DIGITAL BROADCASTING

Implementation of new services and their position in Multimedia World

OUTLINE

- Scope of the lecture
- Why digital
- Specifics of Broadcasting
- Transition from Analogue to Digital
- Broadcasting and Multimedia

Scope of the lecture

- Overview of the scene
- Case demonstration

- European perspective

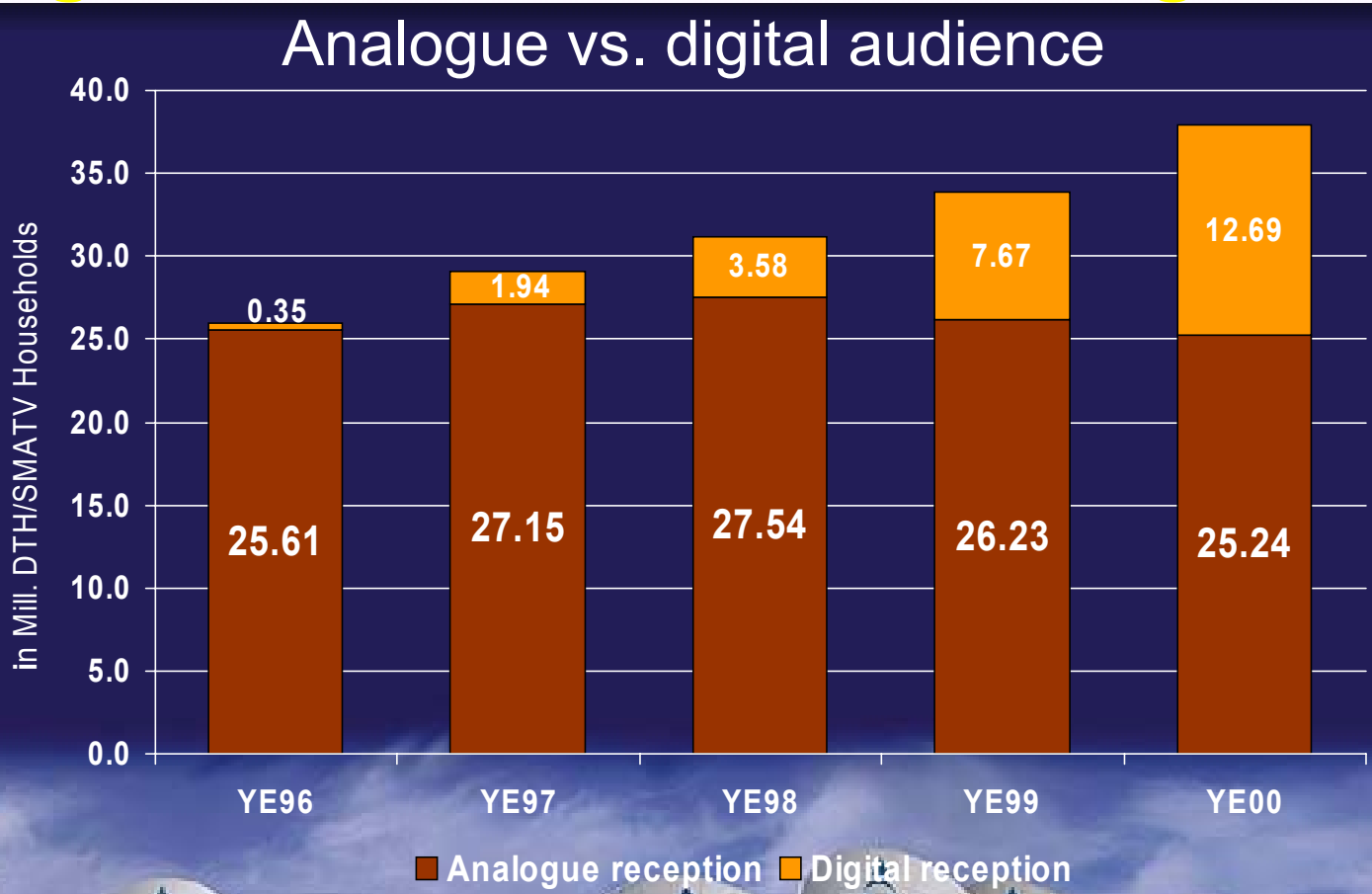
Why digital

- Because it is Digital!
  - Sharing technology with IT industry
  - Improvement in quality
  - Spectrum efficiency
  - New services possible

Specifics of Broadcasting

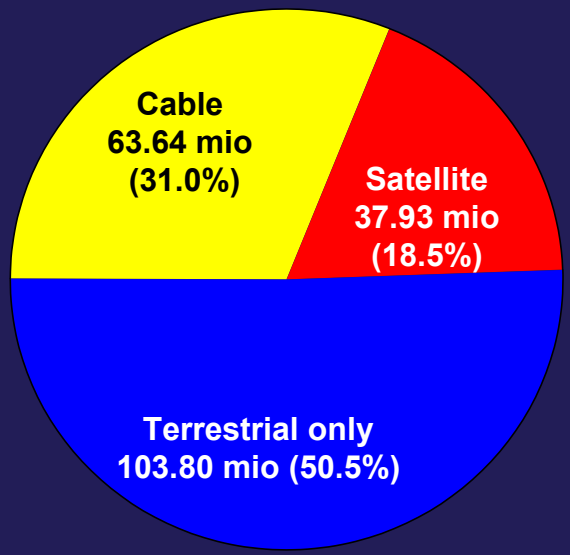
- Biggest user base in radiocommunications
- Political importance
- Inherent inertia
- Backward compatibility aspects
  - AM to FM
  - B&W to Color
  - Terrestrial vs. Satellite

