



Nuove frontiere del broadcasting da satellite

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The Social Need for Broadcasting

INDUSTRIAL SOCIETY

- ✧ STANDARDIZATION
- ✧ SYNCHRONIZATION
- ✧ CONCENTRATION
- ✧ CENTRALIZATION

POST-INDUSTRIAL SOCIETY

- ✧ INDIVIDUALIZATION
- ✧ SPACE/TIME DE-STRUCTURING
- ✧ DISTRIBUTION
- ✧ GLOBALIZATION

- Broadcasting: the queen of industrial society
 - ✧ Synchronization of social and political consciences
 - ✧ European TV/radio channels? Language is not just vocabulary...
- Radio vs. TV broadcasting: how passive are you longing to be?
 - ✧ Free mind vs. full immersion
 - ✧ Spoken language vs. body language
- Interactive Mobile Broadcasting: the post-industrial frontier
 - ✧ Personalized content selection and profile
 - ✧ Individual watching instead of family watching: personal TV
 - ✧ Linear vs. VOD vs. peer-to-peer



Digital TV Market Trends

Global digital TV homes (millions)

	2000	2005	2011
LatinAmerica	2,6	5,4	16,9
NorthAmerica	26,5	63,6	122,1
AsiaPacific	3,9	21,1	202
EasternEurope	1,2	6,1	32,6
WesternEurope	17,4	47,4	121,4
Rest of the World	0,8	2,5	5,1
Global	52,3	146,2	500,1

Source: Informa Telecoms & Media

Top 10 countries by digital TV homes (million)

	2005		2011
USA	58,9	USA	110,5
UK	17	China	98,5
Japan	9,7	Japan	43,3
France	7	Germany	26,9
Germany	6,3	UK	24,4
Italy	6	India	20,7
Canada	5,5	Italy	19,9
Spain	2,7	France	19,6
Australia	2,6	Canada	11,7
Mexico	2,2	Russia	10,6

Source: Informa Telecoms & Media

Digital TV homes as a % of TV households

	2000	2005	2011
LatinAmerica	3	6	16
NorthAmerica	23	52	96
AsiaPacific	1	4	33
EasternEurope	1	5	24
WesternEurope	12	32	79
Rest of the World	0	2	5
Global	5	13	36

Source: Informa Telecoms & Media

Global digital TV homes by platform (million)

	2005	2011
DTT	20,1	73,7
Cable	50	278,9
DTH	73,7	113,6
IPTV	2,4	33,9
Total	146,2	500,1

