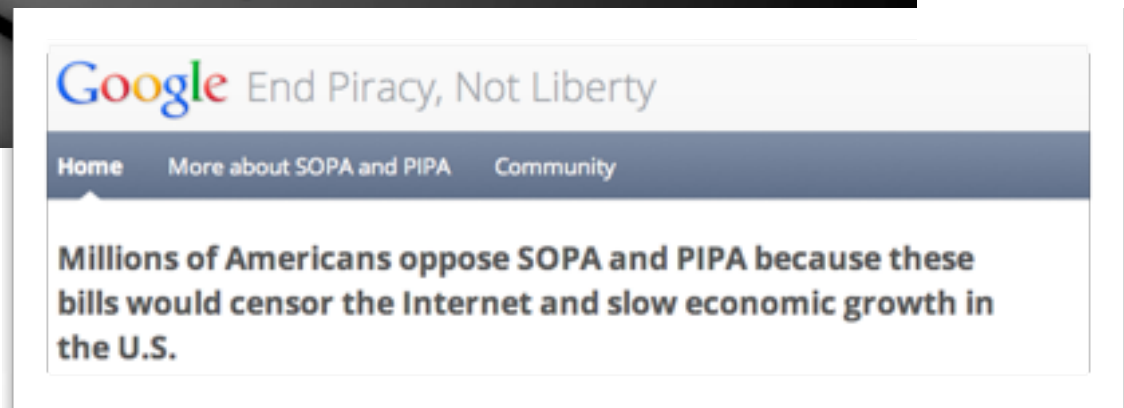


# January 18, 2012



The image shows a black and white banner for Wikipedia's 2012 blackout. On the left, there is a large, stylized 'W' logo above the word 'WIKIPEDIA' in a serif font, with a mirrored 'WIKIPEDIA' below it. To the right, the text reads: 'Imagine a World Without Free Knowledge'. Below this, a paragraph explains that for over a decade, Wikipedia has built the largest encyclopedia in human history, but that U.S. Congress is considering legislation that could damage the free and open Internet. It states that for 24 hours, Wikipedia is being blacked out to raise awareness, with a link to 'Learn more'. At the bottom right, it says 'Make your voice heard' and includes icons for Facebook, Google+, and Twitter.

SOPA =  
Stop Online Piracy Act



The image shows a banner from Google titled 'End Piracy, Not Liberty'. It features the Google logo in its multi-colored font. Below the title, there are navigation links for 'Home', 'More about SOPA and PIPA', and 'Community'. The main text of the banner states: 'Millions of Americans oppose SOPA and PIPA because these bills would censor the Internet and slow economic growth in the U.S.'

# 11 Web Radio, Web TV and IPTV

## 11.1 Web Radio

## 11.2 Web TV

## 11.3 Audio and Video Streaming over IP

Literature:

Chris Priestman: Web Radio, Focal Press 2002

# A British Radio Pioneer, 1924

**John Reith, *Broadcasting over Britain*, 1924**

Later Director General of BBC

“We are missing infinitely more than we are receiving ... Thought is probably permanent, and a means may be found to ally thought with ether direct and to broadcast and communicate thought without the intervention of the senses or any mechanical device, in the same manner as a receiving set is today tuned to the wave-length of a transmitter so that there may be a free passage between them.”

- “free passage between them” clearly indicates bi-directionality!

# What Is Web Radio?

- Web radio is about *live audio streams*
  - Which may be composed from archives!
  - Which may be made accessible in archives as well!
- Audio content is delivered to large audience, in identical form for all listeners
  - No individual streams, no download (no “on demand” service)
- “Simulcast”: Traditionally produced radio program is transmitted in Internet simultaneously

# Historic Parallels between Radio and Web Radio

- Technical problems with sound quality
  - Early radio transmission (1920's) were of poor sound quality, short wave radio still is today
  - Early radio transmission over the Internet was of poor sound quality, but the situation is improving rapidly
- The ever-repeated threat situation between new and old media
  - Early radio was considered a threat to news and entertainment industries
    - » Like TV for movie industry
  - Web radio as a threat for traditional radio, news, entertainment?
  - Lesson from history: Media grow into complementary, synergetic situation
- Driving force are amateurs
  - Early radio program development, at least in the U.S., driven by amateur stations
  - Exactly identical situation for Web radio today
- Private/public/commercial, funding models, ...

# Radio and Democracy

- Bertolt Brecht, 1930:

“Radio could be the most wonderful public communication system imaginable, a gigantic system of channels – could be, that is, if it were capable not only of transmitting but of receiving, of making listeners hear but also speak, not of isolating them but connecting them.”

  - Bertolt Brecht even conducted amateur experiments with the new medium “radio” himself
- Radio, if not restricted by monopolies, is a decentralized, democratic medium
  - Web radio may be the way to remove the constraints (frequency shortage) which have led to monopolies
  - Web radio removes spatial constraints of radio (global medium)
- “Vertical” organization (centralized, hierarchic, top-down) vs. “horizontal” organization (decentralized, peer-to-peer, bottom-up)
  - Radio started as a horizontally organized experiment

# Types of Web Radio Stations/Programmes

- According to traditional sectors of the radio industry:  
(Lewis/Booth: *The Invisible Medium*)
- Sector 1: Early European Model
  - Public service and state radio as governmental organizations, often monopolies
    - » Web radio as additional distribution channel, as platform for global services, for cross-media effects with other parts of Web presence (information, shop)
- Sector 2: American Model
  - Commercial enterprises funded through advertising
    - » Web radio as platform for advertising (also for the traditional broadcast)
    - » Web radio as additional source of revenue (through e-Commerce)
- Sector 3: Alternative
  - *Community stations (free radio)*, see [www.amarc.org](http://www.amarc.org)
  - *Underground stations*
  - Web radio as a cheap technology, avoiding also many licensing problems

# Experience of Radio Listening

- Experience formed by receiver technology:
  - 1930s: Large valve radio as important “furniture” in the living room
  - 1950s onwards: TV taking over as centre of living room
  - 1960s: Transistor radios make radio receivers portable, enable car receivers
  - 1970s: Stereo high-fidelity systems change expectations of audience
  - Today: Mainly background music and car receivers
- Market niche for Web radio:
  - High-quality terrestrial radio (FM) has limited local range
- Competitors for Web radio:
  - Global-range radio of good quality (Satellite radio, Digital Radio Mondiale)
- Web Radio experience, integrated into daily life:
  - Computer as playback device?
  - Must seamlessly integrate with existing devices
    - » ...or be completely stand-alone and innovative
  - Smartphones, speaker systems for portable players, specialized devices



# Physical Devices for Internet Radio

- A radio receiver should look like one, even if it is Web radio...
  - Standalone Internet radio devices
- Product pioneers around 2000:
  - Kerbango, SonicBox
- General problem:
  - Streaming is power-intensive
  - Device receiving and processing the audio signal from Internet preferably runs on mains electricity
- Trend since 2010: Broad range of products