Digital drives satellite market growth



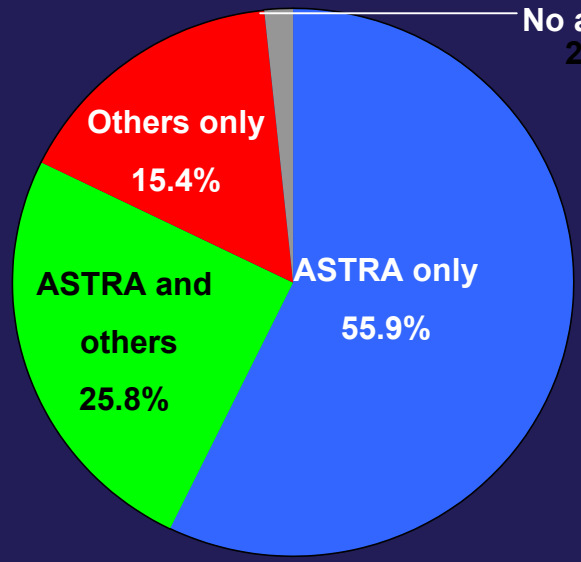
Terrestrial vs. Satellite broadcasting

Reception modes



Base: 205.37 mio TV households in Europe*

Market share of satellite systems



Base: 37.93 mio DTH/SMATV households in Europe*

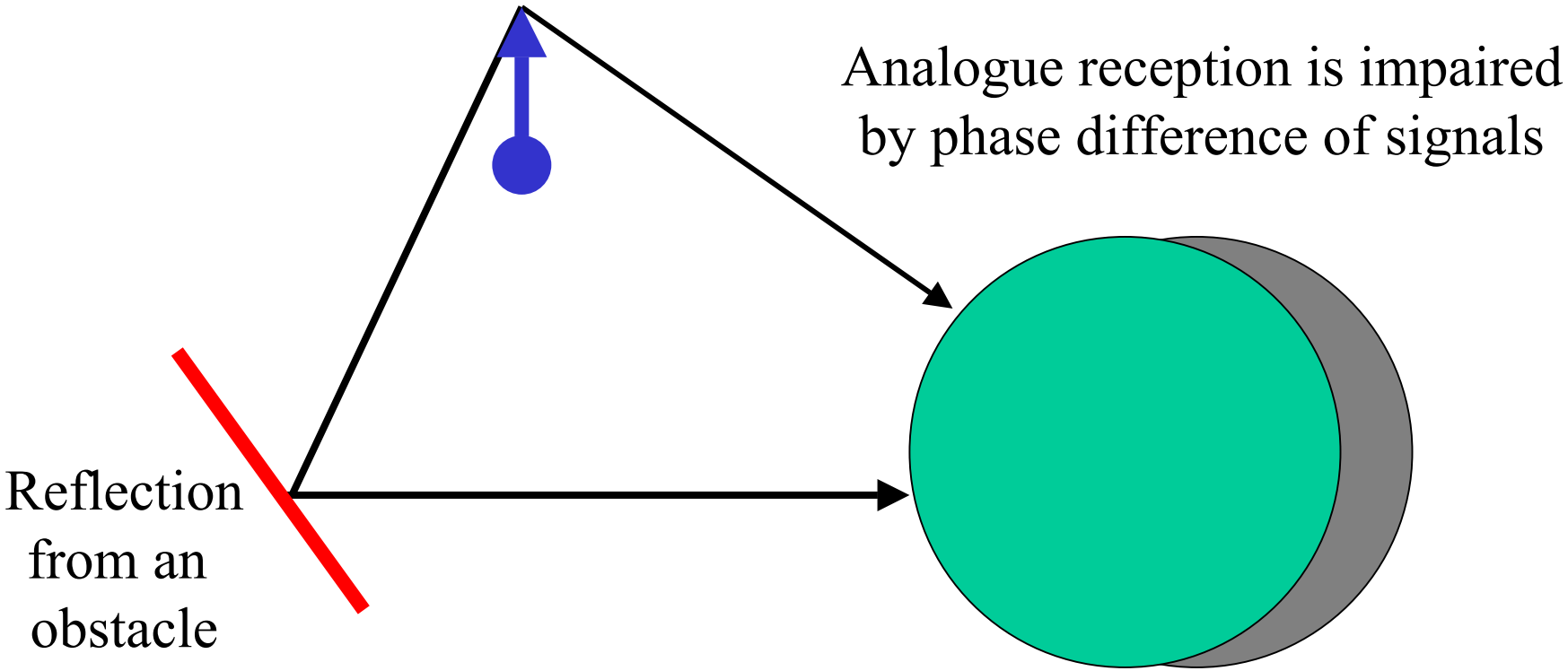
* 29 European countries within the ASTRA footprint
Source: SES/ASTRA, Satellite Monitors

Terrestrial broadcasting

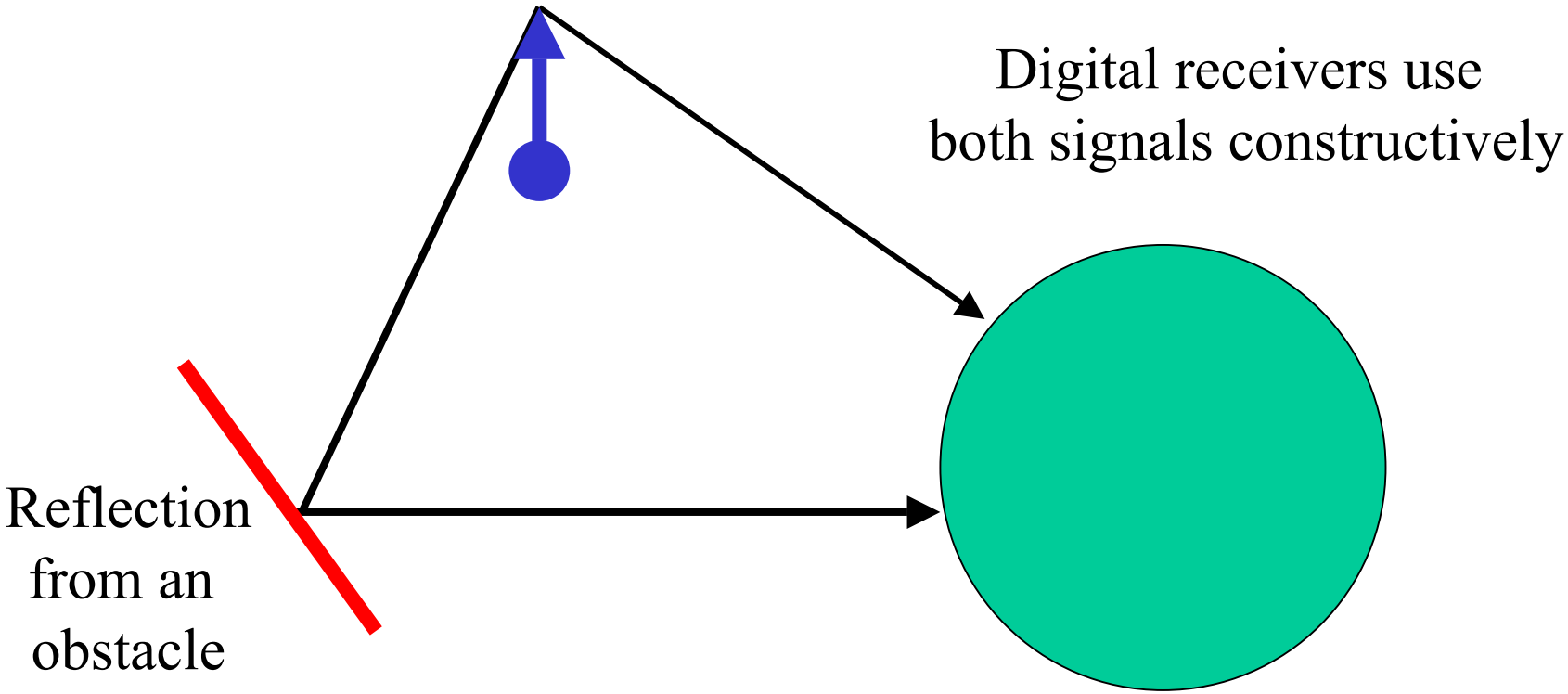
- Multipath propagation
- Inefficient frequency reuse