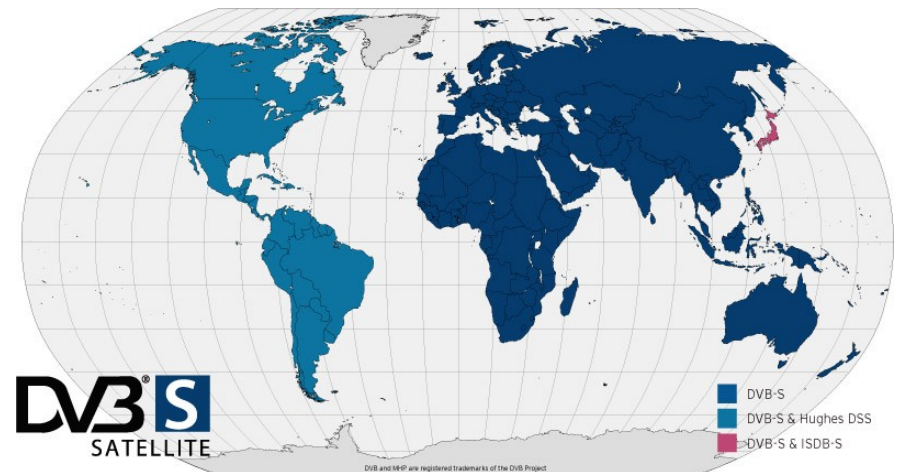
Source: Informa Telecoms & Media

**Mobile TV market forecast:
514 millions in 2011**

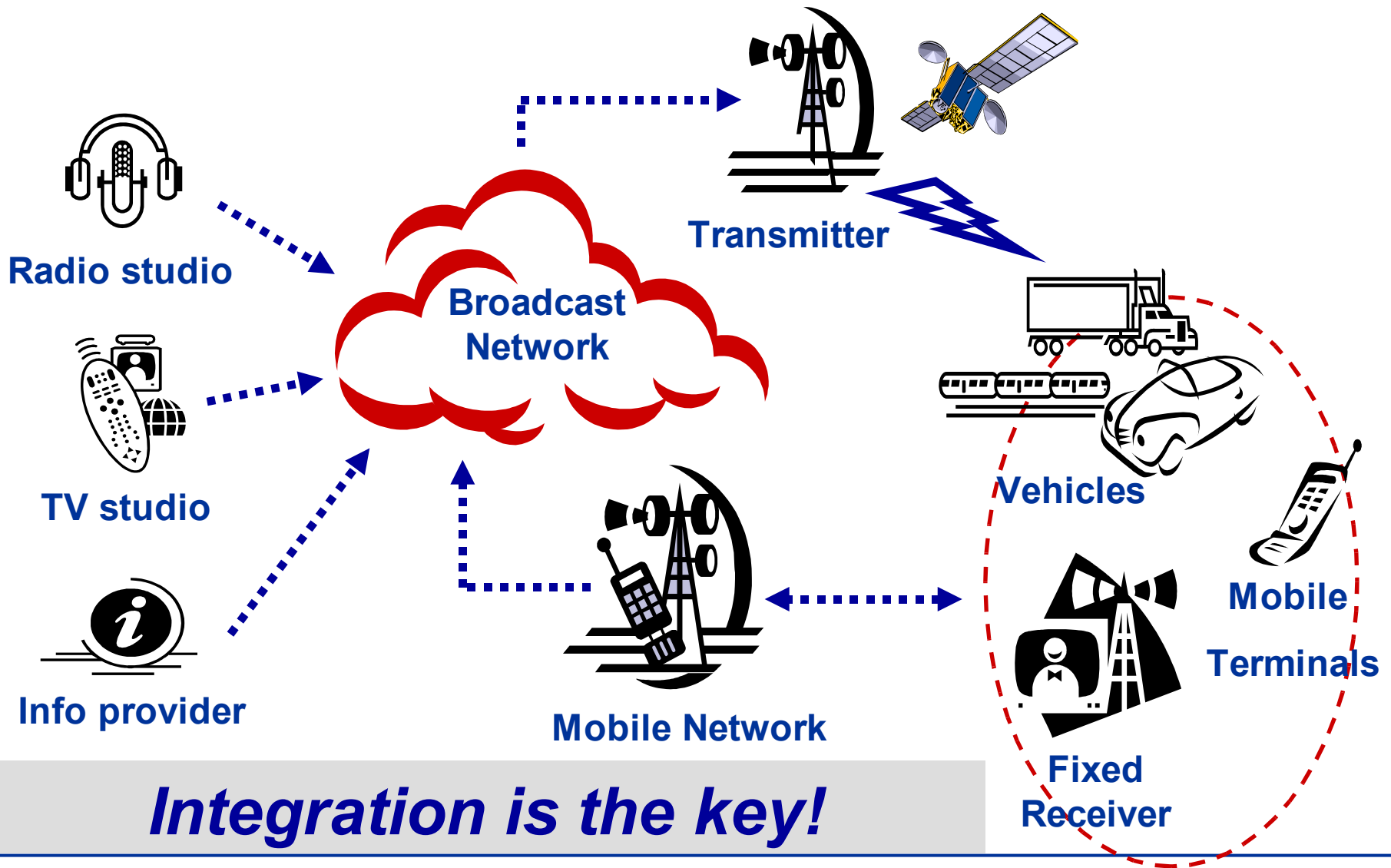


Satellite Broadcasting: one reaches infinity

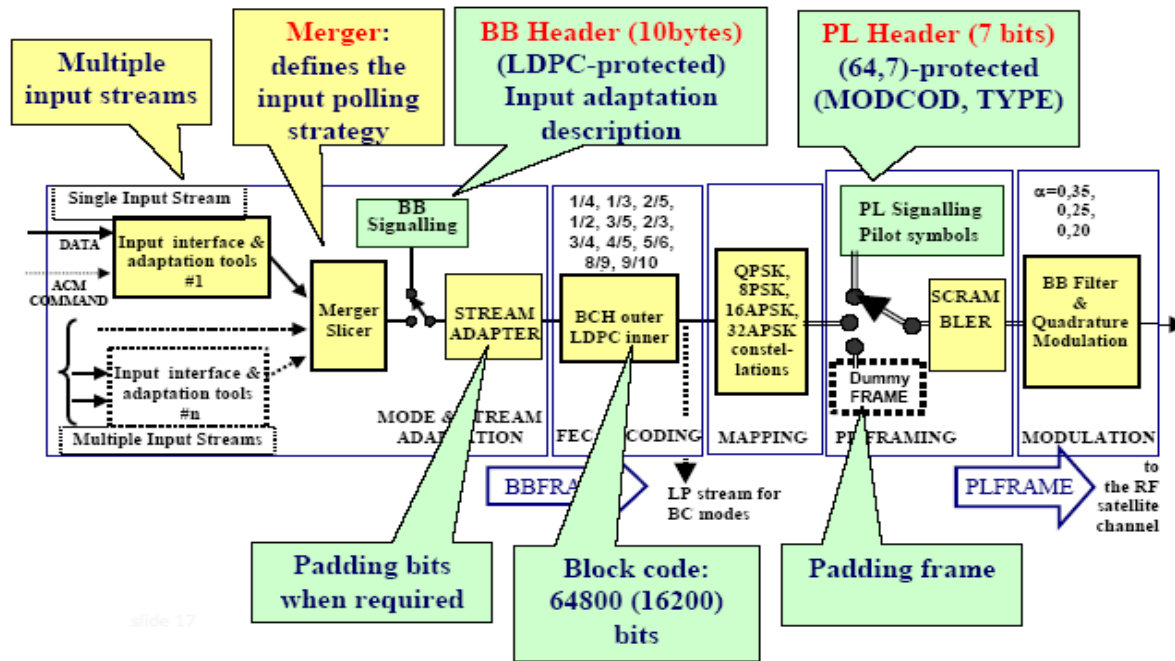
- **Maximal coverage area with minimal environment impact**
 - ✧ 3 GEO satellites can cover the entire Earth
- **Barriers are purely regulatory**
 - ✧ Spectrum licenses
 - ✧ Content distribution licenses
- **Success stories for satellite broadcasting:**
 - ✧ DVB-S (DTH)
 - ✧ XM Radio & Sirius Satellite Radio
- **What's new in town?**
 - ✧ HDTV
 - ✧ DVB-S2/RCS
 - ✧ MBSAT
 - ✧ Ku-Band mobile
 - ✧ DVB-SSP (DVB-H+)
 - ✧ MediaFlo
 - ✧ SDR
 - ✧ Worldspace, Ondas, Europa-Max