Kerbango's Internet Radio



SonicBox device



Logitech Squeezebox



DNT IP2go



DNT IPmicro



Sagem My Web  
Tuner 500



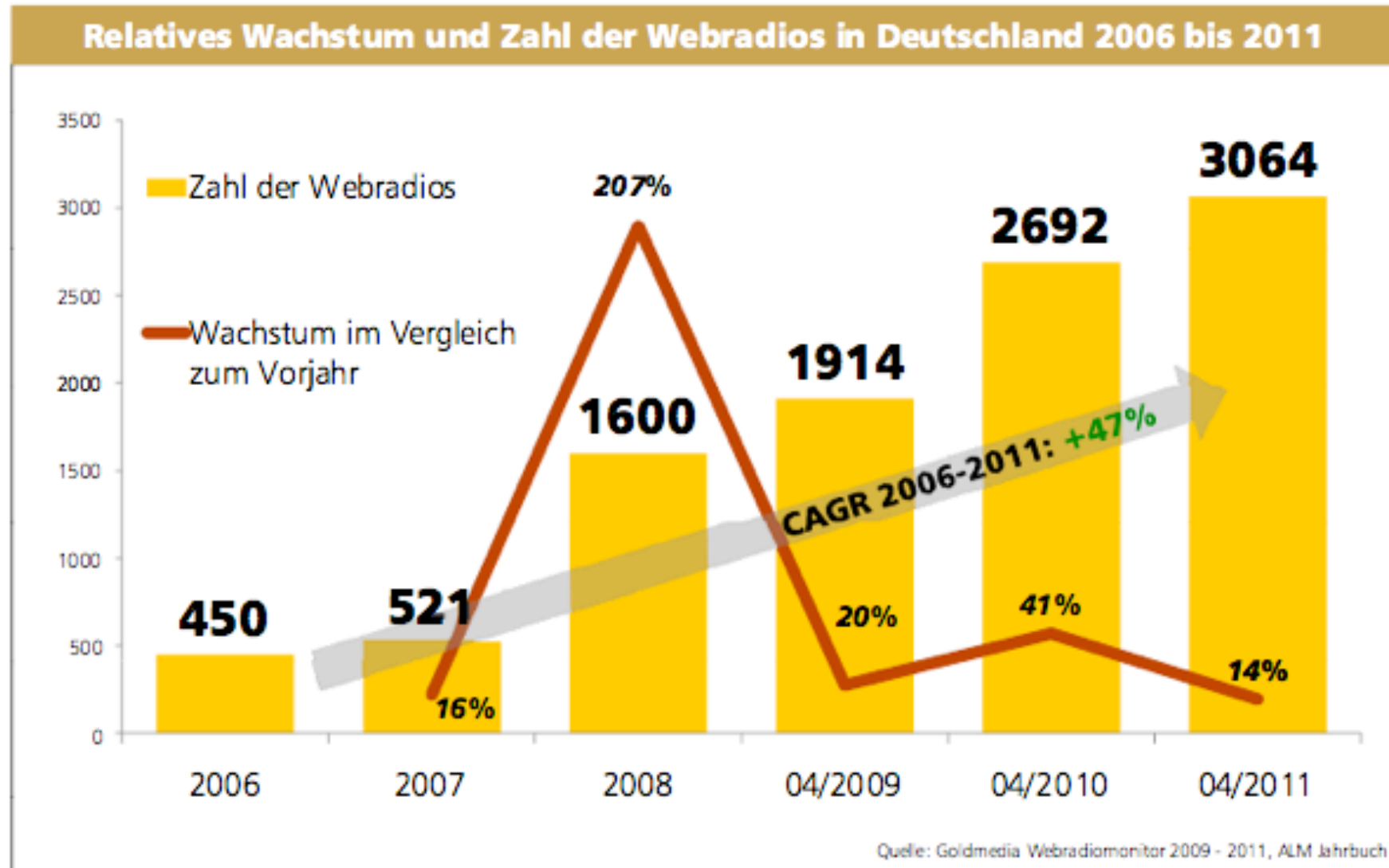
Parrot Asteroid  
Car Radio

# Value Production Chain for Web Radio (Germany)

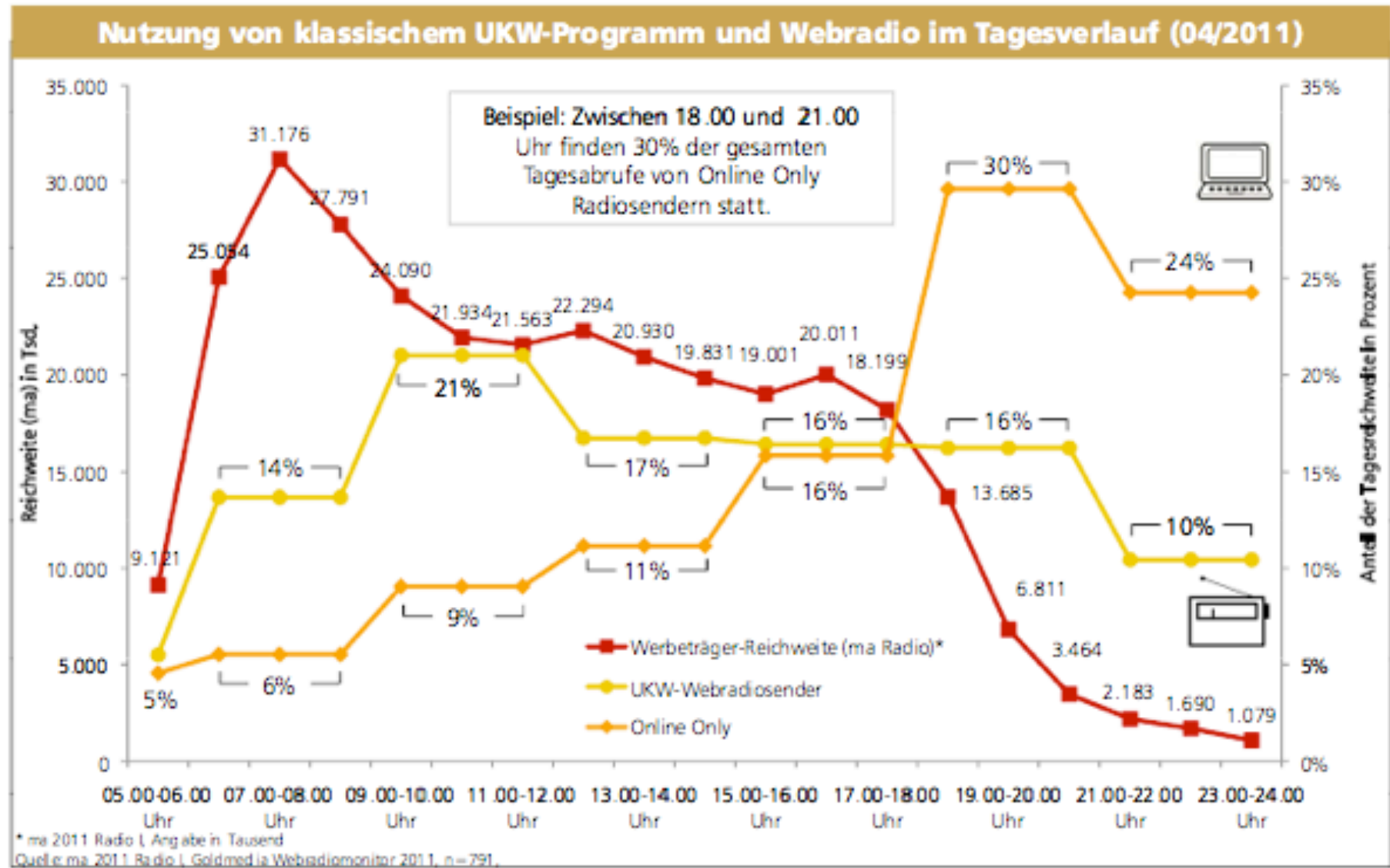


Goldmedia Webradiomonitor, im Auftrag der BLM (5. Juli 2010)

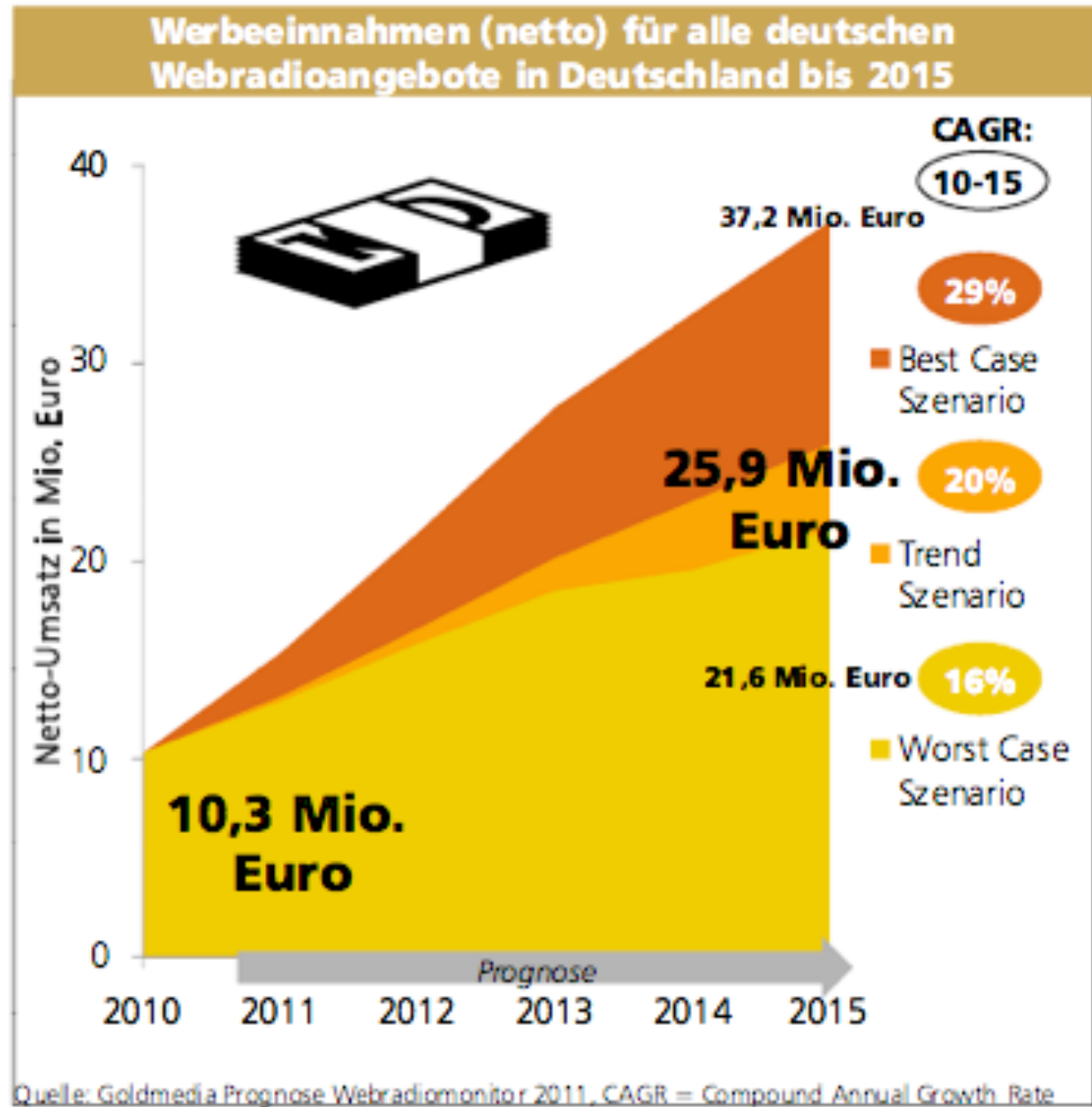
# Internet Radio Market (1)



