"Towards HDTV and beyond …"

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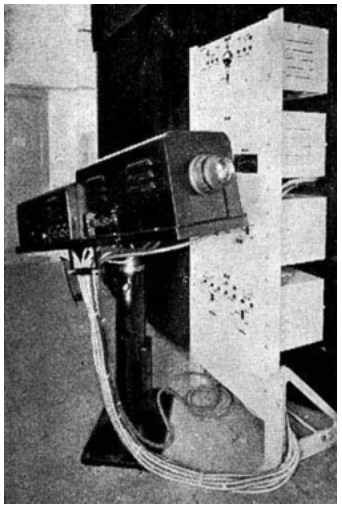
RAI – Technological Strategies

Summary

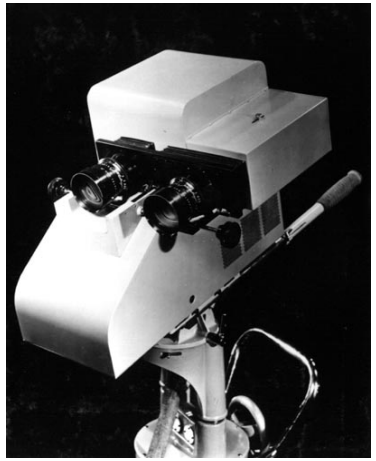
- ✓From TV to HDTV
- ✓Technological developments
- ✓Value chain impacts
- ✓Beyond HDTV