Mobile Broadcasting Network Architecture

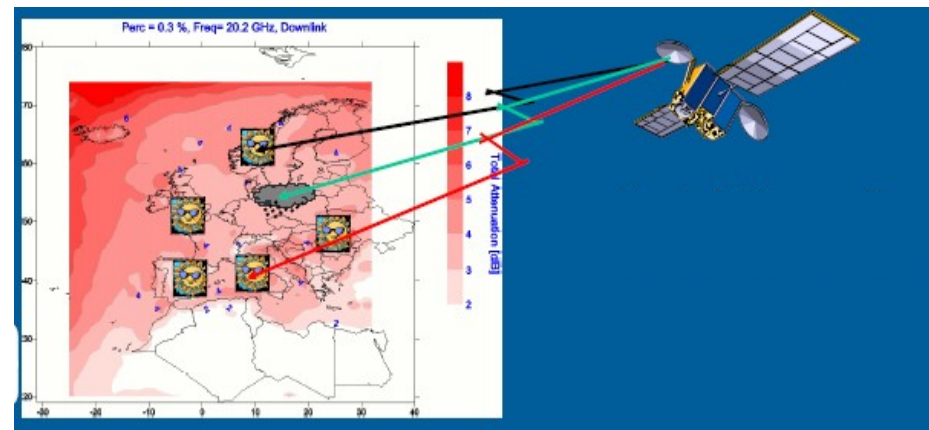


DVB-S2: Adaptive Coding and Modulation



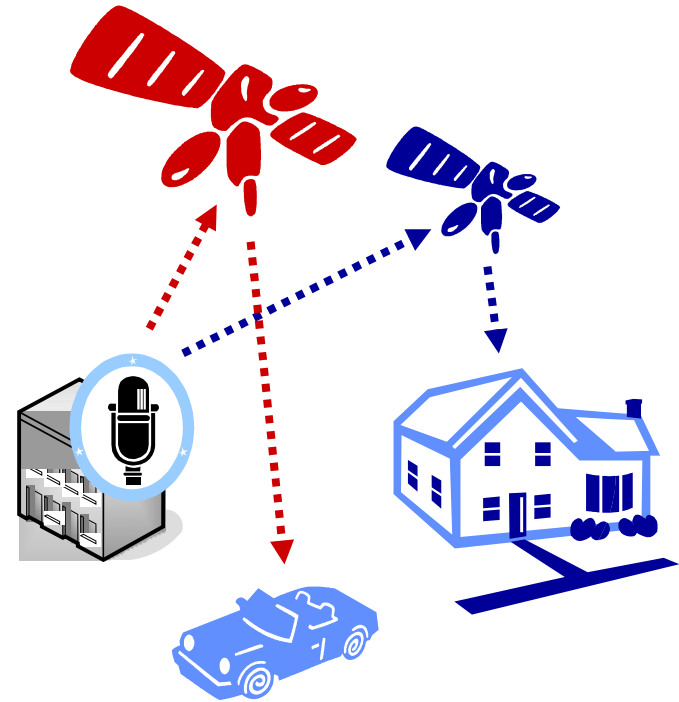
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- Macro adaptation (30%)
- Micro adaptation (200%)
- Extension to mobile



DARS systems: XM radio

- **DARS = Digital Audio Radio Service**
- **XM Satellite Radio (CONUS)**
 - ✧ started in 2001
 - ✧ A \$1,5 billions program targeting the vehicular market
 - ✧ 100 Thematic radio channels, FM+ quality
 - ✧ Around \$10/month subscription
 - ✧ Receivers price starting from about \$100
 - ✧ XM had around 6M customers end of 2006
 - ✧ **Constellation**
 - ❖ 2 GEO satellites
 - ❖ Terrestrial repeaters (~1500)
 - ✧ **Air interface**
 - ❖ QPSK TDM
 - ❖ S-Band
- **www.xmradio.com**