- COFDM modulation
  - Limits multipath degradation
  - Single frequency networks

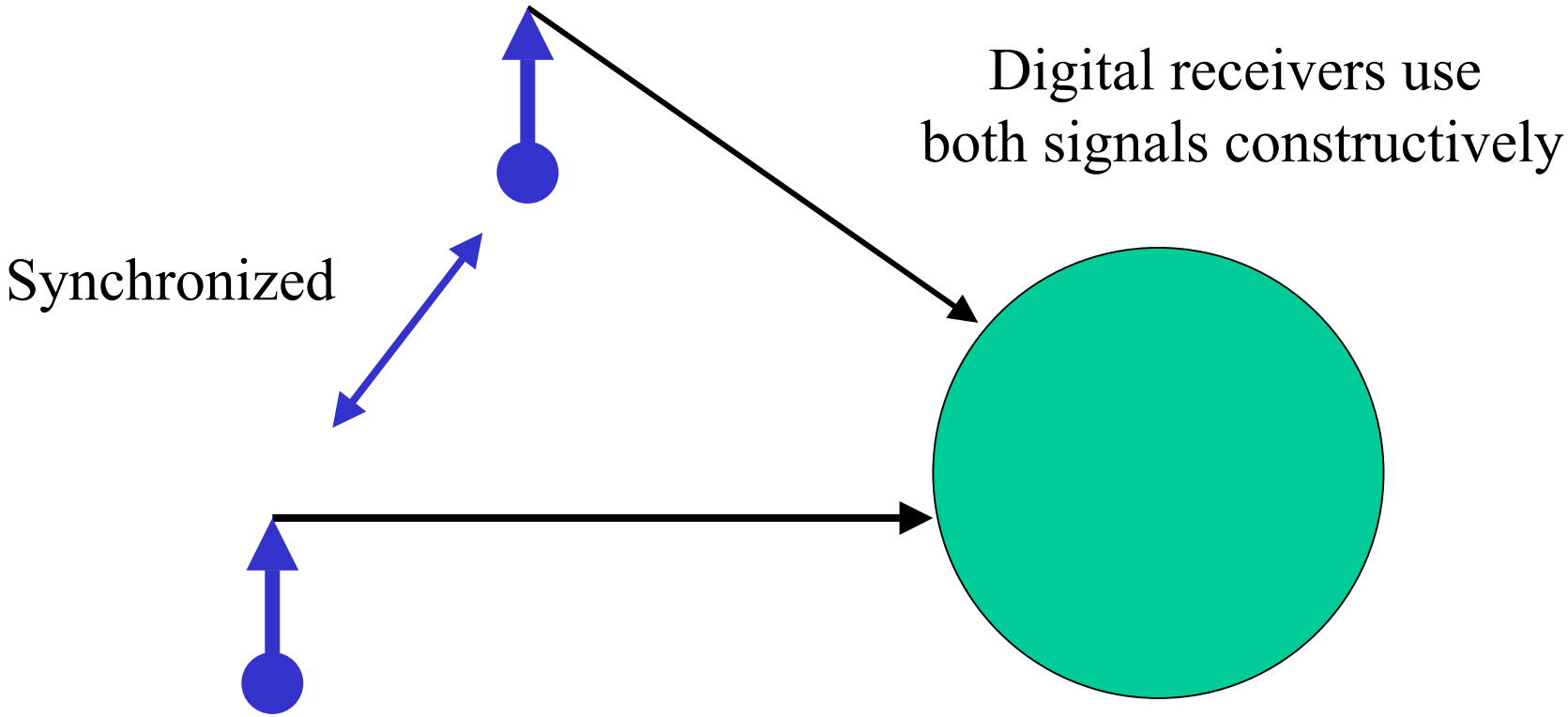
Multipath propagation



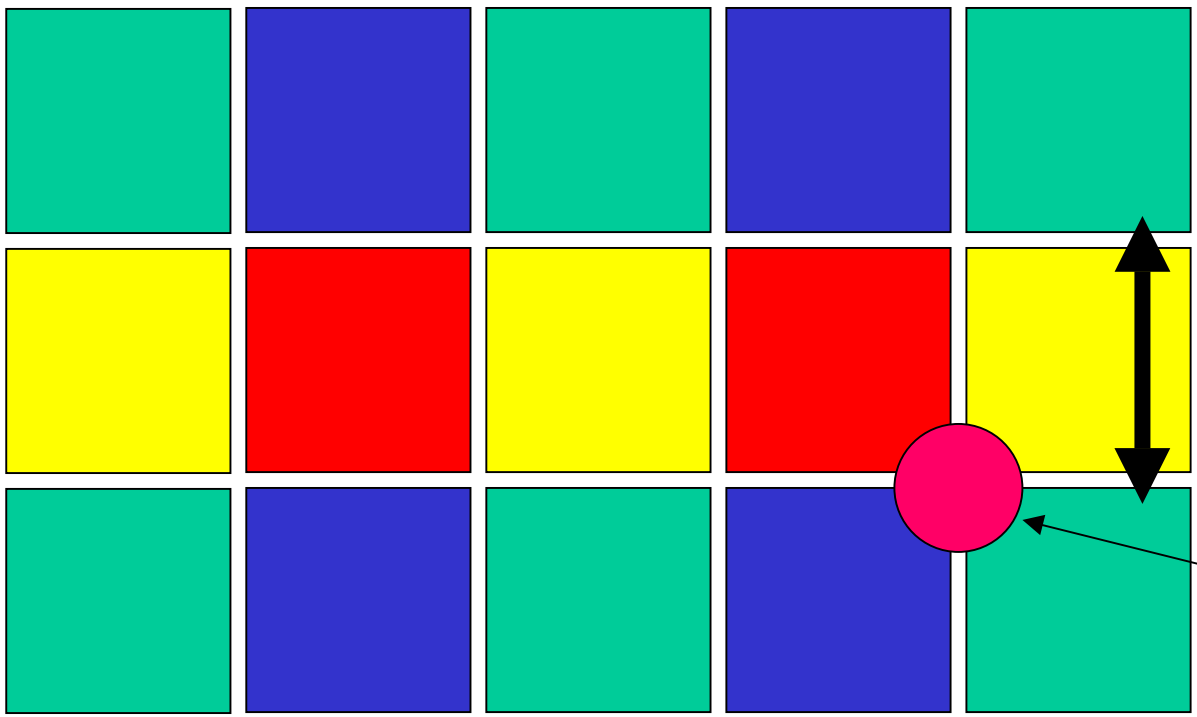
Multipath propagation



Synchronized transmitters



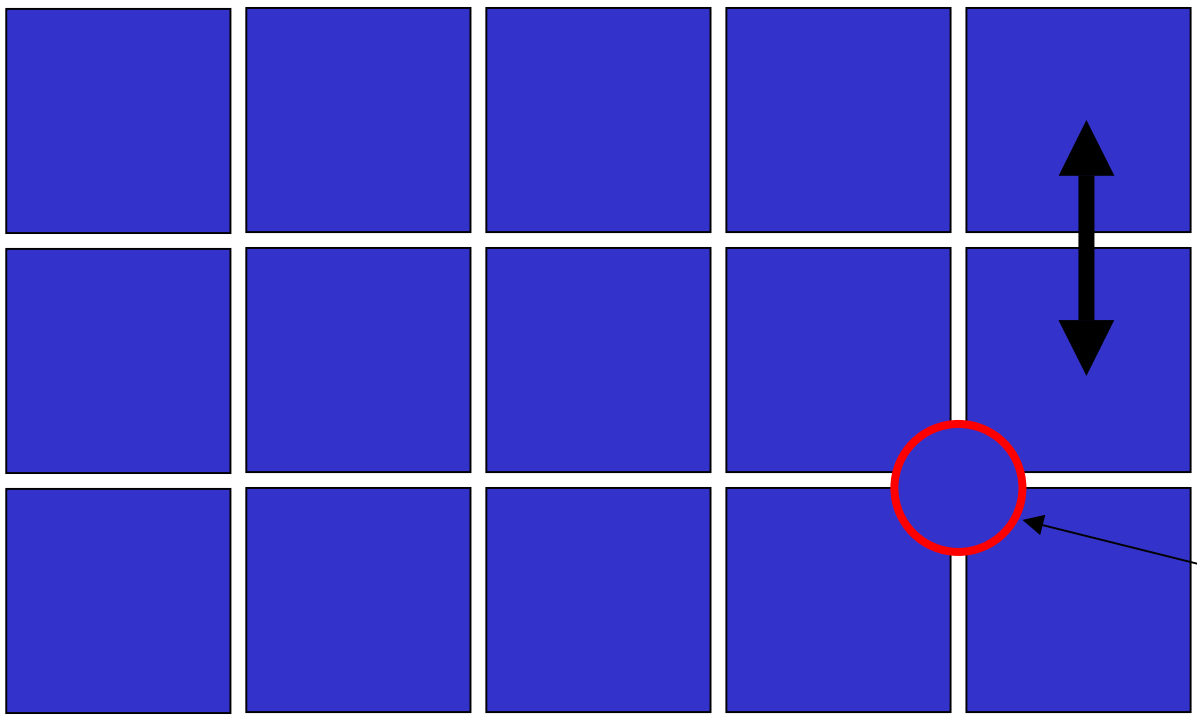
Multiple frequency networks



Separation required

Gapfillers require additional spectrum

Single frequency networks



Limited distance

Gapfillers operate on same frequency

T-DAB

- Eureka 147 system with 1.5 MHz blocks
  - VHF: Core in 230 - 240 MHz
  - L-Band: Part of 1452 - 1492 MHz
  - 4 to 5 CD-Quality or up to 8 quality channels in one frequency block
- Wiesbaden 1995 CEPT Plan
  - Slow take off

Allotment Plan Concept

- Generic networks in real areas
- Compatibility assessment based on reuse distance
- Administrative agreements to correct irregularities
- Conversions from allotments to assignments

Wiesbaden process

- Identification of spectrum resources
- Establishment of planning criteria
- Collection of requirements both for T-DAB and protection of other services
- Wiesbaden Planning Meeting 1995
- Maintenance of Plan
- Conversion of allotments

Wiesbaden results

- 700 allotments
- Over 6000 other services considered
- 3000 administrative agreements reached during the planning, about 300 effective
- Plan maintainable both procedurally and technically
- DACAN Software

DVB-T

- 8 MHz channel raster identical with analogue TV
- Chester 1997 – procedures for transition from analogue to digital
- Geneva 2004 – All digital Plan to replace Stockholm 1961 Plan

Chester principles

- Rigid planning vs. uncoordinated development
- Level playing field for early adopters and delayed implementers
- Reasonable preservation of Stockholm rights
- Virtually all systems in Europe are interference limited
- Reference situation based on test points

Reference situation

- Reliable database of transmitters
- 36 test points for each transmitter
- Over 80000 transmitters
- Collection of data, validation, disputed cases
- Use of reference situation
- COCOT Software

