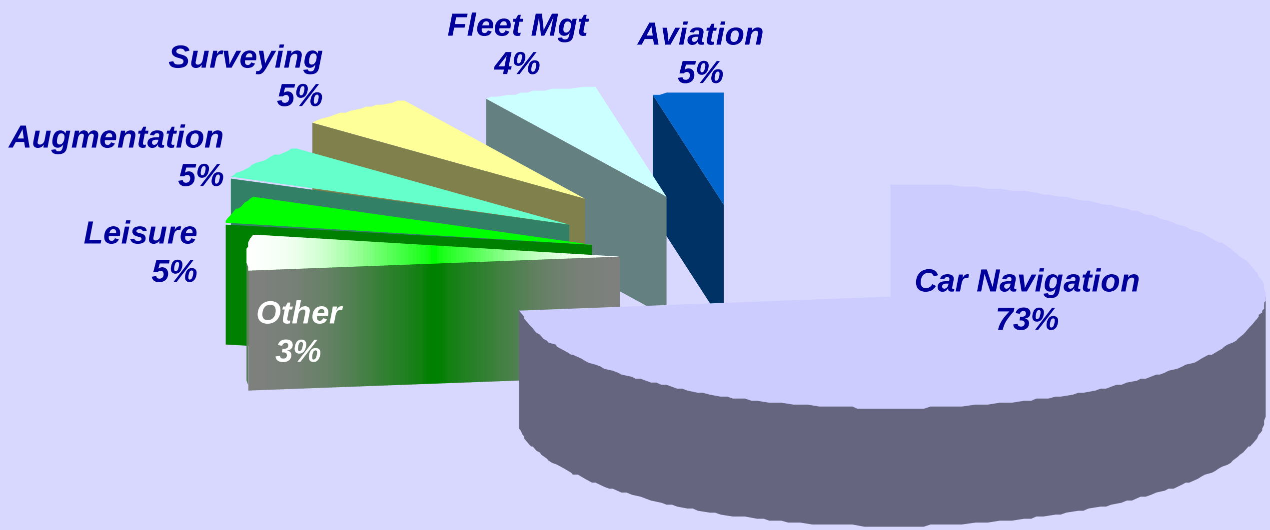
European GNSS Market 1999



Market Size €1Bn

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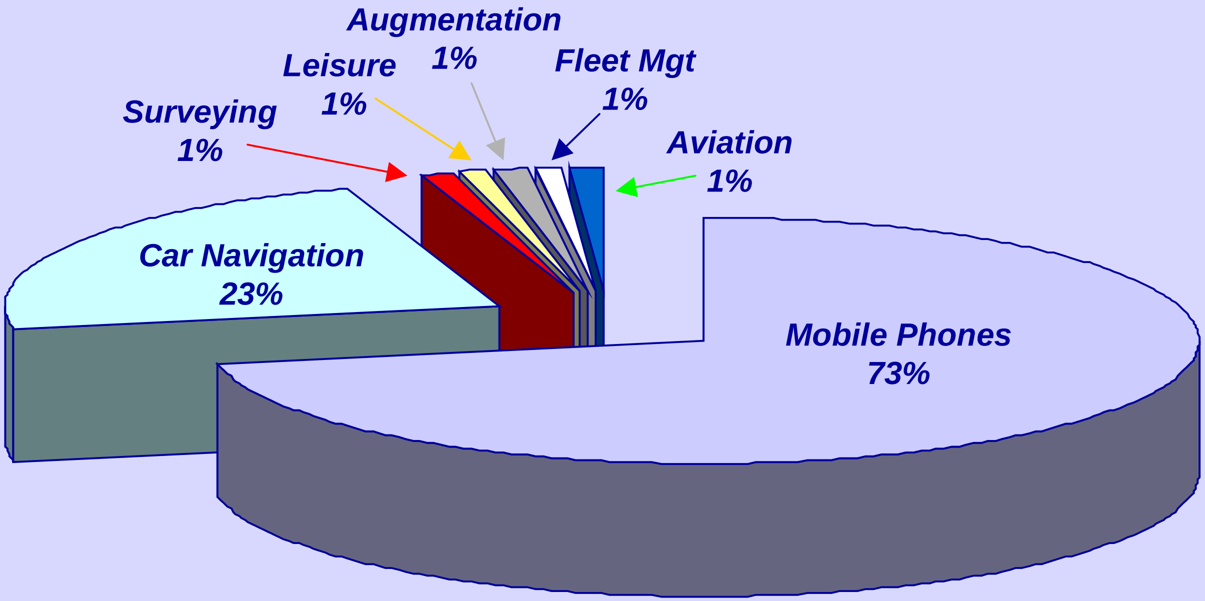
European GNSS Market 2005



Market Size €6Bn

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.