# Internet Radio Market (2)



# Internet Radio Market (3)



# Copyright and Web Radio

- Fundamental problem #1:
  - Traditional radio (terrestrial, cable) receivable only within clear location limits
    - » Partially also true for satellite transmission
  - Web radio in general receivable globally
    - » Anything receivable in U.S. is subject to U.S. legislation!
- Fundamental problem #2:
  - Replication of digital content is very easy
  - Capturing Web radio streams
- Web radio stations are extremely “visible” - simple to trace!
- Example: U.S. DMCA (Digital Millennium Copyright Act) rules
  - Limits how often playlisted tracks can be repeated within 3 hours
  - Limits on the number of complete tracks from the same album played in proximity
  - Limits on pre-announcement of coming-up tracks
  - ... Targeted at fundamental problem #2

# Example: Clearchannel Stations

- Radio program was simulcasted on Internet
- Speakers of advertisements went to court
  - Special fees for higher audience numbers than agreed on
- Technical response:
  - Different versions for Internet and local radio broadcast
  - Advertisements are automatically adapted
    - » On locally broadcasted program: As before, with local significance
    - » On Internet: Advertisements are replaced with globally valid advertisements
- Problems:
  - Technically and in administration view: difficult
  - Adaptation to global standards may annoy listeners from local community

# Example: Pandora



**Dear Pandora Visitor,**

We are deeply, deeply sorry to say that due to licensing constraints, we can no longer allow access to Pandora for listeners located outside of the U.S. We will continue to work diligently to realize the vision of a truly global Pandora, but for the time being we are required to restrict its use. We are very sad to have to do this, but there is no other alternative.

We believe that you are in **Germany** (your IP address appears to be **84.** . If you believe we have made a mistake, we apologize and ask that you please contact us at [pandora-support@pandora.com](mailto:pandora-support@pandora.com)



# Radio and Visual Information

- **Traditional radio** is a medium for the ears only
  - Most adequate interaction forms are also based on audio
    - » Telephone participation of listeners
  - Additional information may be shown visually (e.g. RDS)
  - Spot advertisement
- **Web radio** can be used as hybrid audio/visual medium
  - On PC, Smartphone, TV set, ...
  - Interaction is greatly eased by using visual information
  - Spectrum of intensity of visual information
    - » Sender logo only
    - » Subtitles with additional information
    - » Additional text (information, interaction)
    - » (Still) Pictures
    - » Video
    - » Banner advertisement!

# Sophisticated Interaction Forms for Web Radio

- *Interaction highly integrated with programme*
- Interactive playlists
  - “Wunschkonzert” (musical request programme)
    - » Individual requests or democratic voting
    - » Automatic overall optimization of playlists
  - Requests may be sent in via Web, email, SMS, ...
- Upload of music and speech contributions
- Interactive games
  - e.g. Guessing of title, artist, ...
- Web radio enables *automatic interaction forms*
  - Little or no manual interaction on sender side
  - Is this still “radio”? Don’t we expect a live moderator?
- Integration with e-commerce offers

# Web Radio / Music Shop Integration 2004

**Webradioantenne**  
 11:14 Uhr >> Homepage >>  
 Antenne Bayern  
 Rockantenne  
 Aktuelle Sendung: Extra  
 Aktueller Titel:  
 >> **ANASTACIA, SICK AND TIRED**  
 Songs anklicken und im Shop bestellen  
 Playing 65Kbps 4:34 / Live  
 News: Frankfurter Polizei-Vize zu Geldstrafe verurteilt... >> mehr

**Music Shop**  
 antenne BAYERN  
 Schnellsuche  
 >> Suche starten  
 Kategorie  
 >> Rock & Pop Hits  
 >> Pop Angebote  
 >> Jazz Hits  
 >> Klassik Hits  
 >> DVD Hits  
 >> DVD Angebote  
 >> Video Hits  
 Service  
 >> Warenkorb  
 >> Kontakt  
 >> AGB

music | charts | neuheiten | specials | überblick | suche

Ihr Suchergebnis: [Seite drucken](#)

Sortiert nach: Medium: Veröffentlichungstermin: Verfügbarkeit:  
 Interpret auf | Alle (176) | Alle (176) | Alle (176)

Anzeige: 1 bis 25 von 176  
 Seite: 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | >>


Interpret	Medium	EUR	Lieferbarkeit	
>> Amos, Tori: Under The Pink	CD	19,99	innerhalb einer Woche	bestellen merken
>> Anastacia: 50 Anos De Forro	CD	17,99	innerhalb 3-4 Wochen	bestellen merken
>> Anastacia: Anastacia (2004)	CD	14,99	Artikel am Lager	bestellen merken


# Web Radio / Music Shop Integration 2011

Antenne.de / Radio / Sendungen

## Das lief im Webradio

> Channel: **ANTENNE BAYERN**

 **Counting Crows** Feat. Vanessa Carlton mit "Big yellow taxi"  
lief am 12.01.2011 um 12:26 Uhr

 **Nickelback** (» [Fotos](#)) mit "If Today Was Your Last Day"  
lief am 12.01.2011 um 12:23 Uhr

**Welcher Titel lief im Radio?**

Musik, die Sie im Programm gehört haben!


ANTENNE BAYERN

An welchem Tag und um wieviel Uhr (hh:mm) haben Sie den Titel gehört?


12 : 35 12.01.2011

**suchen**

**Big Yellow Taxi**  
Counting Crows



Titel: 3:45 min  
Genre: Pop  
Typ: MP3  
Qualität: 320 kbit/s  
€ 1.29

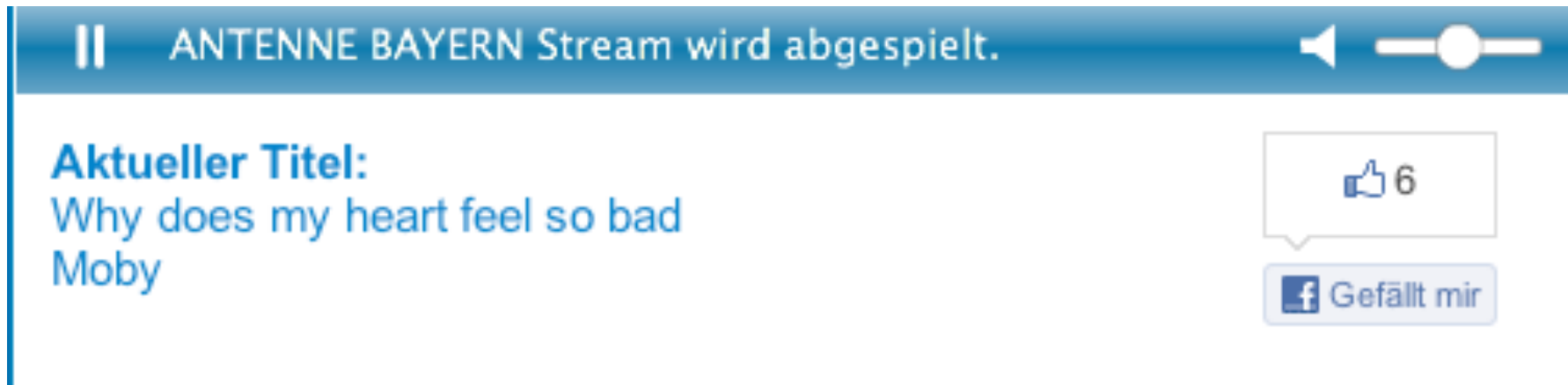


Titel: min  
Genre:

**Titelliste**

Titel	Interpret	Format	Preis	Aktionen
1.		min		

# Web Radio / Music Shop Integration 2012



No integration with music shop anymore...

(Separate services for playlist search, music store)

# Vision of a “Killer Application”? (from 2002)

- The “I want this” button on the car radio
  - On the road, the button is simply pressed when interesting music plays
  - Later, online and in the music store:
    - » Selected music is offered for (selective) buying
  - “I want this” buttons on other devices?
    - » PDA, mobile phone?
- General requirement:
  - Automatic networking of various devices
- Possible path to solution:
  - Integration of music player and mobile telephone
  - Integration of “nomadic” devices into car user interfaces
- 2012: Maybe it is an “I Like” button customers want?