ITU Conference

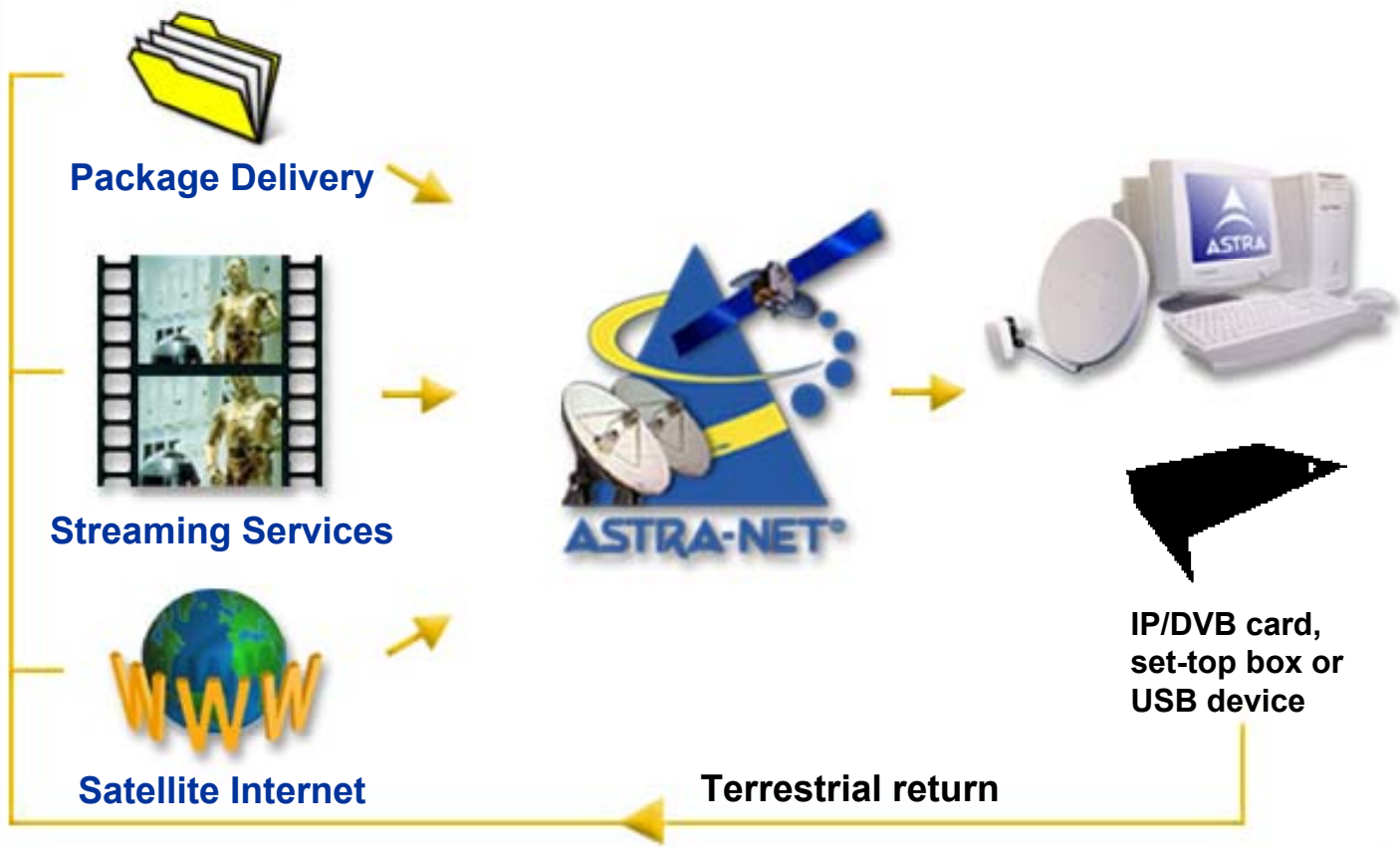
- Preparatory conference 2004
- Second part in 2005 or 2006
- Conclusion of Chester process
- Combined Allotment/Assignment approach is most likely
- European Broadcasting Area and possibly other countries

Case demonstration

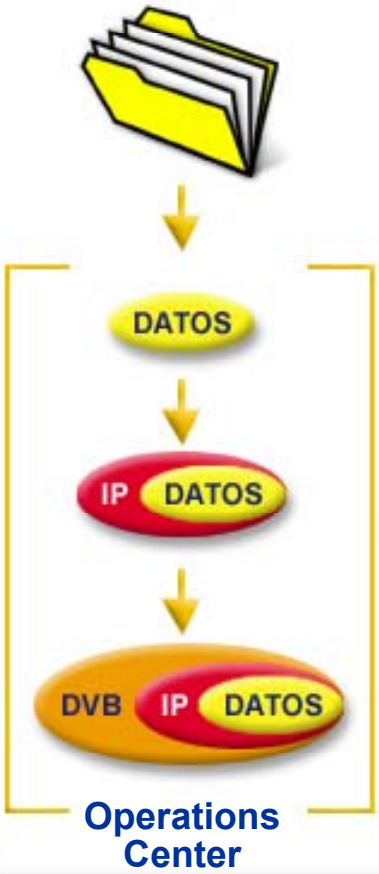
- Multimedia via Satellite
- Coexistence of Broadcasting and IP technologies
- Merits of satellite technology
- Unidirectional IP Platform
- Bi-directional solution: BBI