GALILEO

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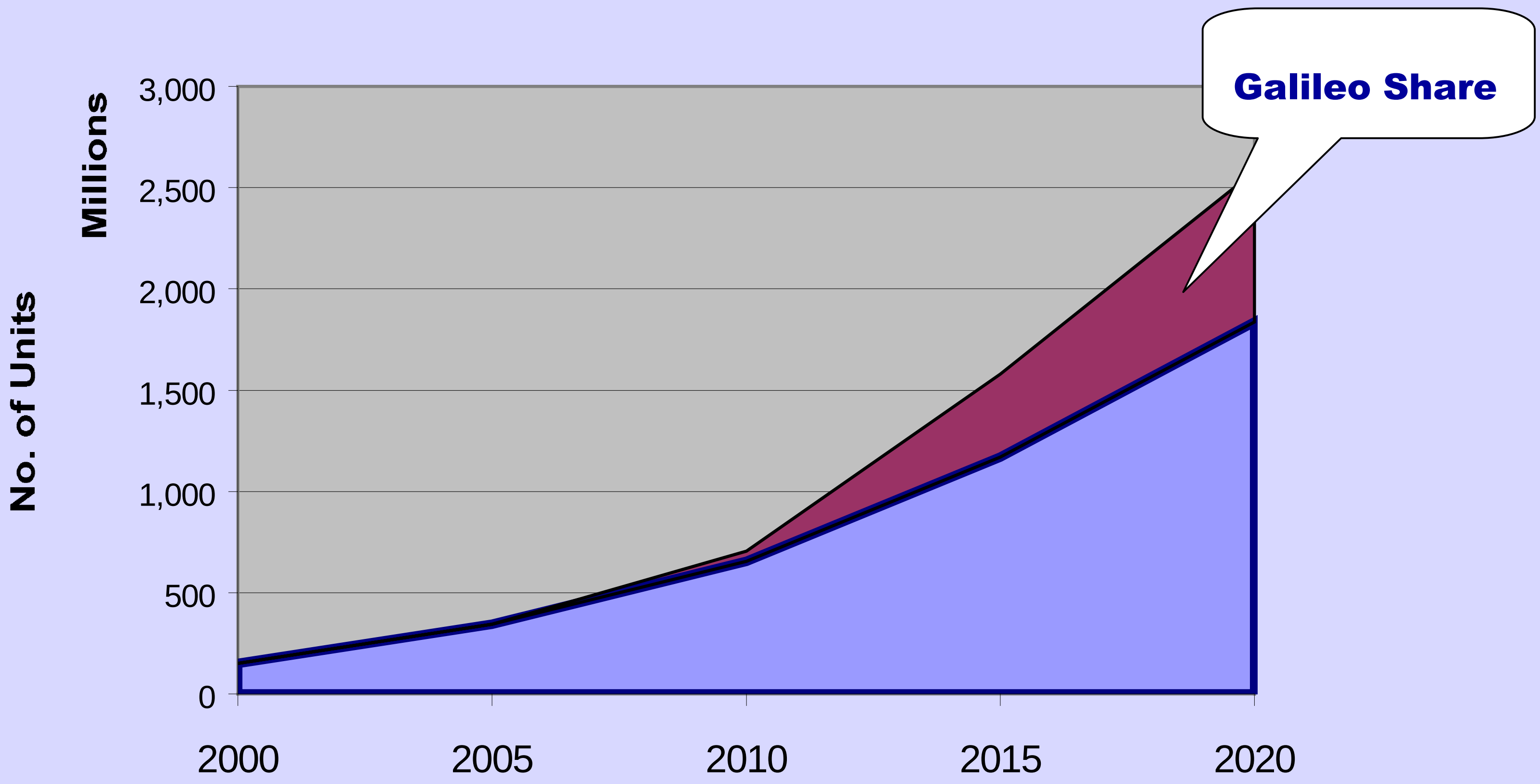
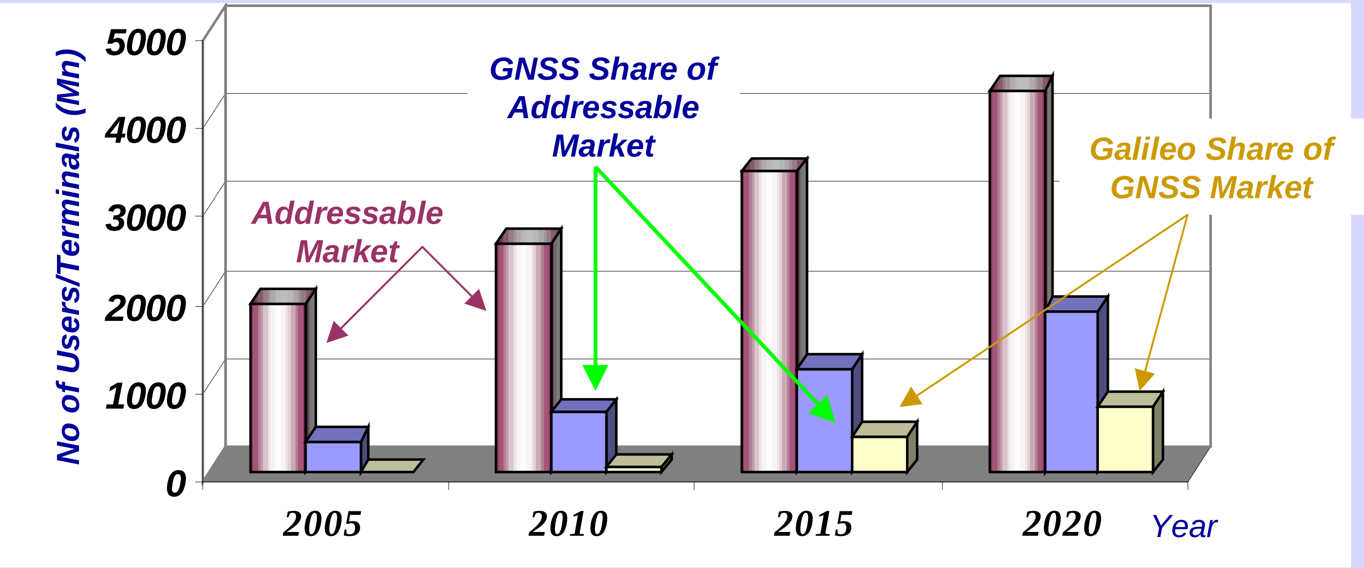
Global GNSS Market Size