# Trends in Web Radio 2012

- According to Webradio Monitor Study (Goldmedia, Germany)
- Constant growth (growth rate slowing down slightly)
- Rapid increase in usage over mobile devices
  - 10% in 2011
  - Prognosis for 2015: 50%
- Change in type of advertisement placement:
  - Currently mainly on Web home page (visual)
  - Increasing use of spot advertisement is likely (audio)
- Integration with Social Media is promising
- Low prospects for paid radio services

# 11 Web Radio, Web TV and IPTV

11.1 Web Radio

11.2 Web TV

11.3 Audio and Video Streaming over IP

Literature:

David Feinleib: The inside story of Interactive TV and  
Microsoft WebTV for Windows, Morgan-Kaufmann 1999

Johan Hjelm: Why IPTV? Interactivity, Technologies and Services,  
Wiley 2008



# Web Radio and Web TV

- In principle, the same questions as for Web radio:
  - Bandwidth problems
    - » much higher requirements
  - Separate medium or simulcast of existing medium
  - Live stream or download
  - Adequate end system
- Quality differentiation
  - Live stream with limited resolution compared to main program
- Possible end systems for Web TV:
  - Computer
  - TV set
  - PDA, mobile phone
  - Special mobile devices (e.g. combined with DVD player)
    - » As seen with DVB-T
- Interactivity of TV programs?

# Web TV Simulcast

- Many streams available  
 E.g. de.wwiTV.com lists 59 live TV streams only for Germany (Jan 2012)

NsdqC	2135.20	-0.51%
NsdqF	1619.50	+0.56%
Nikkei	11103.42	+0.23%
EUR/\$	1.3358	
Gold	441.975	
ÖlBrent	43.10	

[American Express Gold Card + USB-Stick 128 MB oder Reisetrolley - jetzt kostenlos!](#)  
[6% mit BMW Spar&Invest. Die Erfolgskombination mit dem Top-Zins.](#)

**TV-Highlights**

n-tv  
2004

# Web TV Simulcast – Seven Years Later

The screenshot shows the n-tv.de website interface. At the top left, the date and time are 12.01.2011 12:48 Uhr. The n-tv.de logo is prominent. A search bar and navigation links for 'n-tv.de', 'Börsenkurse', and 'Shop' are visible. A main navigation bar includes categories like 'Home', 'Politik', 'Wirtschaft', 'Börse', 'Sport', 'Panorama', 'Unterhaltung', 'Auto', 'Technik', 'Wissen', 'Ratgeber', 'Reise', 'Wetter', and 'Mediathek'. Below this, there are links for 'Videos', 'n-tv Live', 'Sendungen', 'Teletext', 'TV-Programm', 'Bilderserien', 'Bilder des Tages', and 'Gute Nachricht des Tages'. A breadcrumb trail reads 'n-tv.de Startseite > Mediathek > Livestream'. The main content area features a 'LIVESTREAM' section with a video player showing a man in a suit being interviewed. The video title is 'News Spezial Gewalt im Stadion'. A financial ticker at the bottom of the video player shows 'SDax 5.202 +0,2%' and 'DAX Commerzbank. 5,53 +3,2% Daimler 55,23 +0,5%'. To the right of the video player is a 'TOP VIDEOS' section with three video thumbnails and titles: 'Teure Staatsanleihen Portugal braucht ein Wunder', 'Indien und Südkorea bestellen Airbus hat Nase vorn', and 'Klingelnde Kassen Douglas will weiter wachsen'. Below this is a 'NACHRICHTEN' section with tabs for 'WIRTSCHAFT', 'SPORT', and 'WETTER'.

# Web TV as Business Model

Nutzen Sie unsere kostenlose Callback-Funktion!

Produkte Services Technologien Unternehmen Kunden Partner

Deutsch

Willkommen bei TV1.EU - Europas führendem Unternehmen für Online Video Technologie.

**Der One-Minute Pitch**  
Erfahren Sie in 60 Sekunden was TV1.EU auszeichnet.

**Show-it PLUS™**  
So einfach haben Sie Fotos, Videos und Audiofiles noch nie publiziert.

**Erfolgreich mit Web TV**  
Schnell und kosteneffizient Zielgruppen erreichen.

**Europas führende Plattform**  
Der one-stop-shop für Online Video basierte Geschäftsmodelle.

**One Minute Pitch**  
Internet World 2009

Neueste Meldungen: Neue Ski-Saison, neues Web-TV. Ski amadé setzt auf Show-it PLUS von TV1.EU

RSS abonnieren

Source: tv1.eu

# Microsoft WebTV and ATVEF

- ATVEF: Advanced Television Enhancement Forum Initiative
  - Industrial consortium: CNN, Disney, Intel, Microsoft, Sony, and others...
  - Defined standard 1997-1999
  - Triggers embedded into TV programme to activate Web-based content
    - » “crossover links”
    - » Using the Vertical Blanking Interval (Austastlücke)
  - To synchronize Web presentations with TV content
- Microsoft’s WebTV initiative
  - Selling set top boxes
    - » Web browser and ATVEF decoder
  - Providing interactive content through media partners
- Historical failure...
  - ATVEF no longer supported in 2004

# Microsoft MSN.TV



- Short term commercial interest (2004):
  - TV as end system for Internet access (Web/email)
  - Integrated media player
  - No integration with TV programmes

# Examples of Interactive TV from MS WebTV

- Enhanced versions of popular soaps like “Baywatch”, sports reporting, news, and game shows
  - For some time produced by NBC and other large stations
- Background information for TV drama:
  - Information of actors currently seen (name, pictures)
  - Information on location (including advertisements)
  - Additional views not visible on TV
  - “What happened until now” function
- Background information for sports programmes:
  - Players, team history, medal counts, ...
- Customized information in news programmes:
  - News tickers, headlines, travel news customized for individual viewer (selected by set top box)

# Screenshot from Interactive Version of Baywatch

The screenshot displays an interactive interface with a blue background. On the left, there is a photograph of a woman in a yellow top attending to a patient in a hospital bed. Below this is a CT scan image of a brain. To the right, a white notepad contains handwritten text: "Patient suffered a closed head injury leading to a cerebral contusion - Patient underwater an unknown length of time - Currently in a comatose state". Below the notepad is a dark blue box with the text "Pacifica Medical Computerized Tomography (CT) Patient: Robby Quinn". On the far right, a vertical navigation bar contains the text "EXIT HELP WEB" and several small thumbnail images. The bottom of the interface features a dark blue bar with the text "See behind the scenes photos of filming at sea."

*Alaska Airlines*

Patient suffered a closed head injury leading to a cerebral contusion -  
Patient underwater an unknown length of time -  
Currently in a comatose state

**Pacifica Medical**

Computerized Tomography (CT)  
Patient: Robby Quinn

See behind the scenes photos of filming at sea.

The central part of the screenshot shows a behind-the-scenes photograph of three people on a boat. A woman in a black swimsuit is standing, while two men are leaning over the side of the boat. The background shows the ocean and a clear sky.

*Alaska Airlines*

**BAYWATCH INTERACTIVE EXIT HELP WEB**

DIVE BOAT

The crew films boat to boat as Leslie (Heather Stevens) prepares to use a scuba tank wrench to knock out her boyfriend.

See behind the scenes photos of filming at sea.



# Levels of Interactivity in TV

(according to Johan Hjelm 2008)

- Level 1: Interaction with meta-information about the TV programme
  - Electronic/online program guide
  - Personal video recorder
- Level 2: User accesses external information
  - Teletext
  - On-device portals
- Level 3: User influences program by voting
  - Big Brother, Americal Idol etc.
  - May include chat and other interaction with other users
  - Either through separate phone/Web interaction or through Set Top Box
    - » UK: BBC/BSkyB: "red button" for interactive services / teletext
- Level 4: Story or other content of TV program changed by interaction
  - Simple form: Add-On multimedia material (e.g. BSkyB "green button")
  - Extrapolation: TV converging towards games

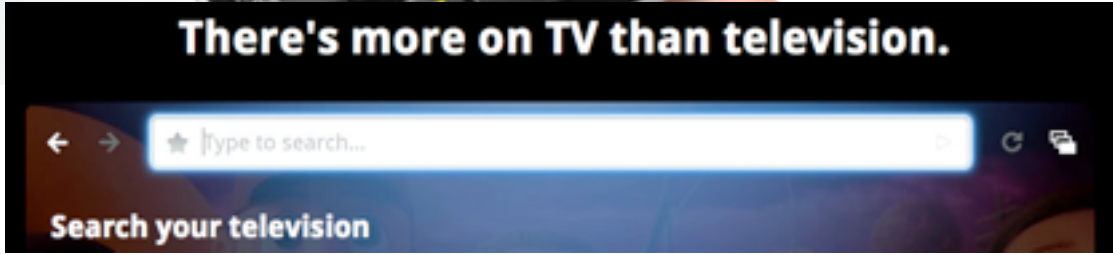
# Success Stories of Interactive TV?

- Voting is popular:  
27 % of all young European users of mobile phones have voted or otherwise participated in interactive game shows via phone
- BBC:  
During 2004 Olympics, more than 60% of viewers watched the event in an interactive way
- Johan Hjelm, based on research of EU project LIVE:
  - Interaction works best in documentaries and news
  - In fiction, people want interaction as unobtrusive as possible
  - Most viewers are not programmers, and they *may not know their own needs*
  - People want to belong to groups
  - TV viewers expect to be surprised

# Interactive TV 2011?



With **Logitech Revue**, you can watch what you want wherever it comes from—the Web or TV—on your HDTV.