TV is a long-standing improving technology

Berlin Olympic games (1936): 180 rows

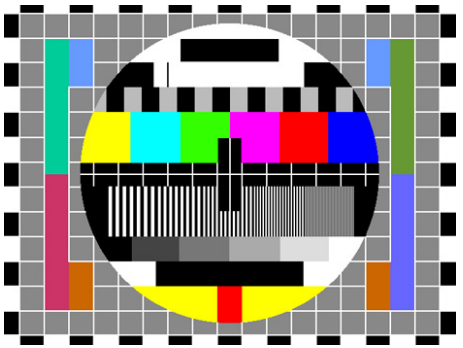


BBC (1937): 405 rows



NTSC (1949): 525 rows

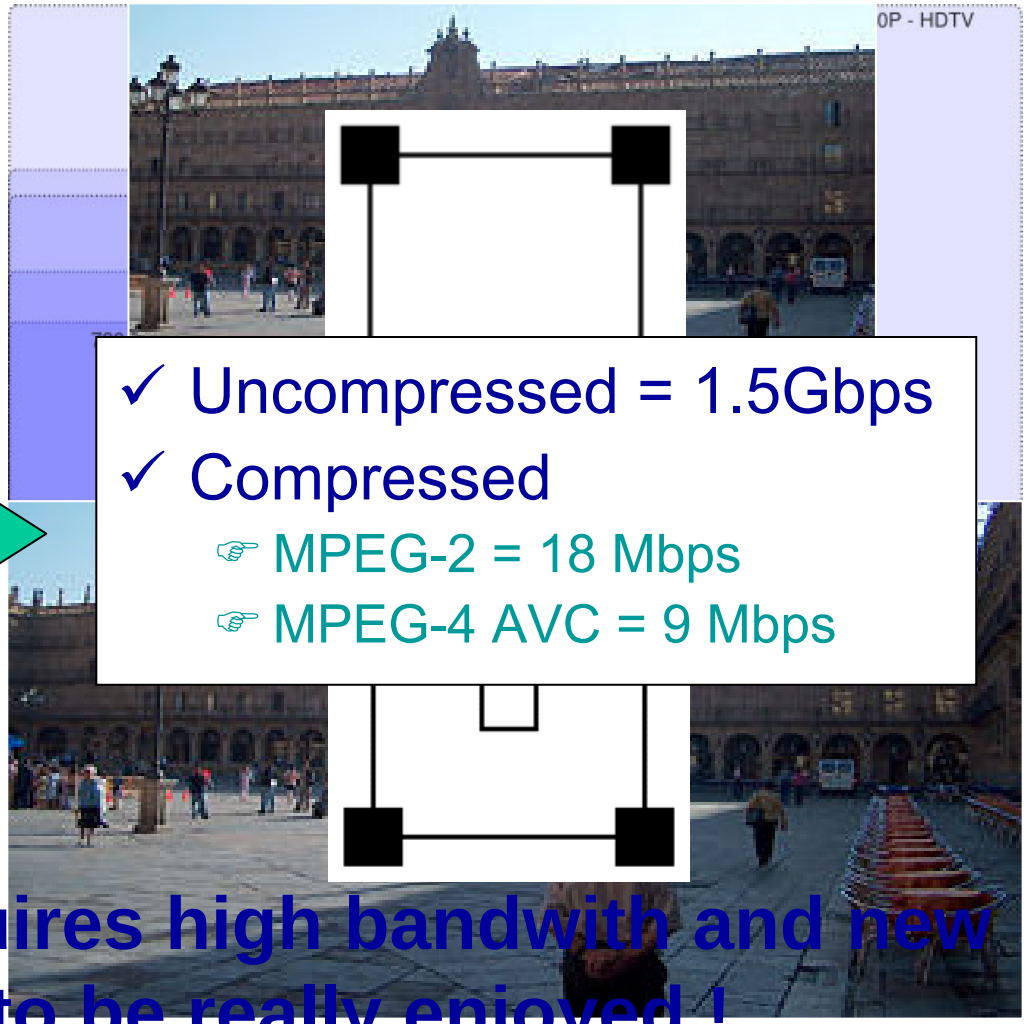
PAL (1963): 625 rows



HDTV: 1000 rows

HDTV facts

- ✓ Spatial resolution:
  - ☞ 576 x 768 → 1080 x 1920
- ✓ Wide format:
  - ☞ 4/3 → 16/9
- ✓ Rich audio:
  - ☞ Stereo → Multichannel
- ✓ Stability of images:
  - ☞ 25 → 50 fps
  - ☞ Interlaced → progressive



HDTV experience requires high bandwith and new equipments to be really enjoyed !

Public Broadcasters are supposed to pioneer technology

- ✓ In early 80s RAI pioneered HDTV production:
  - ☞ 1983: “Arlecchino” (cinematography by Vittorio Storaro);
  - ☞ 1986: “Giulia and Giulia” (directed by Peter Del Monte);
- ✓ In 1986, RAI and NHK jointly performed technical tests and demonstrations with early HDTV system;
- ✓ In 1990 (Italia-90 World Soccer Cup) RAI transmitted 17 games in HDTV with the first digital compression system via satellite (joint project Rai Research Center – Telettra));
- ✓ In 2006 (Turin Olympic Winter Games) RAI was the first worldwide broadcaster to transmit HDTV and Mobile TV combined on a single digital terrestrial channel.

RAI for HDTV now

- ✓ High quality productions, previously filmed on 35mm, are now digitally produced in HDTV:
  - ☞ Gente di Mare (series 1 and 2);
  - ☞ La Squadra (series 7 and 8);
  - ☞ Cartoons for children;
- ✓ RAI also shot opera season of Teatro La Scala in HDTV quality:
  - ☞ Aida;
  - ☞ Traviata;

Why HDTV ?

- ✓ Broadcaster:
  - ☞ To offer a brand new quality experience to viewers
- ✓ Producers:
  - ☞ To produce more valuable programmes
- ✓ Viewers:
  - ☞ Fashion … Plaisure …
- ✓ Manifactures:
  - ☞ HDTV is an innovating technology and new equipments are ready

HDTV facts

- ✓ **HDTV retails in Italy for Lcd, PSP, DVD, Camcorders are:**
  - ☞ **22% - volume;**
  - ☞ **62% - value;**

Quomedia 2007

Italia (Migliaia di pezzi)	2004	2005	2006	2007*
Cathode ray tube TV	3.740	3.600	2.897	1.788
Advanced TV	648	1.535	2.465	3.354
Plasma display	105	200	229	253
Liquid-crystal display TV	465	1.258	2.162	3.026
Rear and front projection TV	78	77	74	75
TOTALE	4.388	5.135	5.362	5.142