Global Positioning and Timing Market Size



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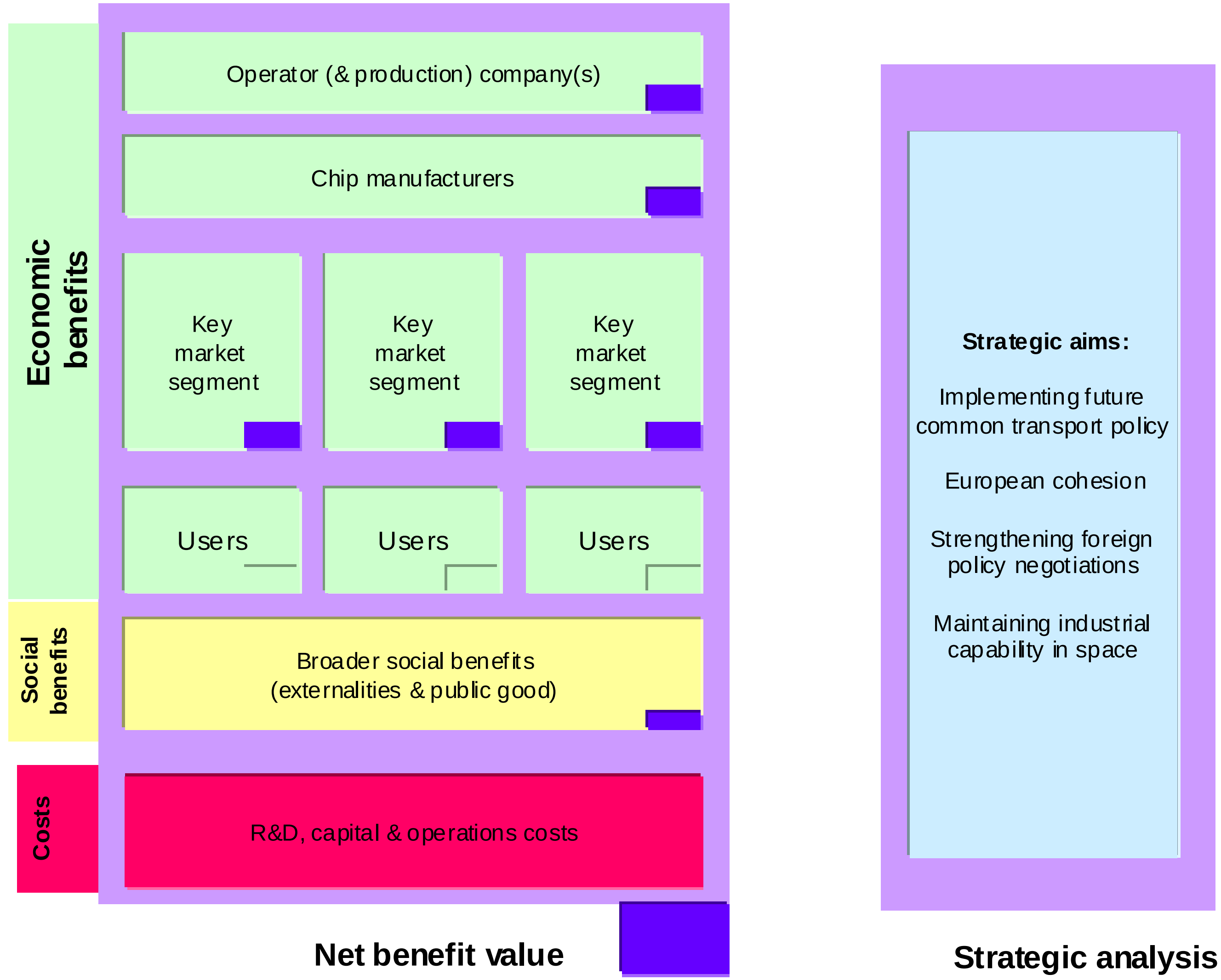
Overview of the cost benefit analysis



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Infrastructure Costs

	Cumulative		Annual		
	2001-2005	2006-2007	2010	2015	2020
Systems engineering and management	**160**	**130**			
Satellites and launches	**320**	**1,320**			
Ground segment	**480**	**380**			
EGNOS integration		**50**			
User segment technology support programme	**70**	**60**			
Operations (and replacements after 2008)	**70**	**210**	**220**	**220**	**220**
TOTAL	**1,100**	**2,150**	**220**	**220**	**220**

Strategic Value

« Zero option »

Cost to Europe of GPS service temporary disruption

In 2015

2 days disruption = 1 billion €

based on GPS use in

- **Transport sector,**
- **Communication sector,**
- **Financial sectors.**

GALILEO Benefits to Producers

	2001-2005	2006-2007	2010	2015	2020
	Annual averages				
Space sector firms and the GALILEO operator	**190**	**930**	**190**	**190**	**190**
Producers of integrated products & services			**20**	**70**	**80**
TOTAL benefits to suppliers	**190**	**930**	**210**	**260**	**270**

GALILEO

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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Social Benefits

	2001-2005	2006-2007	2010	2015	2020
	Annual averages				
Reduced congestion	0	0	200	650	1,425
Decreasing environmental pollution	0	0	70	175	400
Increased safety	0	0	30	15	15
Reuse of radio spectrum	0	0	0	160	160
TOTAL social benefit	0	0	300	1,000	2,000

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Overall view of the results

	2001-2005	2006-2007	2010	2015	2020
	Annual averages				
Supplier benefits (total)	**190**	**930**	**210**	**260**	**270**
User net benefits	**0**	**0**	**1,990**	**4,740**	**7,630**
TOTAL economic benefit	**190**	**930**	**2,200**	**5,000**	**8,000**
TOTAL social benefit	**0**	**0**	**300**	**1,000**	**2,000**
TOTAL benefit	**190**	**930**	**2,500**	**6,000**	**10,000**