Service Diversification: Unidirectional Multimedia IP Platform

ASTRA-NET IP/DVB Platform: Main Functions



Unidirectional Multimedia IP
Package delivery and Streaming services

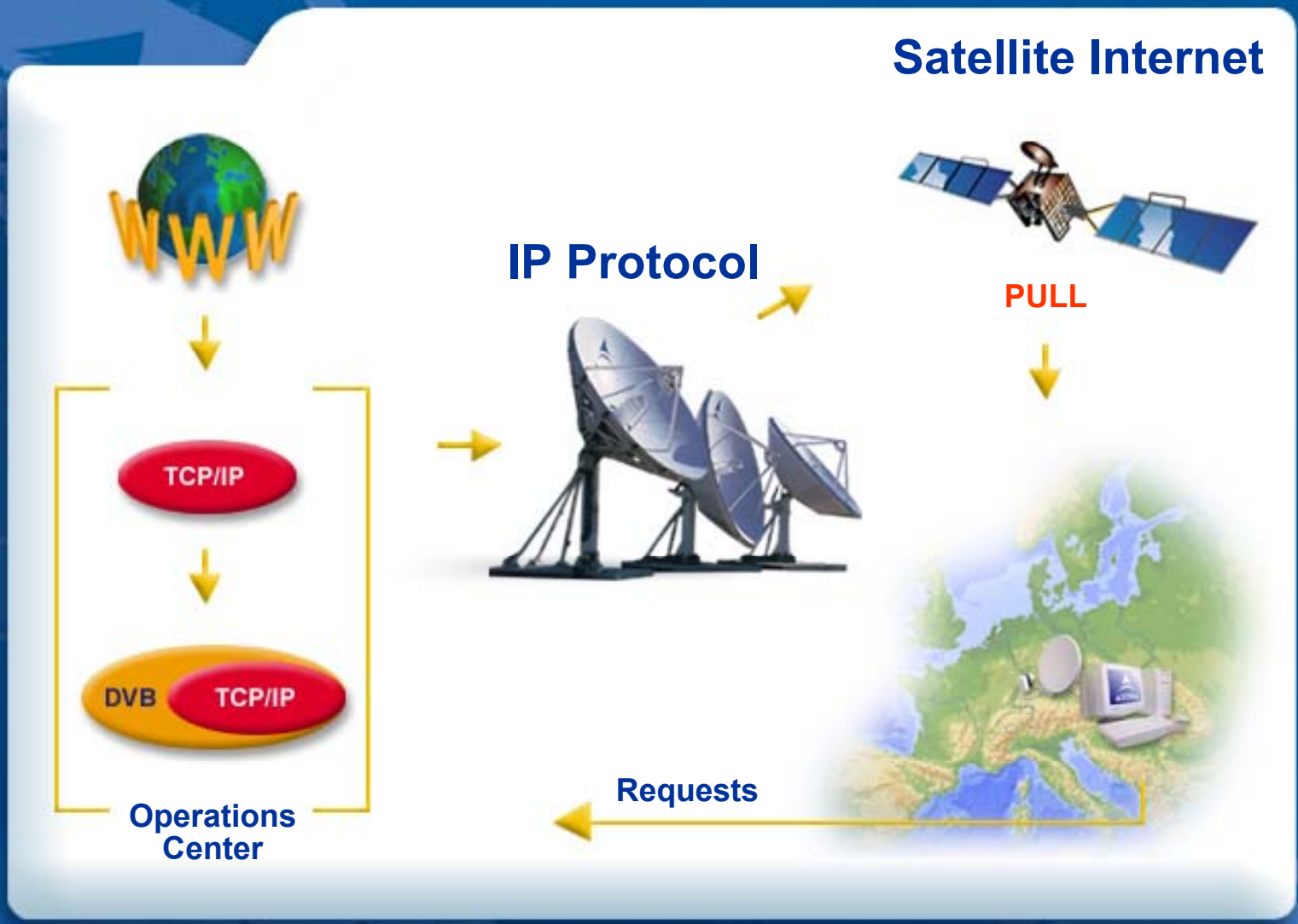


IP Protocol

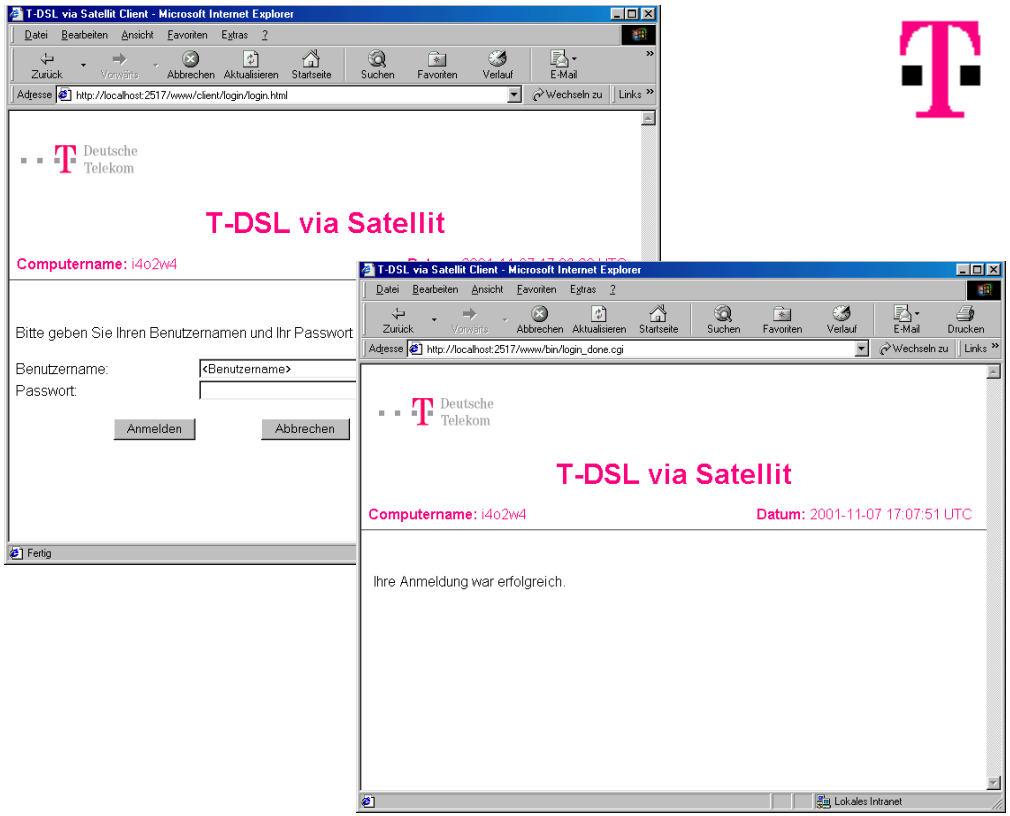
PUSH
or
PULL

…Send a full CD of content with one transmission of under 15 minutes to thousands of receive sites.