Anie-Eito (European Information Technology Observatory) 2007

Capacity of new “DVB-2” systems

- ✓ HDTV suffered so far for lack of transmitting bandwidth;
  - ☞ HDTV started in Europe on Satellite using Mpeg-2 compression;
- ✓ New standards (both compression and coding) have been designed to increase channels capacity:
  - ☞ DVB-2 standards offer up to 30% gain in capacity

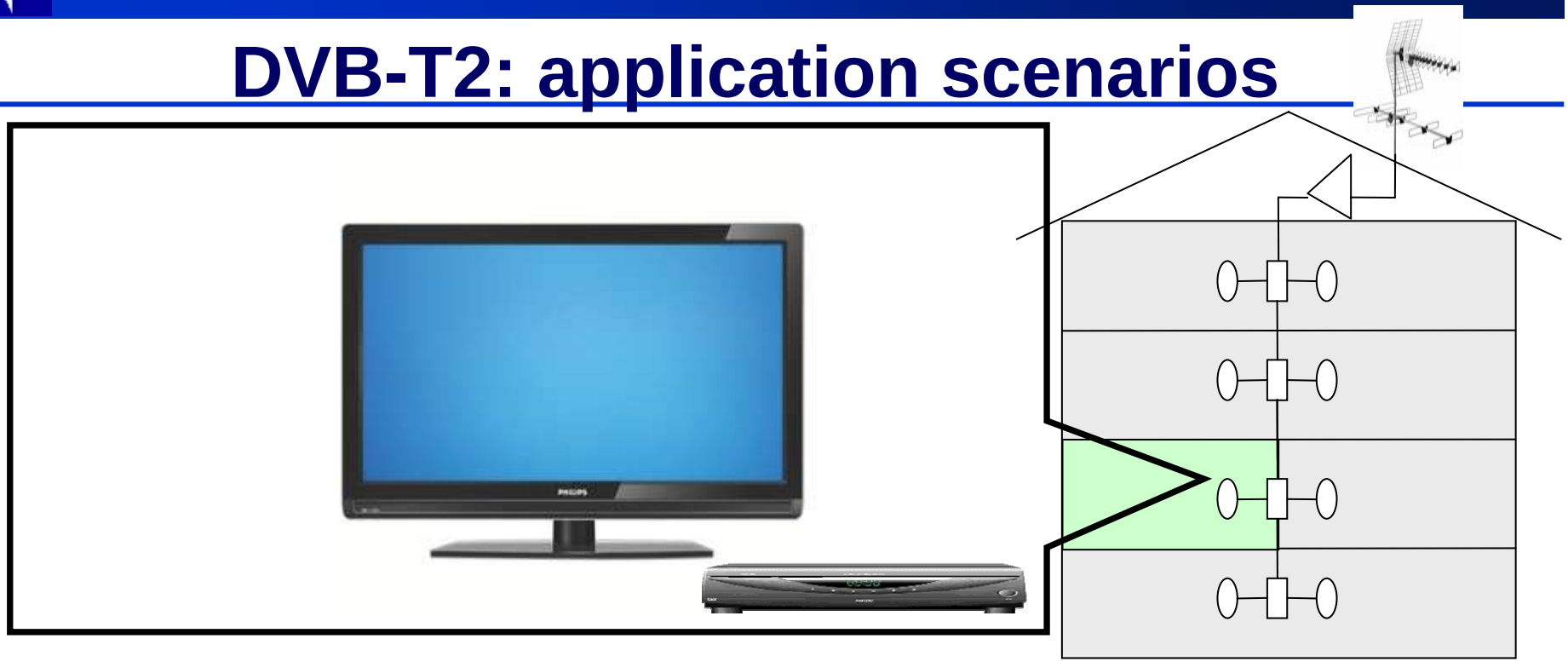
System	Bit-rate capacity	SDTV Prog. *@ 3 Mbit/s*	HDTV Prog. *@ 7-9 Mbit/s*
DVB-T	**24 Mbps**	**8**	**2-3**
DVB-T2	**32-36 Mbps**	**11-12**	**4**
DVB-S	**34 Mbps**	**11**	**4**
DVB-S2	**45 Mbps**	**15**	**5-6**

DVB-T are DVB-S are current standard for Terrestrial and Satellite digital television.