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Cost Benefit Analysis

integrated over 2000-2020

Total economic benefits	**62 billion €**
Total social benefits	**12 billion €**
Total benefits	**74 billion €**
Total costs (3.25 b€ + operations)	**6 billion €**

Internal Rate of Return: 75%

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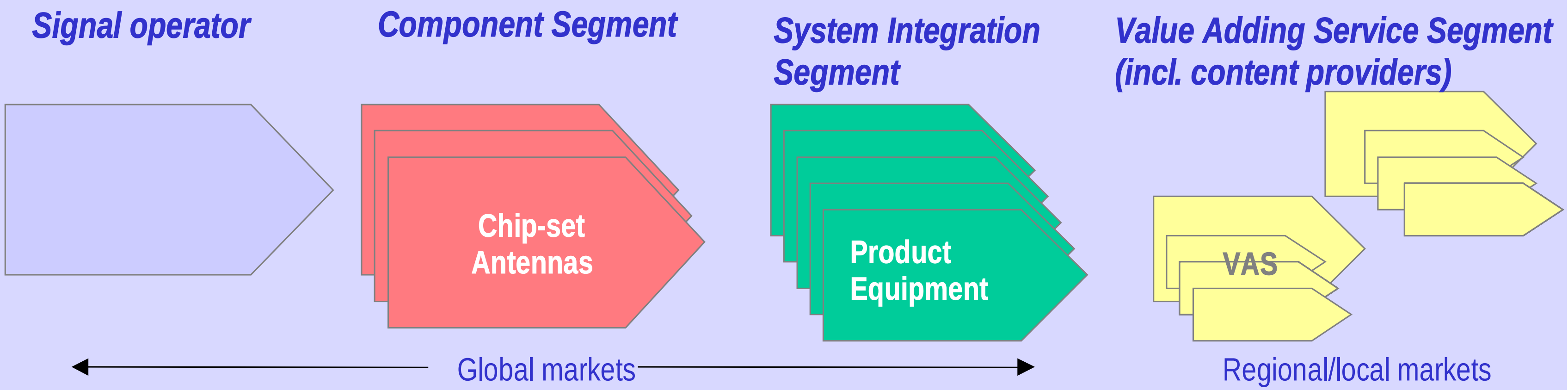
The Sat/Nav Value Chain

Structural characteristics of the Satellite Navigation Value Chain



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Competitive Situation of European Players

Structural characteristics of the Satellite Navigation Value Chain

	WEAK	MEDIUM	STRONG / LEADING
Component level	**CAR-NAV**: chipsets **FLEET MGMT:** chipsets **RAIL**: chipsets **MOBILE COM**: chipsets	**AVIATION**: receivers **AGRICULTURE:** DGPS receivers **TIMING**: chipsets	**CAR-NAV:** digital maps
System integrator level	**MARITIME**: reference stations **SURVEYING:** land & marine, machine control **MOBILE COM:** PDA **LEISURE**: Land & air	**AVIATION**: FMS, GBAS **MARITIME:** nav systems **SURVEYING**: dredging **AGRICULTURE:** yield mapping systems, terminals **TIMING**: timing systems **LEISURE:** maritime	**Car-nav:** systems, telematic receivers **FLEET MGMT:** terminals **RAIL:** wagon tracking systems, train control systems **MOBILE COM:** mobile phones
Service level			**AVIATION**: ATM services **CAR-NAV:** telematic services **FLEET MGMT:** services **SURVEYING:** augmentation **AGRICULTURE:** augmentation **MOBILE COM:** com services

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GALILEO Contribution to overall GNSS market growth

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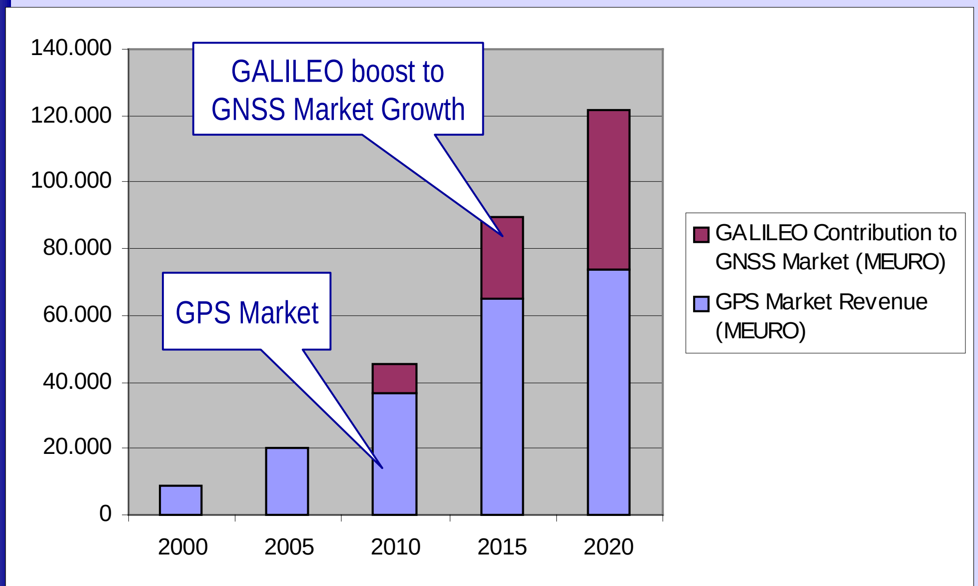
Market prospects for European Industrial Players