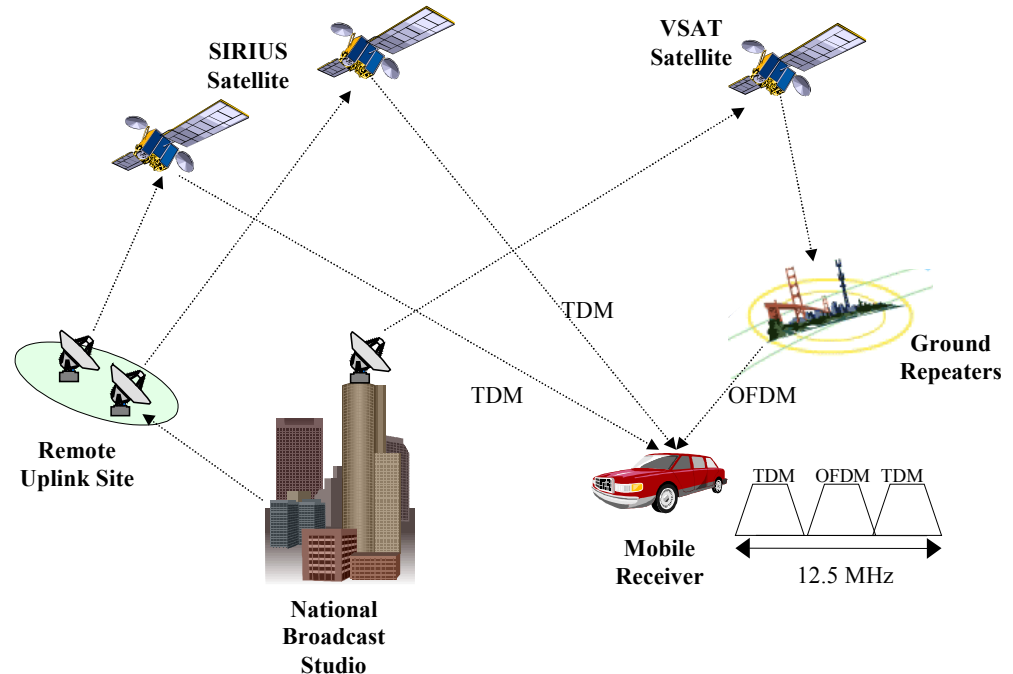


DARS systems: Sirius

● Sirius (CONUS)

- ✧ Started 2002
- ✧ 120 Thematic radio channels, FM+ quality
- ✧ Howard Stern: 500M\$ in 5 years!
- ✧ About \$10/month subscription
- ✧ Around 4M users end of 2006
- ✧ Constellation:
 - ❖ 3 HEO satellites
 - ❖ Terrestrial repeaters (~ 90)
- ✧ Air interface:
 - ❖ Direct link: QPSK TDM
 - ❖ Terrestrial repeater link: QPSK COFDM
 - ❖ Coding: RS+Conv
 - ❖ Sat diversity

● www.sirius.com



MBSAT (Jap-Kor S-DMB)

● MBSAT (Japan and Korea)

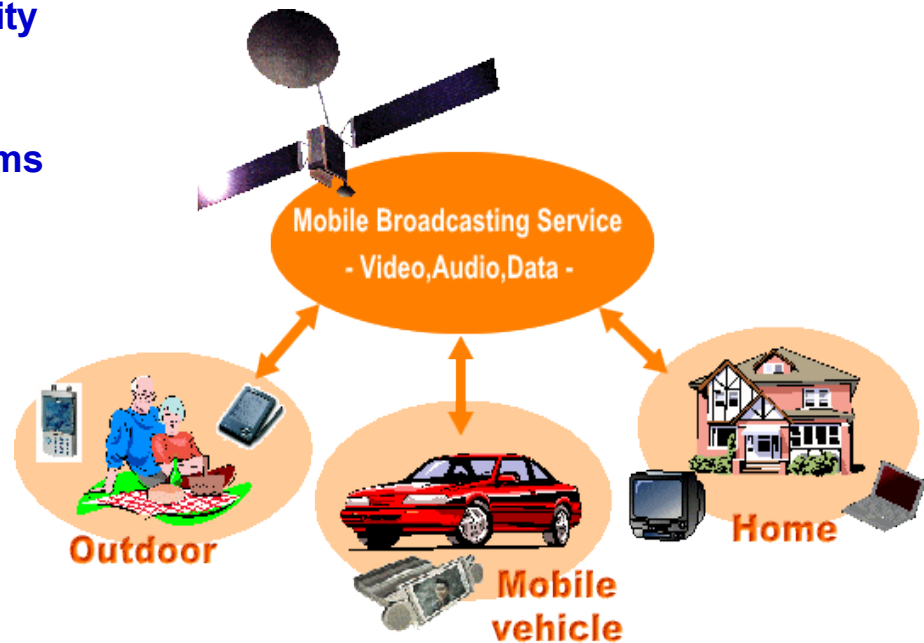
- ✧ opening 2004
- ✧ 25 MHz band at 2,6 GHz, 7 Mb/s capacity
- ✧ Vehicular and pedestrian usage
- ✧ 10 TV and 50 Radio broadcast programs
- ✧ Target 20 Million customers in 2010
- ✧ About 400 to 600 \$ receivers
- ✧ About 3 to 20\$/month subscription