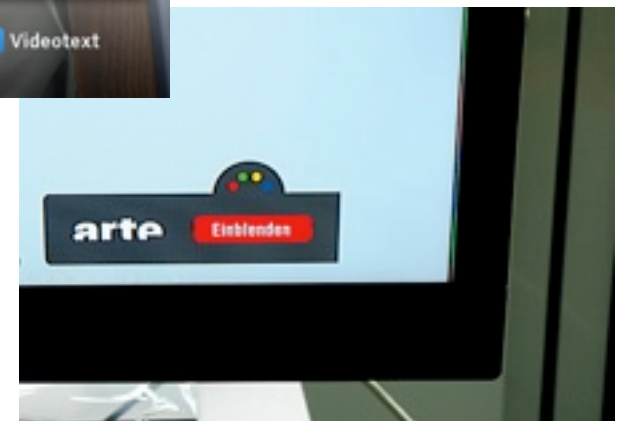
**The web is now a channel**

# Hybrid Broadcast Broadband TV (HbbTV)



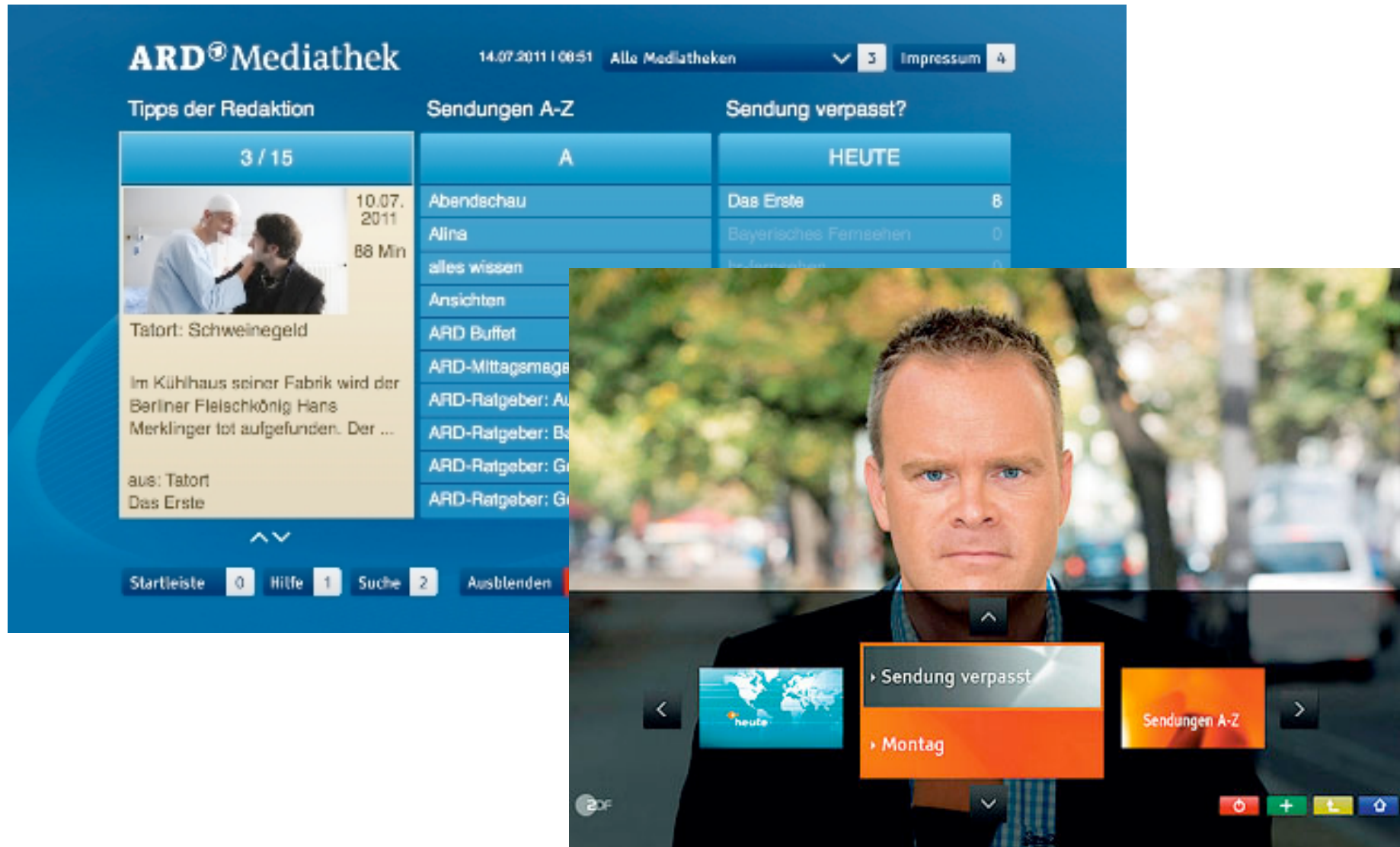
- European initiative
  - Standardization through ETSI
  - Based on Multimedia Home Platform (MHP)
- Founding members of consortium:
  - ANT Software, EBU, France Televisions, IRT, OpenTV, Philips, Samsung, SES ASTRA, Sony, TF1
- Many additional supporters, e.g. from Consumer Electronics:
  - Haier, Humax, Loewe, Sharp, TechniSat, TopField, VBox
- Standard supported by devices from most major brands:
  - (additionally:) Grundig, LG, Telefunken, Toshiba, Panasonic
- Many broadcasters offer actual service:
  - ARD, ZDF, ARTE, RTL, SAT.1, Pro7, ...
- Basic idea:
  - Replacement for traditional videotext by bi-directional Internet channel
  - TV or Set Top Box to be connected to Broadband Internet

# HbbTV Service Examples: Menus



“Red button” on Remote Control  
for start/termination

# HbbTV Service Examples: Mediatheken



# HbbTV Service Examples: Data Presentation

The screenshot displays the BR Bayerntext HbbTV interface. At the top left, the logo 'BR BAYERNTEXT' is visible. Below it, a navigation menu lists various services: Startseite, Nachrichten, Bayern, Sport, Fernsehen, Radio, Wetter, Verkehr, BR-Intern, A-Z, and Hilfe. The main content area is divided into three sections. The left section, titled 'Wetter', shows the date and time 'Donnerstag, 29.09.2011 | 16:26' and a weather summary 'Vielerorts sonnig, Höchstwerte 18 bis 26 Grad.' Below this is a map of Bavaria divided into regions: Unterfranken, Oberfranken, Mittelfranken, Oberpfalz, Niederbayern, Schwaben, and Oberbayern. Each region has a weather icon and a temperature value. The right section, titled 'Jetzt im Bayerischen', features a video player showing a woman and a list of programs: '15.30 Wir in Bayern', '16.45 Rundschau', and '17.00 Das etwas andere Bier: Zoigl'. At the bottom, a navigation bar includes 'Bayern', 'Regionen', '7-Tage-Wetter', 'Berg-wetter', 'Deutschland-wetter', 'Bio-wetter', and 'Reisewetter'. A legend at the bottom identifies icons for 'Ein | Ausblenden', 'Lesezeichen', 'Hauptmenu', and 'BR Start'.