Assuming:

that Galileo will boost the overall GNSS market equal to the 'Galileo share'

that the GNSS market without Galileo equals the GNSS (penetrated) market minus the Galileo share

that European suppliers will maintain their current global market shares

that European suppliers share of GNSS global service revenue equals 20% (European services will be provided by European suppliers)

that GPS and GALILEO will be used in a complementary role

that future standard chipsets will be integrated GPS and GALILEO (GNSS) chips

all revenue provided in this analysis are gross revenues

European Suppliers Global Market Shares

Market prospects for European Industrial Players

VEHICLE NAVIGATION	25%
MOBILE COMM	60%
POLICE/FIRE/AMBULANCE	25%
FLEET MAAGEMENT ALL VEHICLES	25%
PERSONAL OUTDOOR RECREATION	4%
LAND SURVEY&GIS MAPPING	8%
Fisheries & EEZ	8%
MARITIME	8%
MINING	8%
SEARCH&RESCUE	8%
OIL&GAS	8%
RAIL	50%
ENVIRONMENT	8%
PRECISION AGRICULTURE	6%
PRECISION SURVEYING	8%
AIR	8%
PERSONAL PROTECTION	4%
ASSET MANAGEMENT	25%
TIME	4%
Met Forecasting Ionosphere	8%
SPACE	8%
GEODESY	8%
INLAND WATERWAYS	8%
VEHICLE CONTROL&ROBOTICS	8%
CONSTRUCTION &CIVIL ENGINEERING	8%
SECURED DATA	25%

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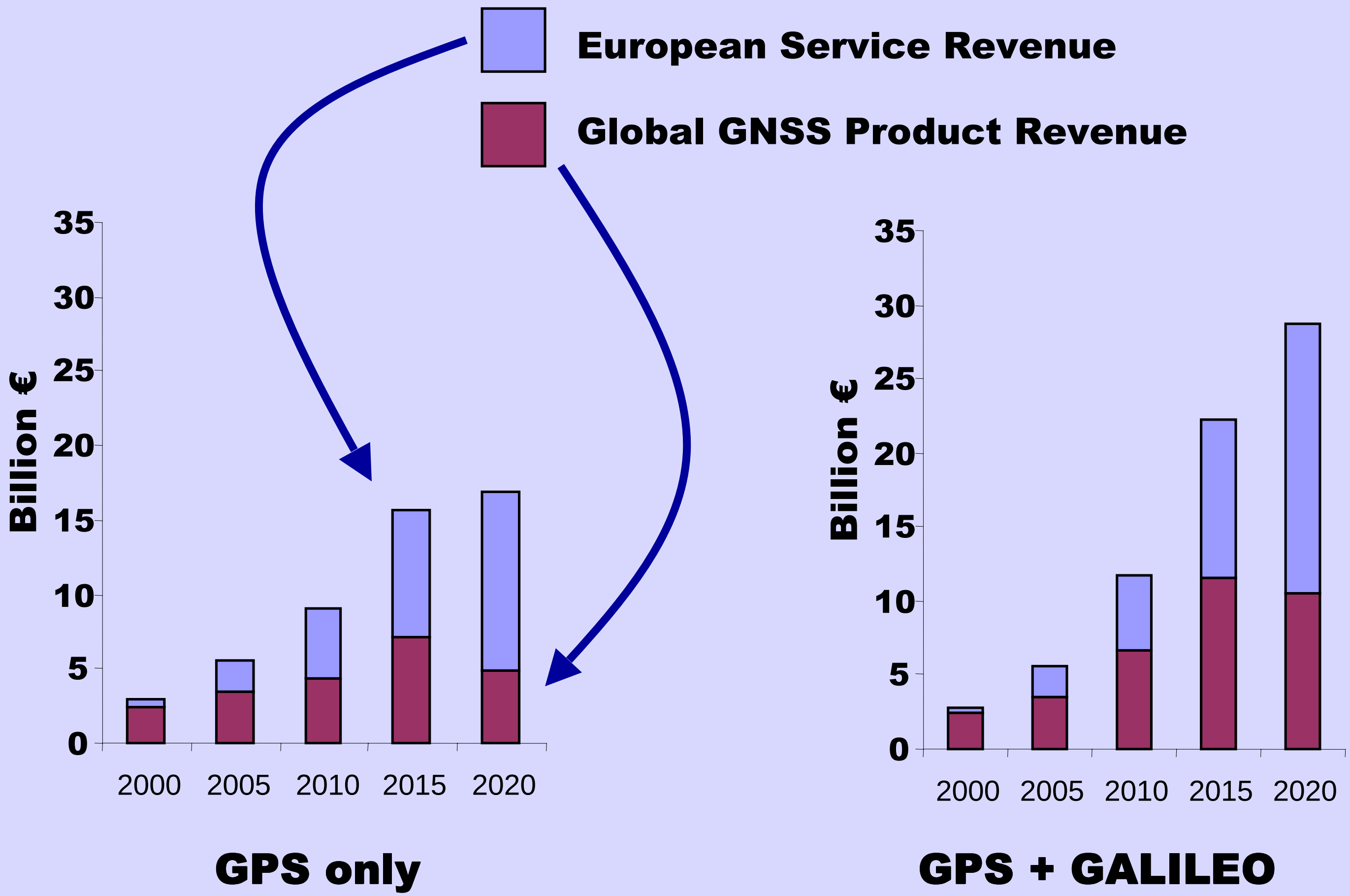
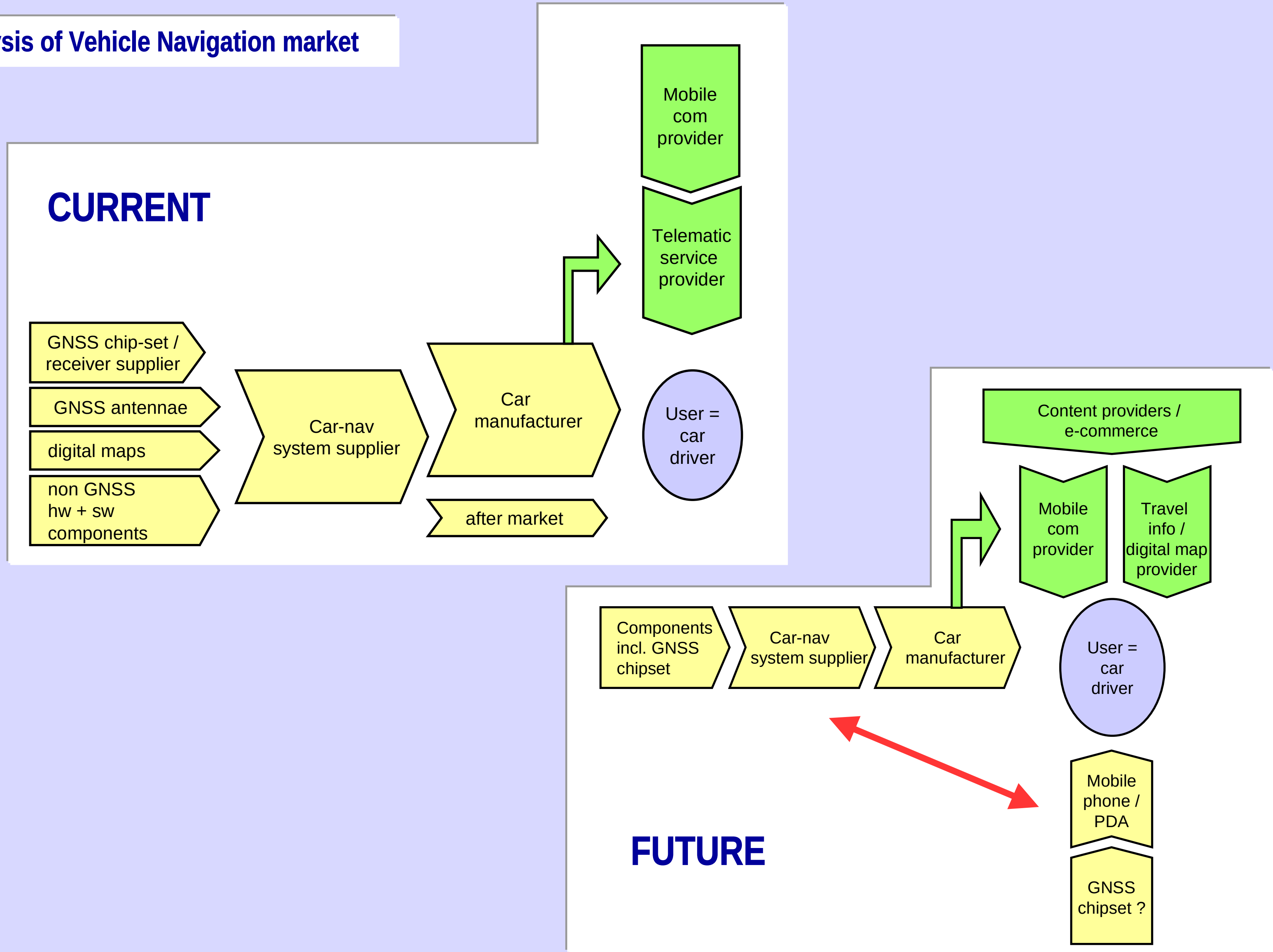
European Suppliers Global Revenues in the GNSS market