Unidirectional Multimedia IP Internet

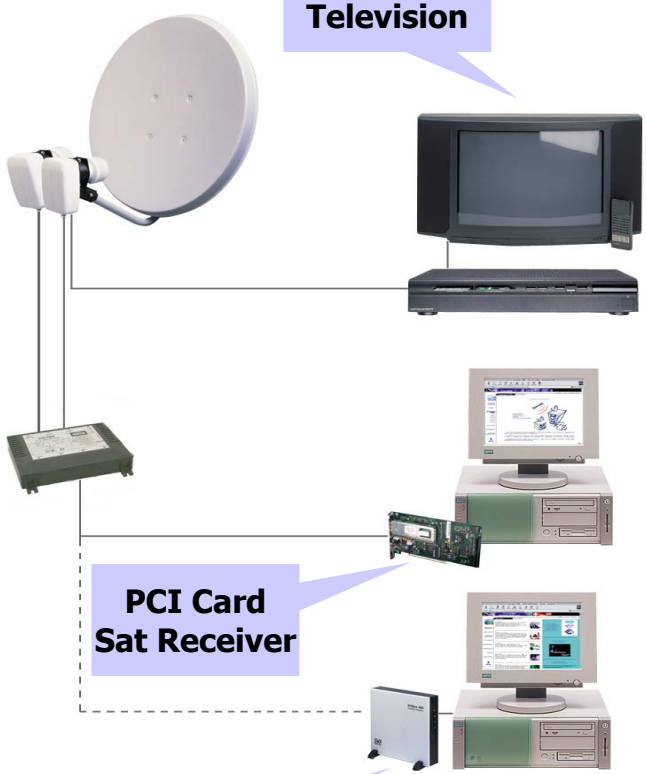


Example: T-DSL via Satellite



Task bar in Windows desktop

Button to activate T-DSL via Satellite



Digital Television

PCI Card Sat Receiver

USB Box Sat Receiver

New generation of digital set-top boxes

- Two independent tuners, MHP 1.1 compliance
- Large hard-disc which allows for storage of both DVB and IP content (no tapes needed)
- Record one channel while storing the other in HD
- Record and watch one same channel simultaneously

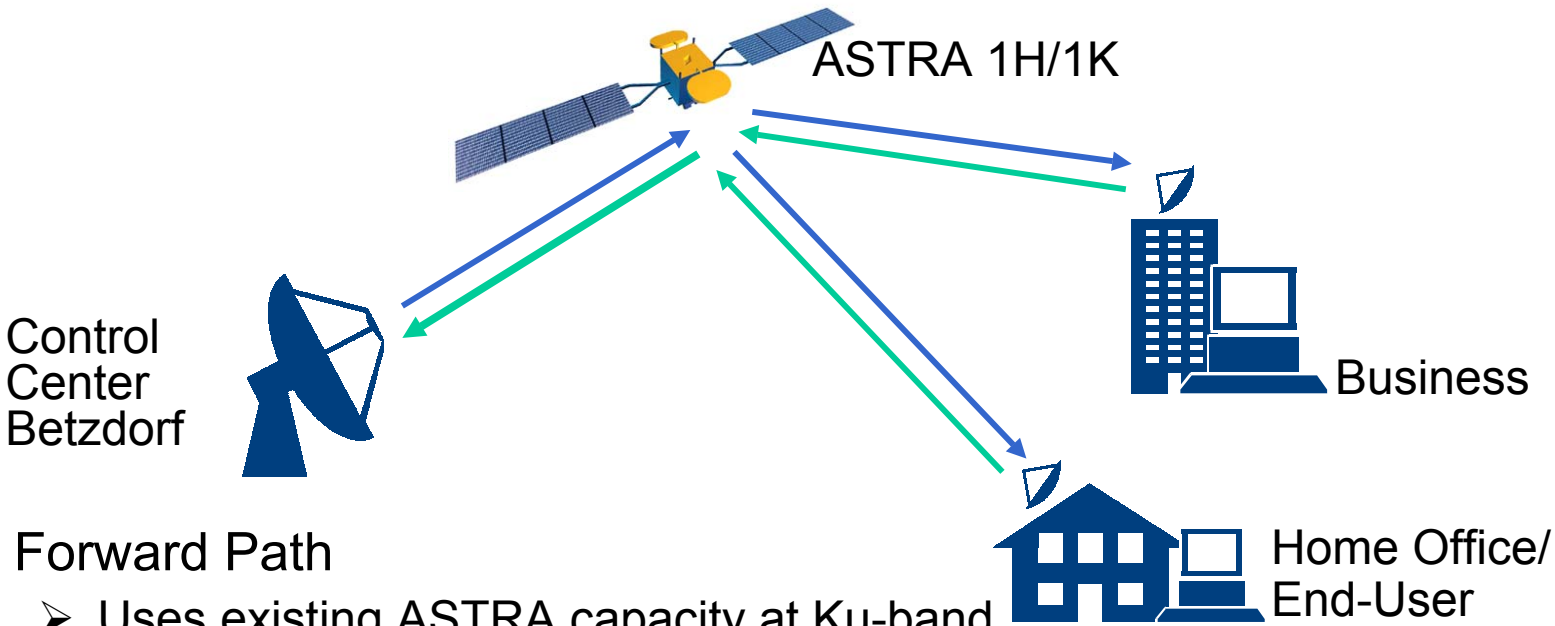
Broadband Interactive System (BBI)

Satellite Interactive Terminal (SIT)

Type	Dish	Transmission	Power	Reception
SIT II	75- 90 cm	384 kbit/s	≥ 45 dBW	38 Mbit/s
SIT III	95-130 cm	2,048 kbit/s	≥ 50 dBW	38 Mbit/s

- Reception in Ku-band, transmission in Ka-band
- Transmit up to 2Mbps in 16kbps increments, with complete systems costing ~3500 USD in 2002