# HbbTV System Overview

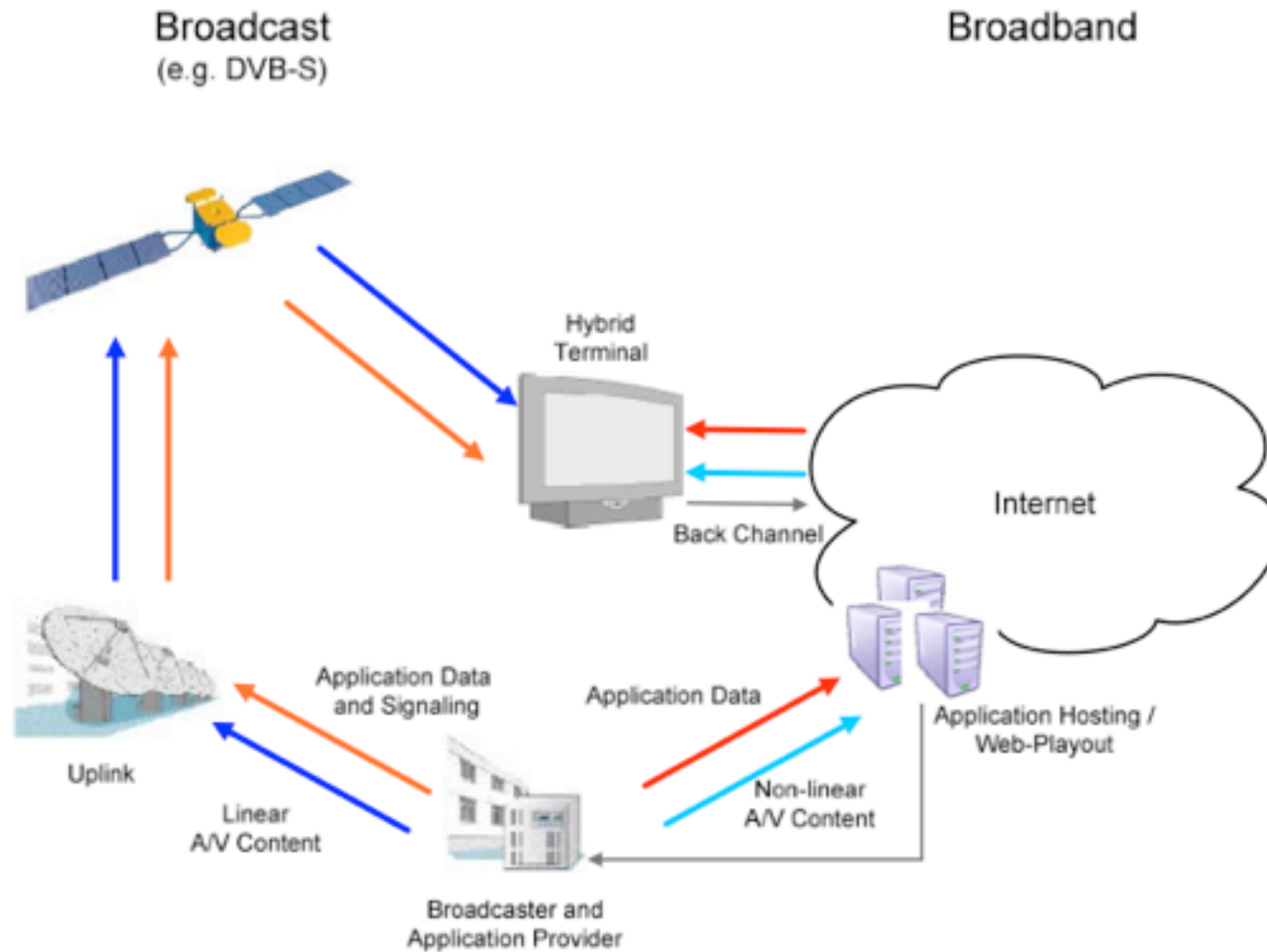
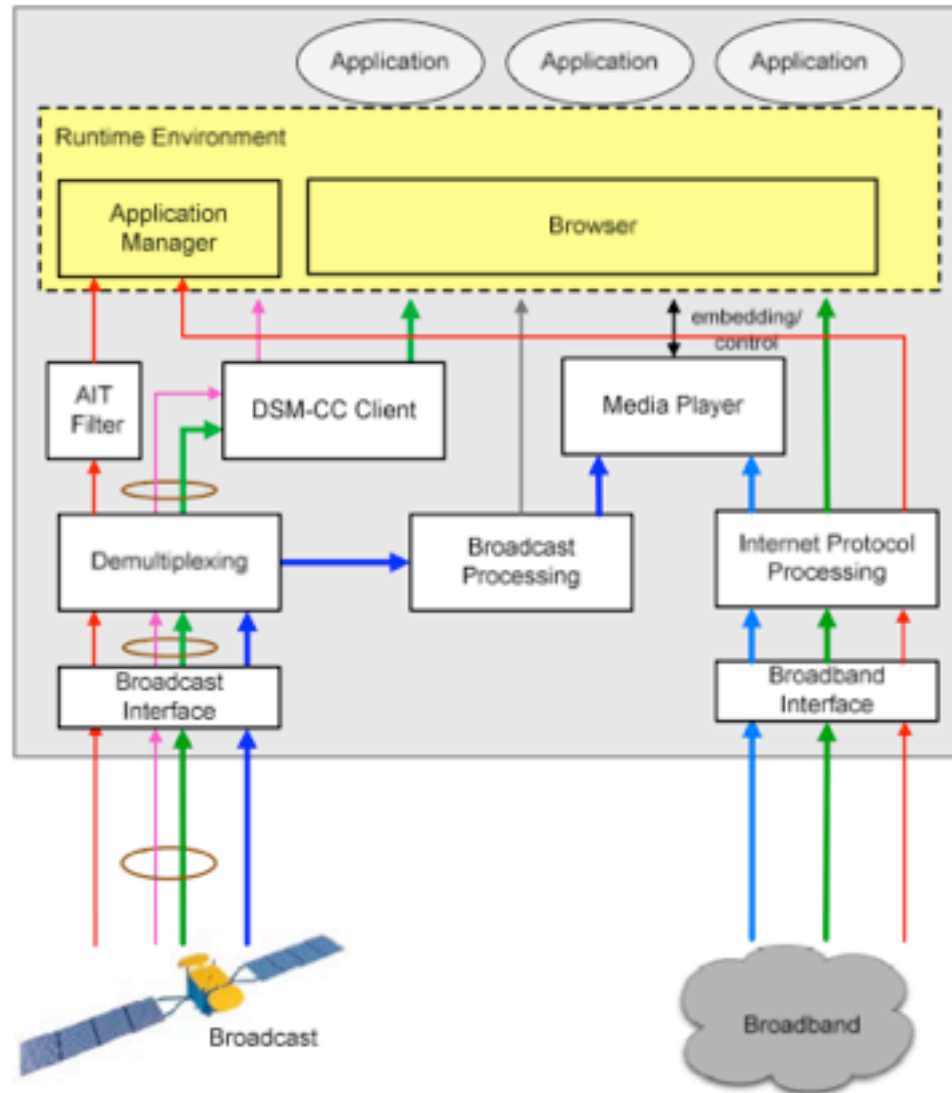


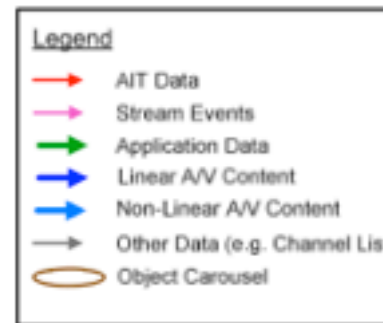
Figure 1: System Overview



# HbbTV Terminal Functional Architecture

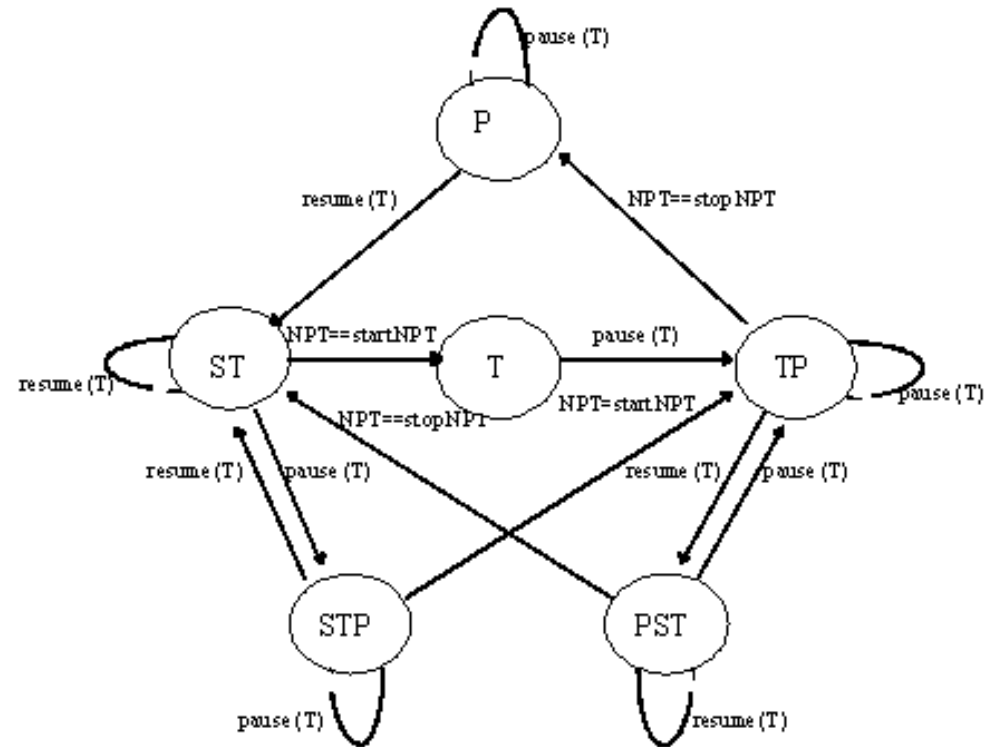


AIT = Application Information Table  
 DSM-CC = Digital Storage Media –  
 Command and Control



# Digital Storage Media – Command and Control

- DSM-CC
  - Relatively old (1996) ISO/MPEG standard
  - Control interface for digital media delivery
- VCR-like control:
  - Covering client-server setup
  - NPT = Normal Play Time (user-related time scale)
- Multiplexed data embedded into transport stream
  - Data carousel
  - Object carousel