Curent and future Value Chain - Vehicle Navigation Market

Detailed Analysis of Vehicle Navigation market



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Market Position of European Car Navigation Suppliers

Detailed Analysis of Vehicle Navigation market

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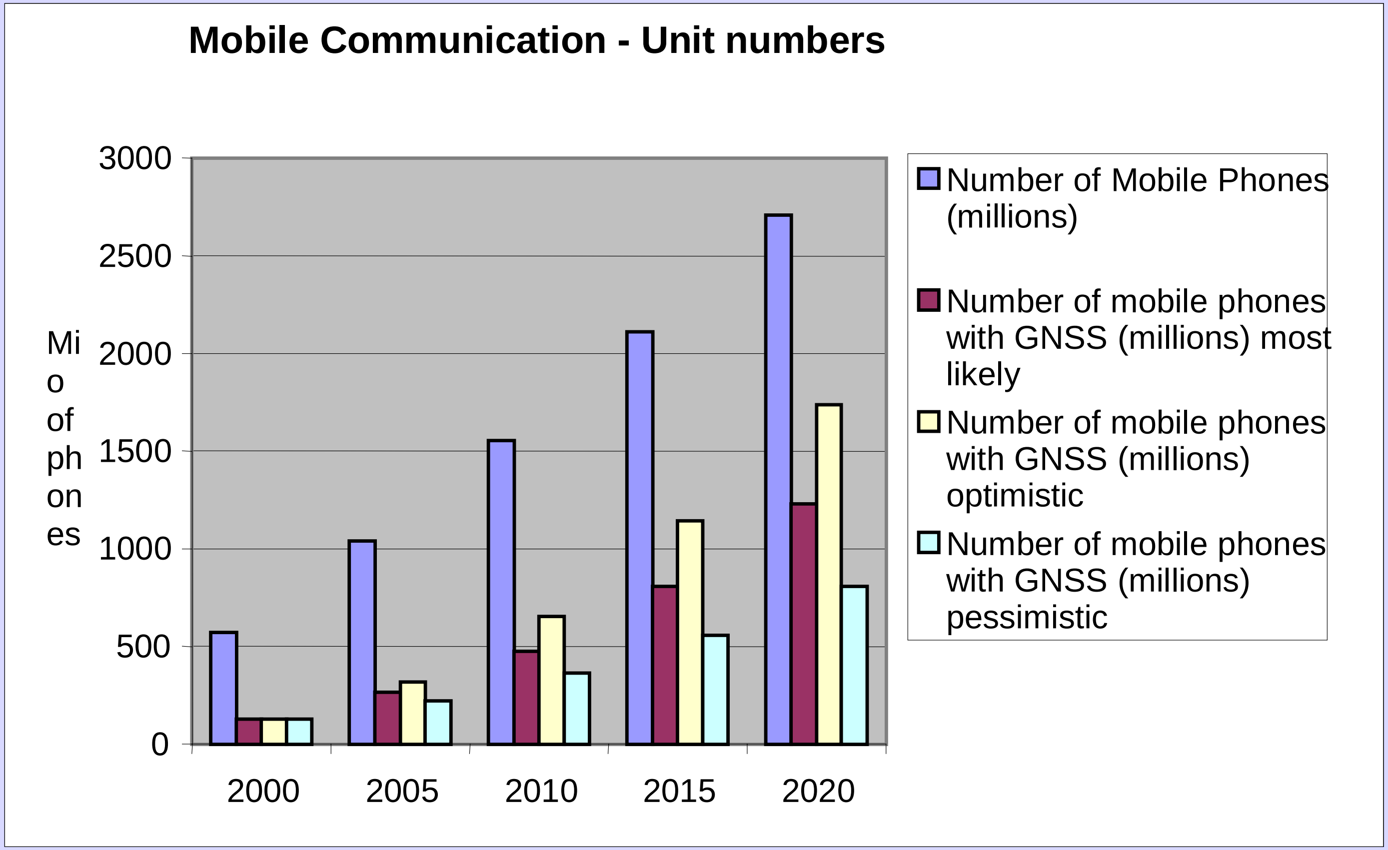
	Market position of the European sat/nav industry – Car navigation		
	weak	medium	strong / leading
Car navigation – products			
Component level	GPS chip-sets / receivers		antennas digital maps
System integrator level			car navigation systems telematic service receivers
Car navigation – services			telematic services

Mobile Communication Market

Detailed Analysis of Mobile Communication Market



Source:GALA Market study

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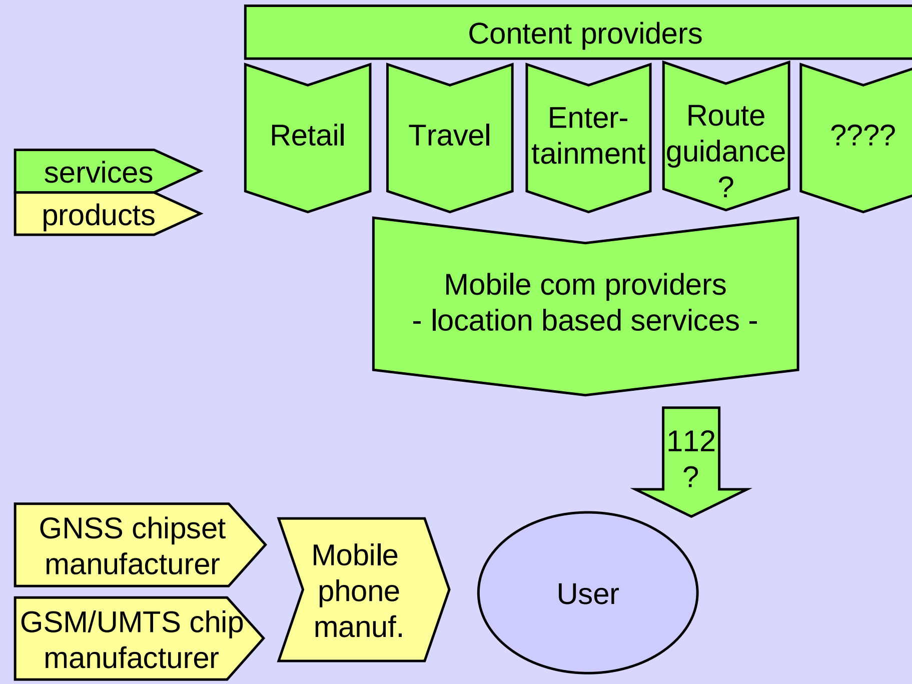
Likely Value Chain of Mobile Com



- **European Commission:** sets the technical requirements for E-112. In the case localisation requires GNSS a compulsory market will emerge
- **Mobile com providers:** have a vital interest to introduce location based services. Set the basic requirements for any localisation feature of mobile phones
- **Mobile phone suppliers:** will make the final decision on the technology to be used for localisation. Have a strategic interest to use GNSS for product differentiation and diversification