● Constellation

- ✧ 1 GEO sat, 12 m antenna

● System Cost ~800 M\$

- ✧ Tens of thousands of terrestrial repeaters

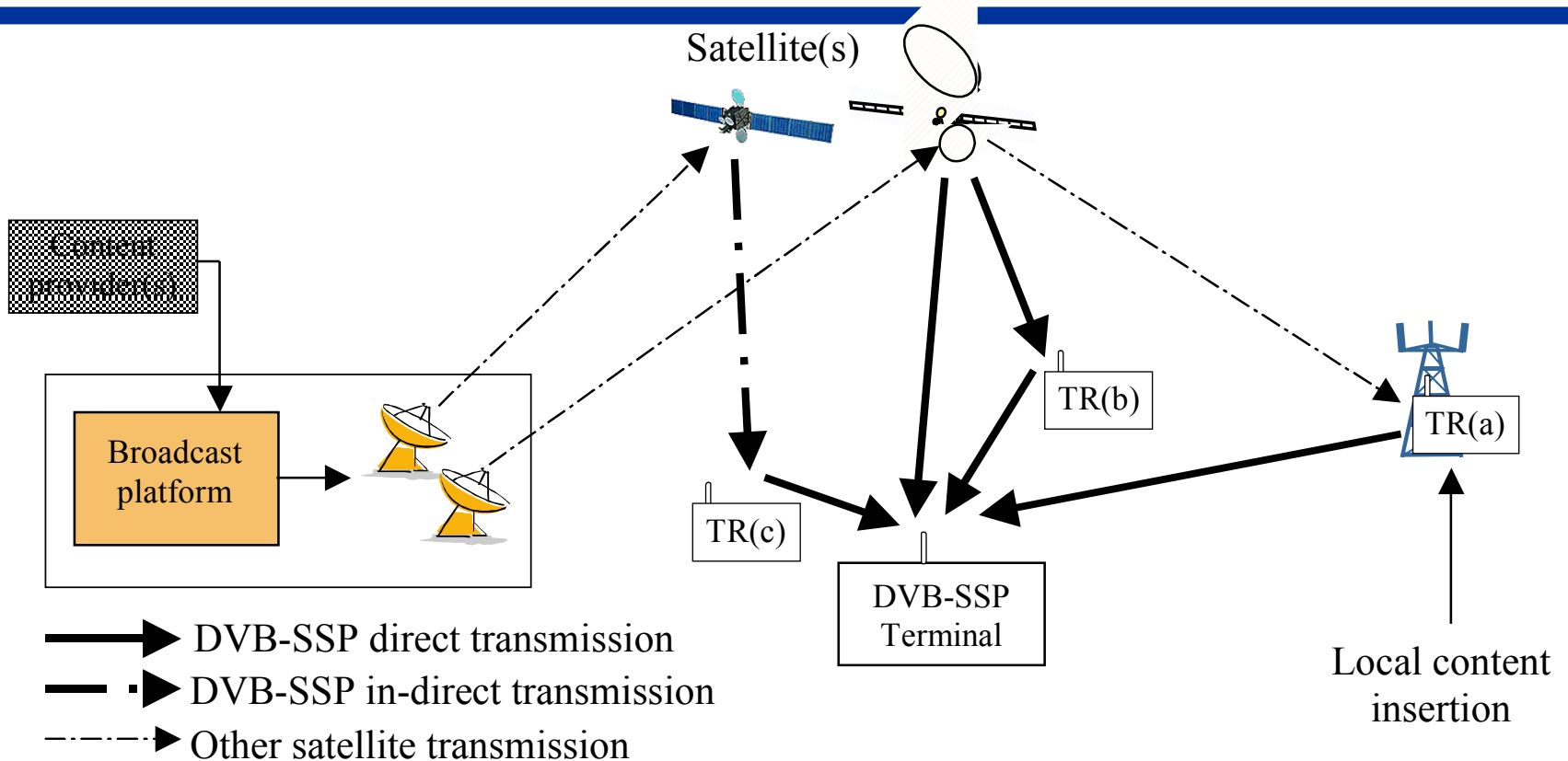




DVB Satellite Services to Portable devices (SSP)

- **Status: Study Mission**
- **Objective**
 - ✧ Hybrid satellite/terrestrial network to deliver multimedia services to handheld
- **Terminal profiles**
 - ✧ Mobile (A): terminal mounted on a mobile vehicle (e.g., car, train or airplane)
 - ✧ Personal (B): terminal size factor compatible with mobile phones and PDAs
 - ✧ Nomadic (C): terminal mounted in a fixed location and used mainly for indirect feeding of the signal (gap-fillers, home repeaters ...)
- **Spectrum**
 - ✧ Below 3 GHz: L and S bands
 - ✧ Above 3 GHz: Ku and Ka bands
- **Driving concepts**
 - ✧ Reusability of DVB specs and technology
 - ✧ Commonalities with terrestrial broadcasting systems
 - ✧ Robustness towards mobile channel propagation
- **Availability of technical specifications: 2006-2007**