RAI's vision for HDTV

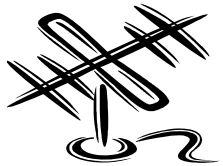
- ✓ RAI is focusing on **scheduled equipments replacement** in studio facilities to migrate from SD to HD;
- ✓ RAI envisages that new development in compression (**Mpeg4-AVC**) and coding (**DVB-T2**) will soon allow HDTV services on DTT:
- ✓ RAI's **Research Center** has developped core elements of DVB-S2 and DVB-T2 standards
- ✓ **RAI announced a Project for a High Definition channel to be lunched in 2009**

DVB-T2: application scenarios



- ✓ HDTV (& SDTV) Broadcasting in VHF/UHF bands

- ☞ Fixed reception via normal MATV cable systems (roof-top directive antenna);
- ☞ Portable reception;
- ☞ Mobile reception;



Compatibility

- ✓ Current DTT Decoders are NOT HDTV-enabled, therefore to launch HDTV services new decoders are anyway required:
  - ☞ marginal cost compared to a HD-ready or Full-HD display;
  - ☞ DVB-T2 & MPEG-4 (H264) will be the new standards for those Countries wich *may wait 2-3 years* for launching terrestrial HDTV;
  - ☞ New DVB-T2 decoders will be compatible with current DVB-T signals;
- ✓ Compatibilities guaranteed by DVB-T2 to broadcasters:
  - ☞ Current trasmitting sites;
  - ☞ Current individual and collective receiving installations (single polarisation);
- ✓ Closing of DVB-T2 standardization process: March 2008;
- ✓ Decoders available by 2009;

Future proof issues

- ✓ Standards are fixed but technology evolves!
- ✓ Even in the expected life time of a TV set (10 years) it is possible that significant changes in coding and compression may occour;
- ✓ Consumer side needs:
  - ☞ Connectivity to future external decoders (i.e. HDMI);
  - ☞ Flexibile and upgradeable conditional access system;
  - ☞ Extensible sw capabilities (i.e. Over the Air upgrading, Common Interface cards);
- ✓ Broadcaster side needs:
  - ☞ Backward compatibility of existing standards;
  - ☞ No legacy of running receivers;
  - ☞ Spectrum compatibility;

Beyond HDTV…

- ✓ In spring 2006 NHK presented at NAB (Las Vegas) the future standards fot HDTV: **Ultra HDTV**
  - ☞ Audio: 22.2;
  - ☞ Format: 7.680 x 4.320 pixel;
  - ☞ 32 M pixel: 16 times current HDTV;

Open issues

- ✓ The Ultra-HDTV looks visionary and fashinating;
- ✓ NHK claims it to offer “presence”;
- ✓ The system have been presented but years will last until consumer & broadcast equipment will be available;
- ✓ Which channels will be available for live transmissions of Ultra-Hdtv?
- ✓ Production and archive will require huge amount of storage;
- ✓ RAI’s and BBC’s Reasearch Centers are cooperating with NHK on Ultra-HDTV development.

The human factor

- ✓ Our eye:
  - ☞ more than **130 million** retinal receptors;
  - ☞ approximately 1.2 million fibres (axons) in the optic nerve;
  - ☞ large amount of pre-processing is performed within the retina;
  - ☞ the central area of the retina (*fovea*) produces the most accurate information: the resolution limit is around **10,000 points**;
- ✓ Viewing is NOT merely a matter of points !
- ✓ HDTV is NOT merely a matter of rows ...

Creating a brand new experience

- ✓HDTV is a matter of engaging:
  - ☞Definition, Sound & Format;
- ✓HDTV is a matter of tale:
  - ☞Changes in shooting and cinematography technique are required:
  - ☞*Telling in high definition* will be the challence;
- ✓HDTV is a matter of experience:
  - ☞Give value to the viewer;
  - ☞Create a ***Wow-TV*** experience;

Thank you