GALILEO - Actors with an interest in the Galileo Programme

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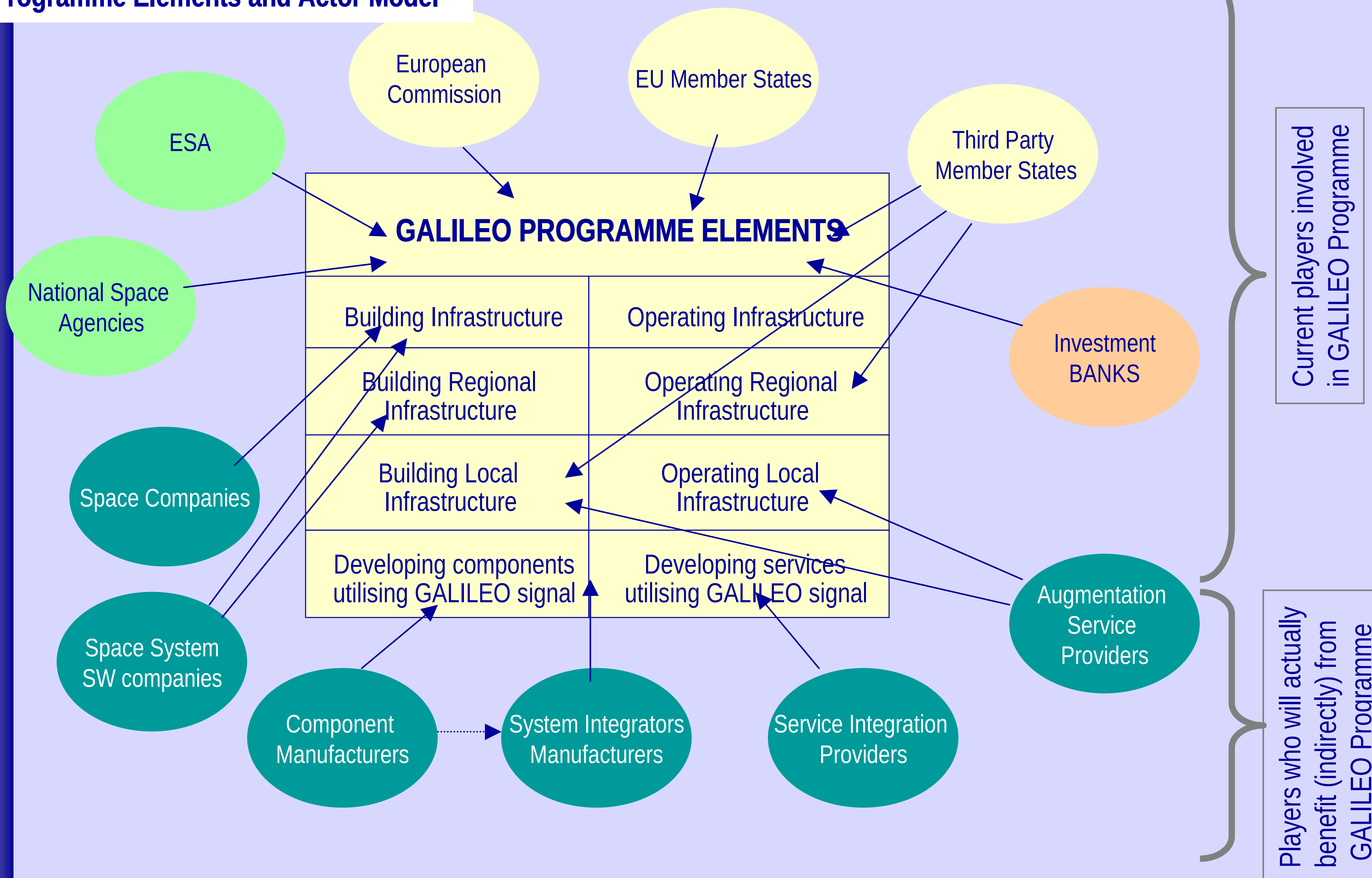
GALILEO Programme Elements and Actor Model



Type of Industrial Actors and motivation to be involved?

GALILEO Programme Elements and Actor Model

Actor	Motivation
Space Companies	Earn money from building GALILEO satellites Gain and develop new competencies May benefit other part of business within the larger corporation
Component Manufacturers GNSS ships	Given that dual chips will be the future standard. European suppliers will get the opportunity to establish themselves and gain market shares
Space System SW companies	Earn money from developing software to GALILEO satellites and ground system
Augmentation Service Providers	To influence how augmentation services will be provided in order to protect their current business
System Integrators Manufacturers	To influence GALILEO technical specifications to be incorporated in their planning for future product development and to be involved in RDT programmes in order to gain competitive advantage in their core business areas
Service Integration Providers	To influence GALILEO service provision, to be involved in RDT programmes, to be in involved the tender process of service provision in order to integrate these into their future service provision to gain competitive advantage in their core business areas

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Major players - interests in various segments

Parent company	*Operating company*	*Market segment*
Bosch	• ***Bosch - Blaupunkt*** • ***Teleatlas*** • ***Bosch***	Car navigation systems, telematic receivers Car navigation - digital maps Car navigation - GPS antennas
Alcatel	• ***Alactel*** • ***Euteltracs***	Mobile phones Fleet management
Deutsche Telekom	• ***T-Mobil*** • ***Tegaron***	Mobile communication Telematic services, fleet management services
France Telecom	• ***Orange*** • Médiamobile • Mobiloc	Mobile communication Telematic services Fleet management
Siemens	• ***Automotive division*** • ***VDO Dayton (?)*** • ***Mobile phone division*** • Engineering division	Car navigation Car navigation, telematic receivers Mobile phones, telematic receivers Land traffic control systems
Thomson	• Airsys • ***DSNP*** • MLR • ***Racal Tracs*** • Global Telematics	Aviation DGPS receiver, surveying, maritime, fleet management Maritime, leisure SBAS, DGPS receivers Telematic services, fleet management

Interest in the down-stream sector (1)

Private investments of an order that could exceed the GALILEO Infrastructure build cost can be envisaged from European industry into the downstream sectors.

Interest in being closer to the GALILEO Programme at a cost, e.g. shareholder in an eventual GALILEO Holding Company.

To fully exploit the potential benefits of the GALILEO Programme into the downstream segments considerable investments have to be made into product and service development, market preparation and development.

Conclusions

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Interest in the down-stream sector (2)

Areas that are likely to attract such investments are those where there already exists a strong player in the GPS based markets and those beginning to emerge including:

- Vehicle and vessel fleet management services
- In-car navigation and communication systems
- Location based mobile communications sector