# Content Formats in HbbTV

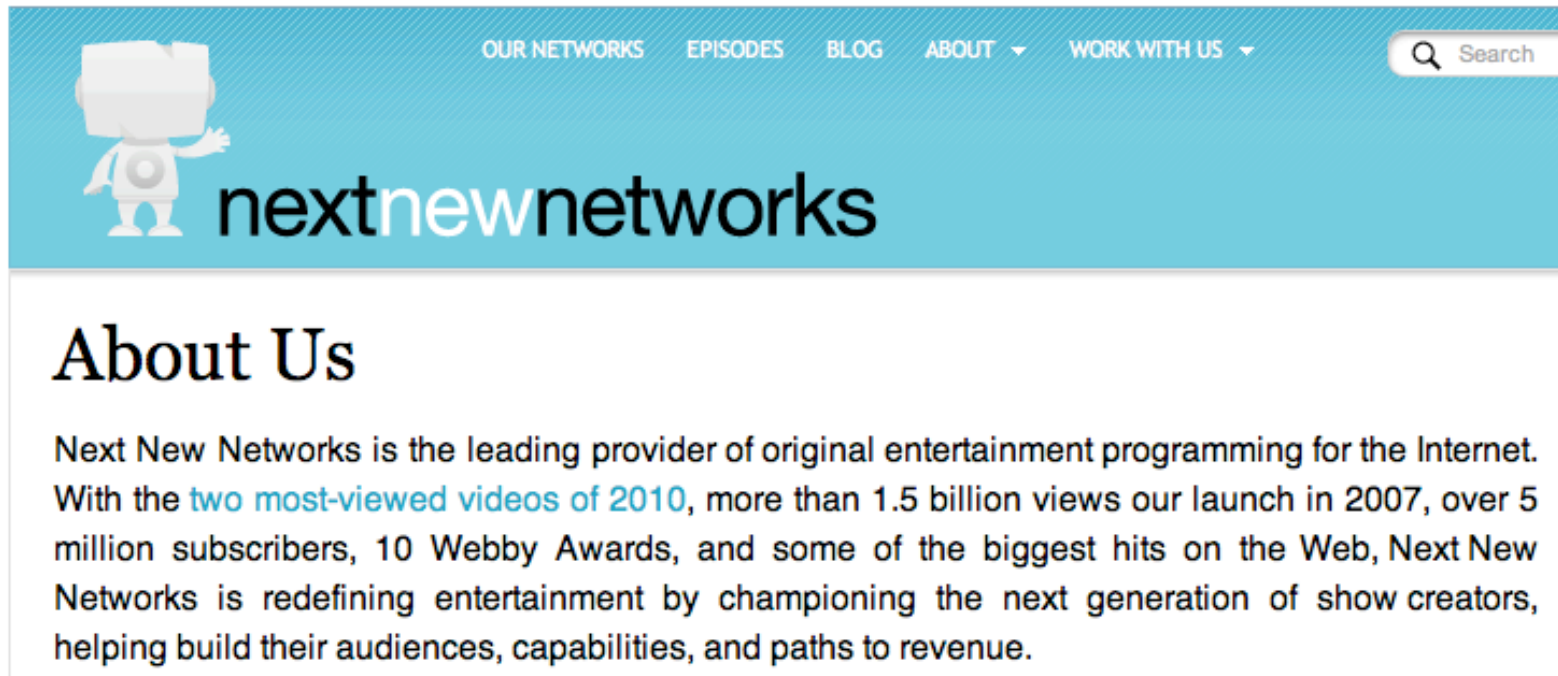
- Browser-based technology: CE-HTML
  - Developed by Consumer Electronics Organization (CEA-2014)
  - Adoption of HTML 4 and CSS to TV sets
- Dynamic interfaces based on JavaScript
  - Using additional, TV-specific APIs
- Declarative Application Environment (from OpenTV forum)
  - Applications based on ECMAScript, SVG, CSS
  - Dynamic DOM, including AJAX-style asynchronous requests
- Various standard image, audio and video formats
  - JPEG, GIF, PNG
  - MPEG1-L3, HEAAC, E-AC3
  - MPEG4 AVC (SD and HD)

# Streaming support in HbbTV

- From the HbbTV specification:
- “7.3.2.1 Protocols for streaming
  - Unicast streaming using HTTP 1.1 shall be supported as defined in clause 5.2.2.2 of the OIPF protocols specification [4] with the addition that the range header shall be supported in seek operations. The terminal should only buffer data equivalent to approximately 10 seconds of normal play in advance of the current play position unless the download rate is consistently lower than the consumption rate.
  - Where unicast streaming of non transport stream based MPEG4/AVC video and MPEG/AAC audio using RTSP and RTP is supported, this shall be as defined by clauses 6, 7 and 8 of ISMA [6]. The terminal shall support the "Interleaved RTSP & RTP/AVP over TCP transport" method. For audio and video the restrictions of the present document apply.”
- OIPF = Open IP TV Forum, see [www.oipf.tv](http://www.oipf.tv)

# Trends in Web TV 2012

- Integration of multimedia content sources:
  - Web content as TV channel (Web in the TV)
  - Production of video material for online-only distribution (TV in the Web)



The image shows a screenshot of the Next New Networks website. The header is a teal-colored bar with a white robot icon on the left. To the right of the icon is the text 'nextnewnetworks' in a white, lowercase, sans-serif font. Further right in the header are navigation links: 'OUR NETWORKS', 'EPISODES', 'BLOG', 'ABOUT' (with a dropdown arrow), and 'WORK WITH US' (with a dropdown arrow). On the far right of the header is a search bar with a magnifying glass icon and the text 'Search'. Below the header, the main content area has a white background. The section title 'About Us' is in a large, black, serif font. Below the title is a paragraph of text in a black, sans-serif font, describing the company's mission and achievements.

OUR NETWORKS EPISODES BLOG ABOUT ▾ WORK WITH US ▾ Search

## About Us

Next New Networks is the leading provider of original entertainment programming for the Internet. With the [two most-viewed videos of 2010](#), more than 1.5 billion views our launch in 2007, over 5 million subscribers, 10 Webby Awards, and some of the biggest hits on the Web, Next New Networks is redefining entertainment by championing the next generation of show creators, helping build their audiences, capabilities, and paths to revenue.

# 10 Web Radio, Web TV and IPTV

10.1 Web Radio

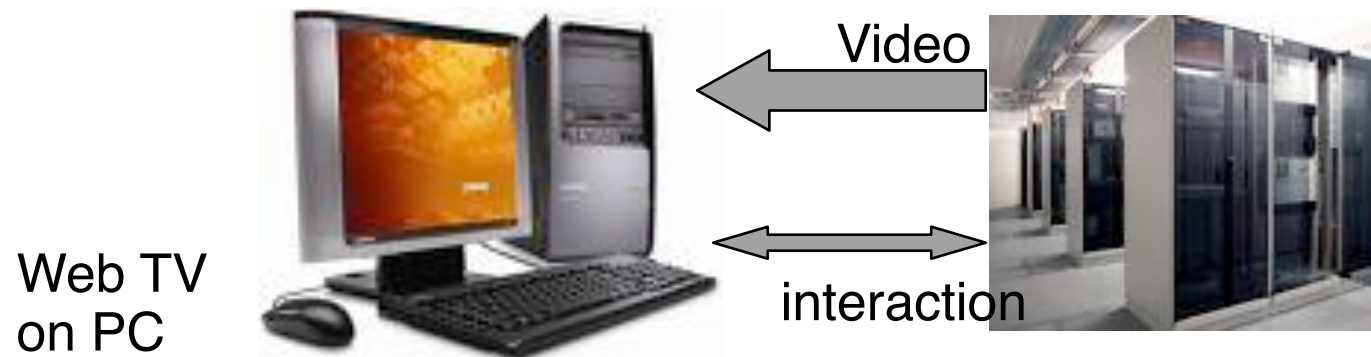
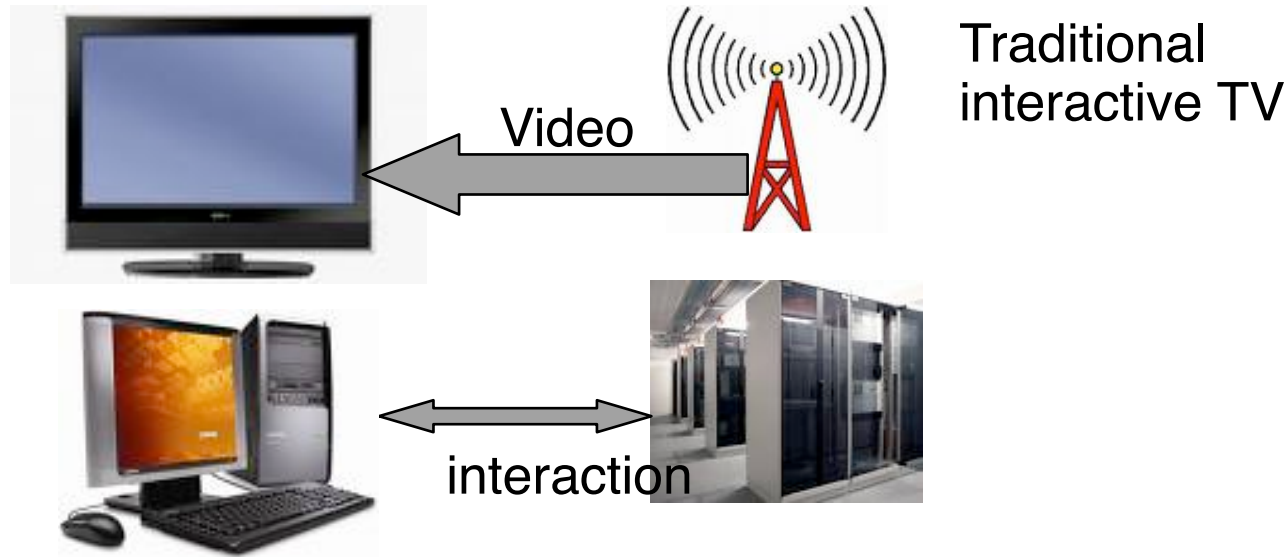
10.2 Web TV