DVB-SSP: reference architecture



TR(a): Co-located/standalone Terrestrial Repeater providing local content insertion,

TR(b): Terrestrial Repeater providing local on-frequency re-transmission,

TR(c): Terrestrial Repeater providing local in-direct to direct DVB-SSP translation



DVB-SSP: candidate architectures

	DVB-S2 modified	DVB-H modified	DVB-H enhanced
Terrestrial component	DVB-H	DVB-H with modifications	DVB-H with enhancements
Satellite component	DVB-S2 with modifications		

- **DVB-S2 with modifications (→ DVB-S2 Ad-hoc group)**
 - ✧ MPE-FEC with extended interleaving depth
 - ✧ Time slicing
 - ✧ Optimized physical layer interleaving
 - ✧ Spectrum spreading for ku/ka applications (if required)
- **DVB-H with modifications:**
 - ✧ MPE-FEC interleaving depth
 - ✧ Bandwidth scaling
- **DVB-H with enhancements**
 - ✧ Forward error correction codes (turbo or LDPC)
 - ✧ Enhanced synchronization mechanisms



SDR (Satellite Digital Radio)

- **Latest Standard version closed on 27/9/2006 (ETSI TS 102 550, 551-1, 551-2)**
- **IPL (Inner Physical Layer): ETSI TS 102 551-1, 551-2**
 - ✧ **L-Band (1.4-1.5 Ghz), S-Band (2.0-2.3 GHz)**
 - ✧ **Single Carrier: TDM (similar to DVB-S2)**
 - ❖ **Modulation: QPSK, 8PSK, 16 APSK**
 - ❖ **Data rate: 3 Mbit/s – 43 Mbits/s**
 - ✧ **Multi Carrier: OFDM (similar to DVB-T/H)**
 - ❖ **Modulation: QPSK, 16 QAM (hierarchical, non- hierarchical)**
 - ❖ **Number of sub-carriers: 2k (DVB-T), 2k, 1k, 0.5k**
- **OPL (Outer Physical Layer): ETSI TS 102 550**
 - ✧ **Error protection, outage mitigation, zapping/delay**
 - ✧ **FEC: 3GPP2 Turbo code**
 - ❖ **Rate: 1/5, 1/4, 1/3, 1/2, puncturing**
 - ❖ **Interleaver up to 32000 symbols**
 - ❖ **Mixing, segmentation, dispersion, collection**
 - ✧ **Stream types: transparent, MPEG, IP**
- **Time slicing: only at physical layer (no coding at upper layers)**



Positioning of systems

- It is very difficult to predict the success of one solution over another
- Several aspects must be considered:
 - ✧ **Business/Market**
 - ❖ Network ownership to broadcasters or to mobile operators?
 - ❖ Fair share agreement between mobile operators and broadcasters
 - ❖ Low tariffs, ideally comparable to Internet levels
 - ❖ Low cost impact on cellular handset (need to subsidize)
 - ❖ Cost of network deployment, including repeaters
 - ✧ **Architecture/technical**
 - ❖ Service continuity over nation wide coverage, in line with today's coverage for mobile voice communications
 - ❖ Efficiency and throughput. Broadcast capacity in line with the traffic associated to the content/service adapted to mobile environment
 - ❖ Low impact on terminal autonomy
 - ❖ Security and DRM issues
 - ✧ **Regulatory**
 - ❖ Harmonised spectrum over several countries, allowing critical market size



Master in Mobile & Digital TV

- **Academic Year 2006/2007**
- **Organizing entities:**
 - ✧ **University of Bologna**
 - ✧ **Alma Graduate School**
 - ✧ **Fondazione Guglielmo Marconi**
 - ✧ **Fondazione Ugo Bordoni**
- **With support from**
 - ✧ **AICT**
 - ✧ **Mavigex**
 - ✧ **Telespazio**
 - ✧ **Teleromagna**
 - ✧ **Teko Telecom**
 - ✧ **Vodafone**
 - ✧ **Wireless Future**
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**European
Commission**