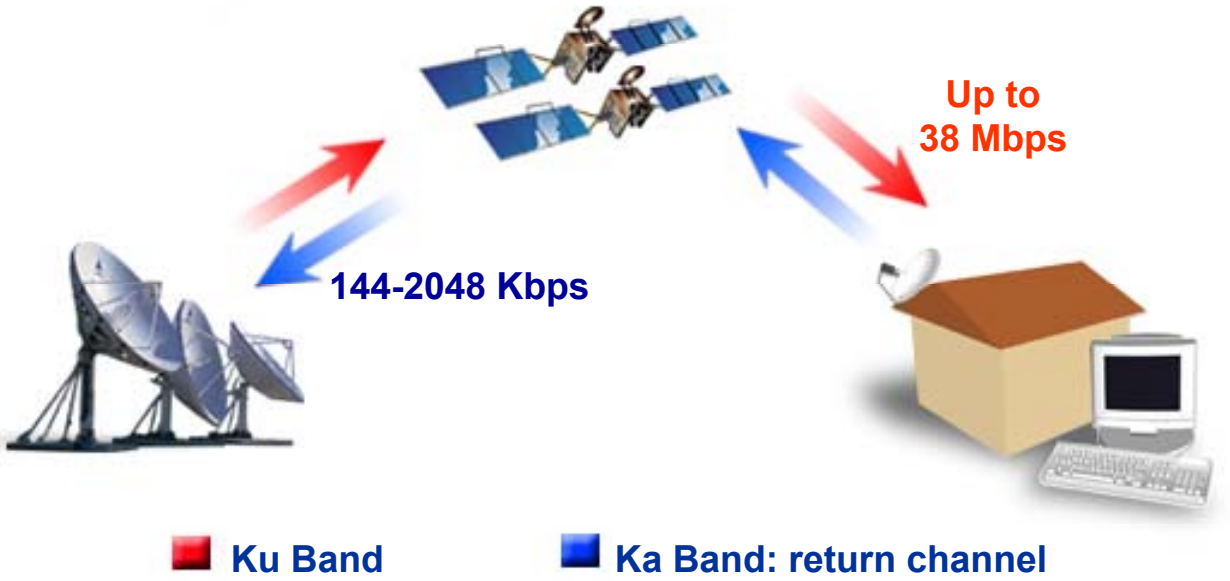
BBI: Network Architecture



- Forward Path
  - Uses existing ASTRA capacity at Ku-band
  - Digital Video Broadcast (DVB-MPE) signal
  - Burst Time Plan transmitted to synchronize network
- Return Path
  - Uses Ka-band on ASTRA 1H (and ASTRA 1K)
  - Uses ATM-like 53 byte containers (DVB-RCS Open Standard)
  - Shares transponder efficiently among all users

Bi-directional B2B rollout

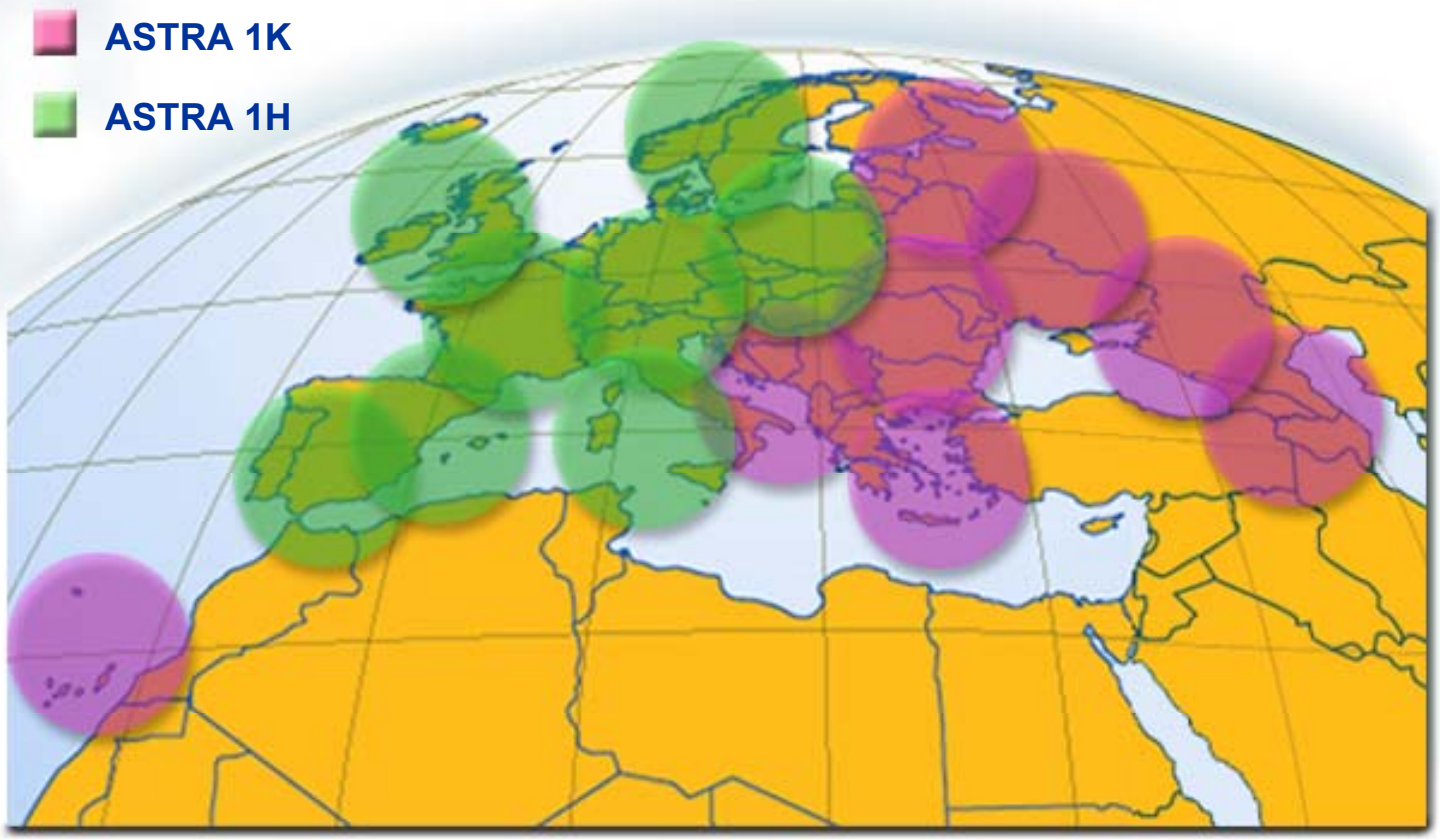
Broadband Interactive System (BBI)



- ASTRA 1H launched June 1999.
- ASTRA 1K scheduled mid-2002.
- BBI complements terrestrial infrastructure

Broadband Interactive System (BBI) Coverage

ASTRA shared payload Ka-band coverage



Broadband Interactive System (BBI): Satellite's competitive positioning

- **Solves the terrestrial bottleneck:**
  - Higher speed
  - Last-mile availability
- **Cable/ADSL are only partial solutions:**
  - Fragmented European coverage
  - Long implementation timelines
- **ADSL-like functionality with value added:**
  - Available anywhere within beam coverage
  - Broadcast/multicast in the same platform
- **Open-standards DVB/IP platform for service providers:**
  - Immediate implementation
  - Independence from local telephone operator

Broadband technical solutions

Broadband technical solutions

	Transmit /receive	Symmetry	Coverage	Services
Satellite	2 Mbps / 38 Mbps	Asym-Sym	Continental - Global	TV / Data
DSL	500 Kbps / 8 Mbps	Asym-Sym	Local - Regional	TV / Data / Voice
Cable	500 Kbps / 40 Mbps	Asym	Local - Regional	TV / Data / Voice
Optical Fiber	1-10 Mbps / 100 Mbps	Sym	Local	TV / Data / Voice
LMDS	1Mbps / 40 Mbps	Asym	Local	TV / Data / Voice
3G	400 Kbps / 2 Mbps	Sym	Continental ?	Data / Voice / Videostreams