10.3 Audio and Video Streaming over IP

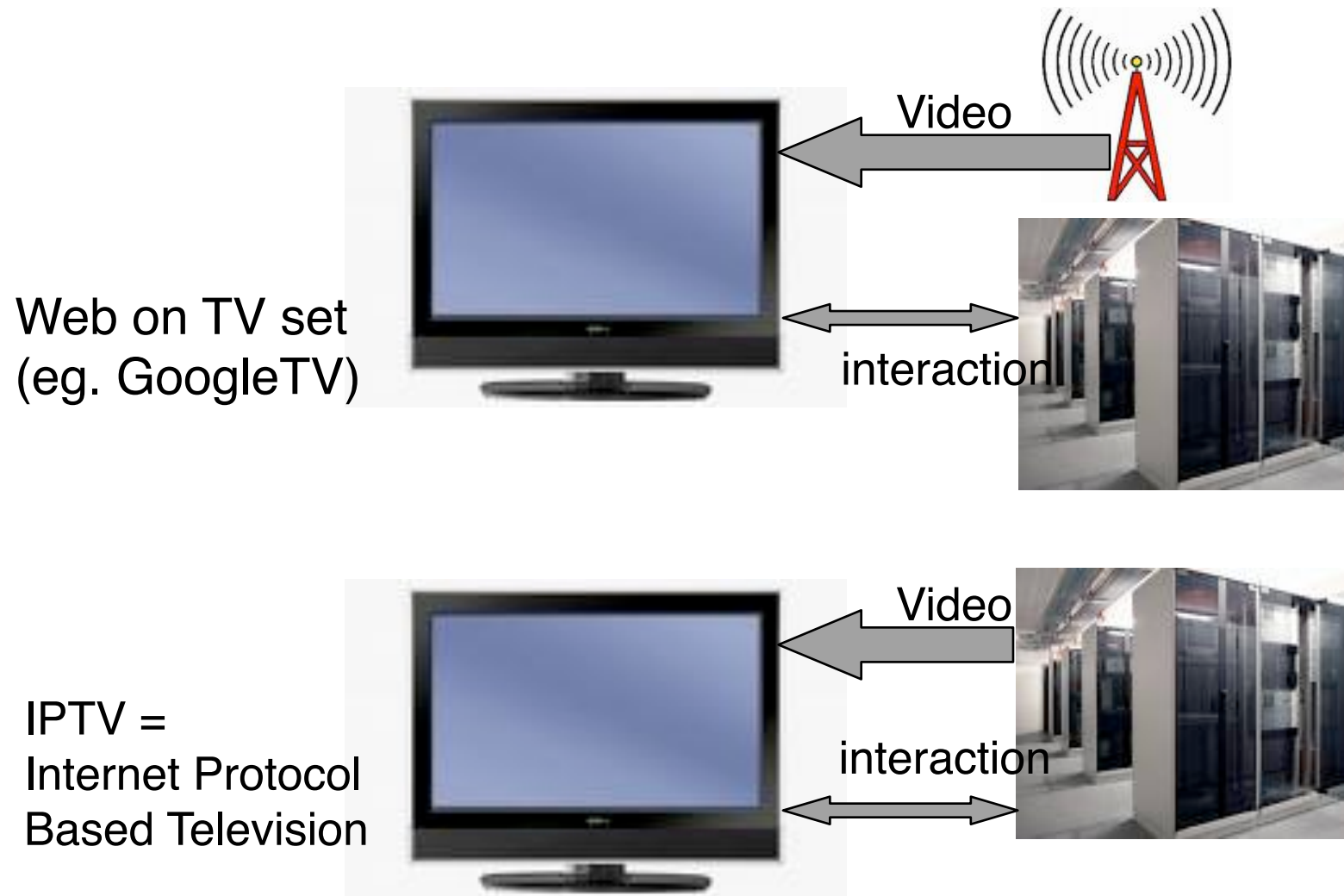
Literature:

Johan Hjelm: Why IPTV? Interactivity, Technologies and Services,  
Wiley 2008

# Traditional TV, Web TV and IPTV (1)



# Traditional TV, Web TV and IPTV (2)



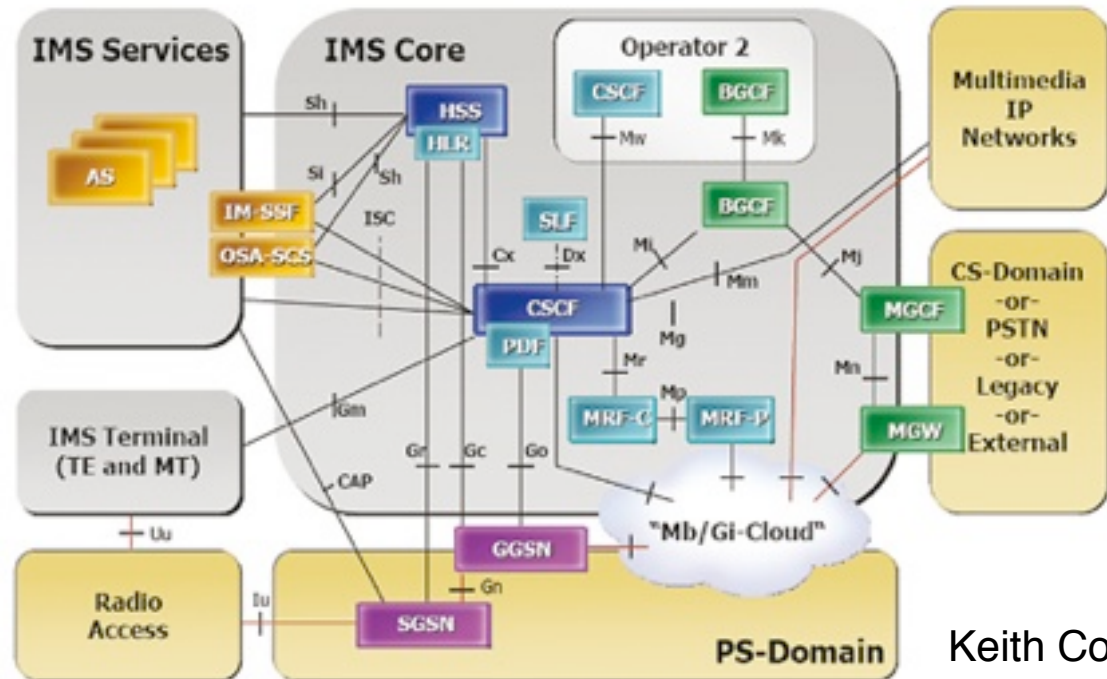
TV programme is carried over Internet, no radio broadcasting or TV cable



# Profile & Presence

- Users need to be authenticated for IPTV
  - Subscription management
- *Presence* information can be valuable for interactive TV
  - Who is online?
  - Who of my friends is watching this?
  - Real-time recommendations
- Presence can be managed in two ways:
  - Server/application based (e.g. Skype), heterogeneous solutions
  - Network based standard solutions (e.g. presence support in IMS, based on 3GPP)

# Internet Multimedia Subsystem IMS



CSCF = Call Session Control Function  
 BGCF = Border Gateway Control Function  
 HSS = Home Subscriber Server  
 CS = Circuit switched  
 PS = Packet switched

Keith Cobler/IMS Magazine

- IMS is an architectural framework from the telecommunication world
  - Original target: Multimedia over wireless networks beyond GSM
  - Generally targeted at fixed/mobile network convergence
- Some companies (e.g. Ericsson) promote IMS as standard for IPTV
  - QoS support in the core network is possible
- IMS architecture is complex (based on "Intelligent Network" architecture)

# Media Streaming in Home Networks



- IP networks in private homes are ubiquitous
  - WLAN, Powerline LAN, ...
- Home network comprises various devices
  - Computers, servers, NAS (Network attached storage)
  - Consumer electronics (CE) devices (TV set, digital radio receiver)
  - Mobile devices
  - ...
- Streaming solutions:
  - Streaming audio, video and images from server to clients (e.g. TV set)
  - Streaming audio and video from CE devices
    - » e.g. TV program from TV tuner to mobile devices
- Dominating standard: DLNA (Digital Living Network Alliance)
  - based on Universal Plug and Play (UPnP)

# DLNA: Streaming Protocols and Media Formats

- Streaming:
  - HTTP 1.1 streaming over TCP as standard method
  - RTP streaming optional
- Media formats:
  - JPEG, LPCM, MPEG-2 as standard formats
  - Other formats optional: MP3, AAC, MPEG4, ...

# Streaming Technology Applications 2012

- IP networks tend to replace all traditional networks
  - Phone network
  - Home networks
  - Broadcast networks (partially)
- IP and Web technology creates a huge amount of flexibility for product solutions
- Intelligent solutions for home entertainment and commercial use are on the market and rapidly developed
  - Key problem is user acceptance and usability