**esa
alphasat**

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**CITIZENS &
GOVERNMENTS**

**EUROPEAN
INFORMATION
SPACE**



**REGULATION
STANDARDIZATION**

**HW & SW
TECHNOLOGY**

**CONTENT &
SERVICES**

**NATIONAL
AGENCIES**

MEMBER STATES

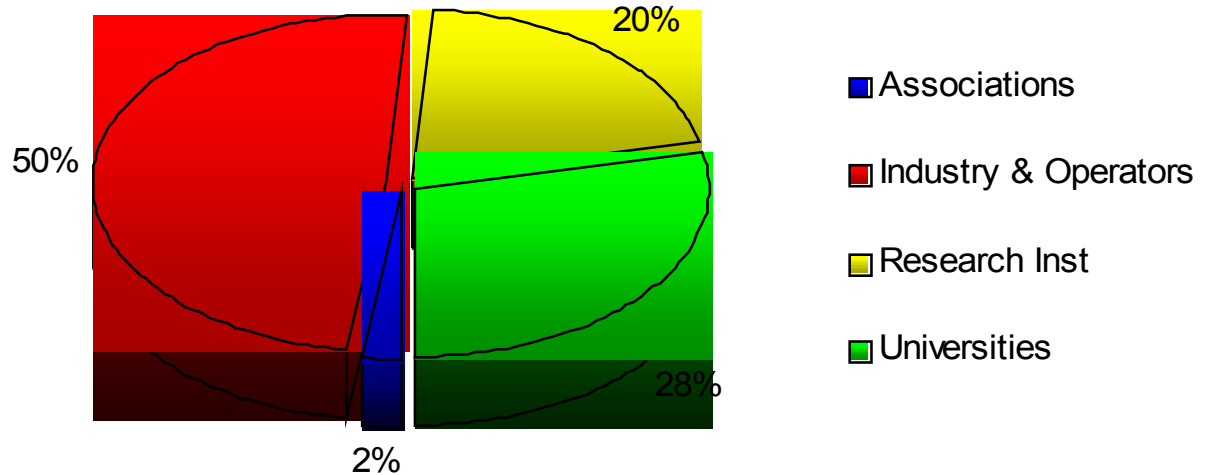


ISI: Constituency

ISI Participants are increasing rapidly. Presently, there are more than **150** institutions from **24** different Countries:

- Austria
- Belgium
- Bulgaria
- France
- Finland
- Germany
- Greece
- Hungary
- Ireland
- Israel
- Italy
- Luxemburg
- Norway
- Poland
- Portugal
- Romania
- Russia
- Slovenia
- South Korea
- Spain
- Sweden
- Switzerland
- United Kingdom
- USA

ISI Participation by Organization Type



www.isi-initiative.eu.org



ISI positioning in FP7

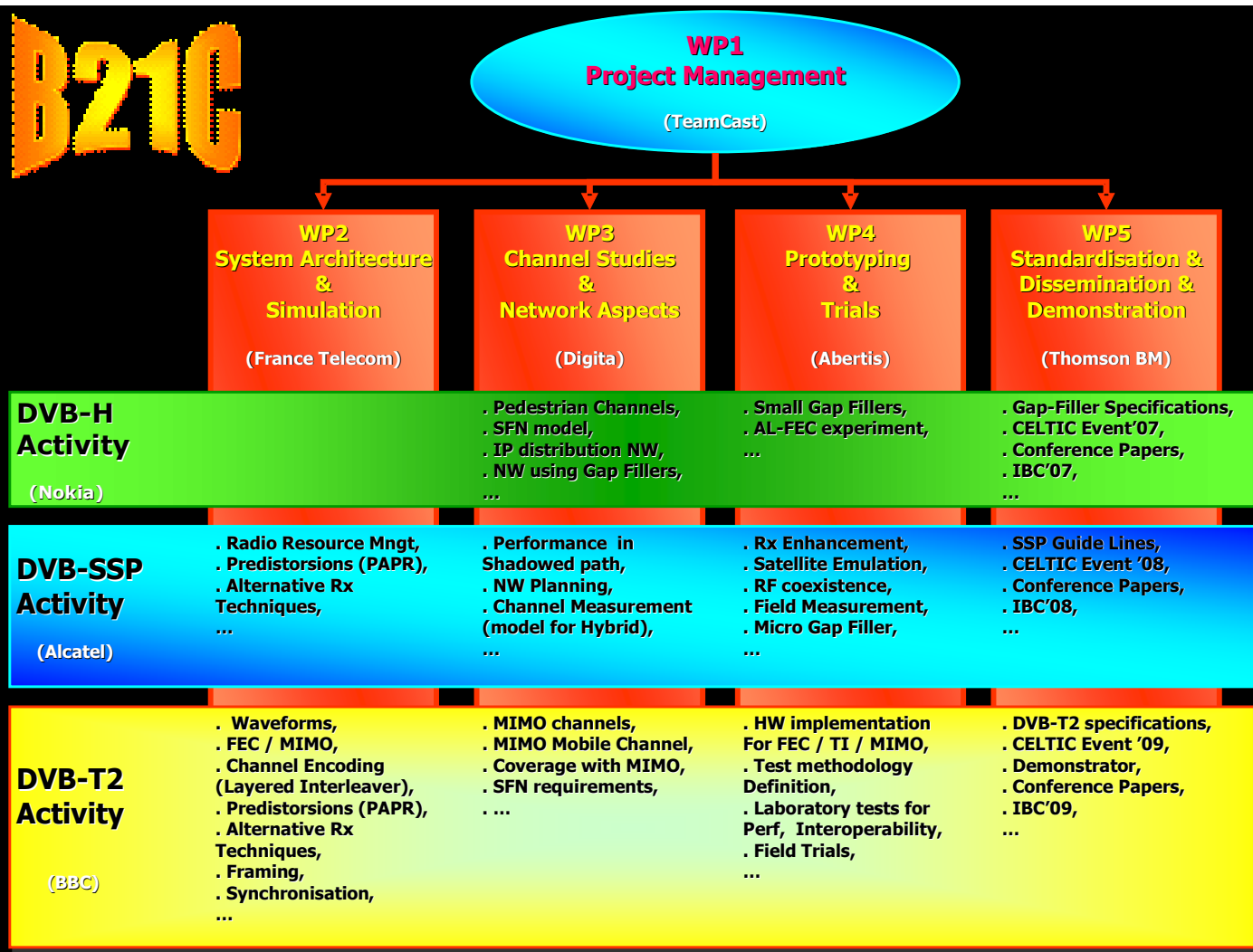
7th Framework Programme Structure

7th Framework Programme Structure										
Specific Programmes	COOPERATION	1. Health	2. Biotech, Food. Agri.	3. ICT	4. Nano, Mater. Produc.	5. Energy	6. Environment	7. Transport	8. Socio-economic Research	9. Security & Space
	IDEAS	European Research Council								
	PEOPLE	Marie Curie Actions								
	CAPACITIES	Research Infrastructures	Research for the benefit of SMEs	Regions of Knowledge	Research Potential	Science in Society	International Co-operation			



B21C (Broadcasting for the 21st century)

B21C

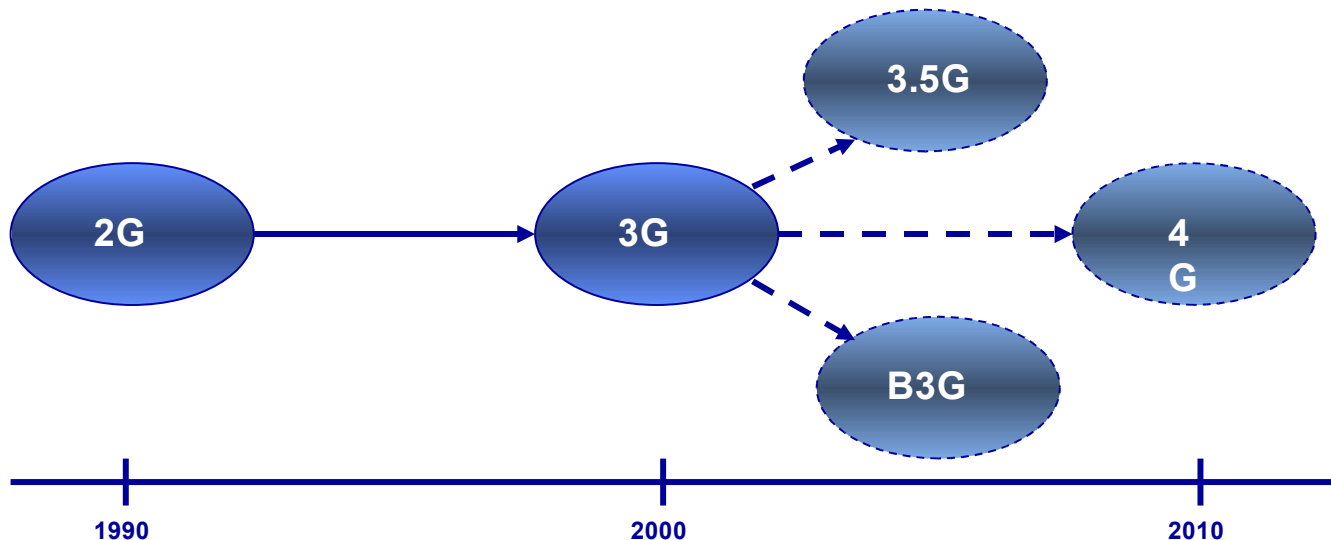


- Abertis Telecom-Retevisión
- Abo Akademi
- Agilent Technologies
- Alcatel
- BBC
- Braunschweig Technical University
- Dibcom
- Digita
- Elektrobit
- ENST Bretagne
- France Telecom R&D
- Fraunhofer IIS
- Hispat
- INSA Rennes
- Mier
- Nokia
- NXP Semiconductors
- RAI Radiotelevisione italiana S.p.a.
- Robotiker
- Rohde&Schwarz
- Sidsa
- Sony
- Space Hellas S.A.
- Tampere University of Technology
- TDF
- TeamCast (Project Co-ordinator)
- Telefonica
- Temex
- Teracom
- Thomson Broadcast & Multimedia
- Turku University of Applied Sciences
- Universitat Ramon Llull
- University of Bologna
- University of Surrey
- University of Turku



ESA/ESTEC: The role of Satellites in 4G

- **Negotiation/kick-off: October 18, 2006**
- **Partners**
 - ✧ **Alcatel Alenia Space**
 - ✧ **ESYS**
 - ✧ **Qualcomm**
 - ✧ **University of Athens**
 - ✧ **University of Bologna (project coordinator)**





Open questions

- **What is the impact of market fragmentation on advertising?**
- **Can ARPU increase be sustained indefinitely?**
- **What will be the ratio between linear and on-demand viewing?**
- **Is the advent of HDTV comparable to the step from BW to colour TV?**
- **How will the user react in front of huge content offer?**
- **What will be the importance of branding?**

ISL

ISL pool lane

Broadband

Broadcast

Mobile