Outline

1.	Introduction and Motivation	
2.	Media on the Web	Part I: Web Technologies for Interactive MM
3.	Interactive Web Applications	
4.	Communities, the Web, and Multimedia	
5.	Digital Rights Management	Part II: Content-Oriented Base Technologies
6.	Cryptographic Techniques	
7.	Multimedia Content Description	
8.	Streaming Architectures	Part III: Multimedia Distribution Services
9.	Web Radio, Web TV and IPTV	
10.	Electronic Books and Magazines	
11.	Multimedia Content Production and Management	
12.	Multimedia Conferencing	Part IV: Conversational Multimedia Services
13.	Signaling Protocols for Multimedia Communication	
14.	Visions and Outlook	

9 Web Radio, Web TV and IPTV

9.1 Web Radio

9.2 Web TV

9.3 IPTV

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 organisations, 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
  - *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:
  - Weird technical configurations, computer as playback device?
  - Introducing new hardware is difficult
    - » Must seamlessly integrate with existing devices
    - » ...or be completely stand-alone and innovative

RIP - Death occurred in March

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

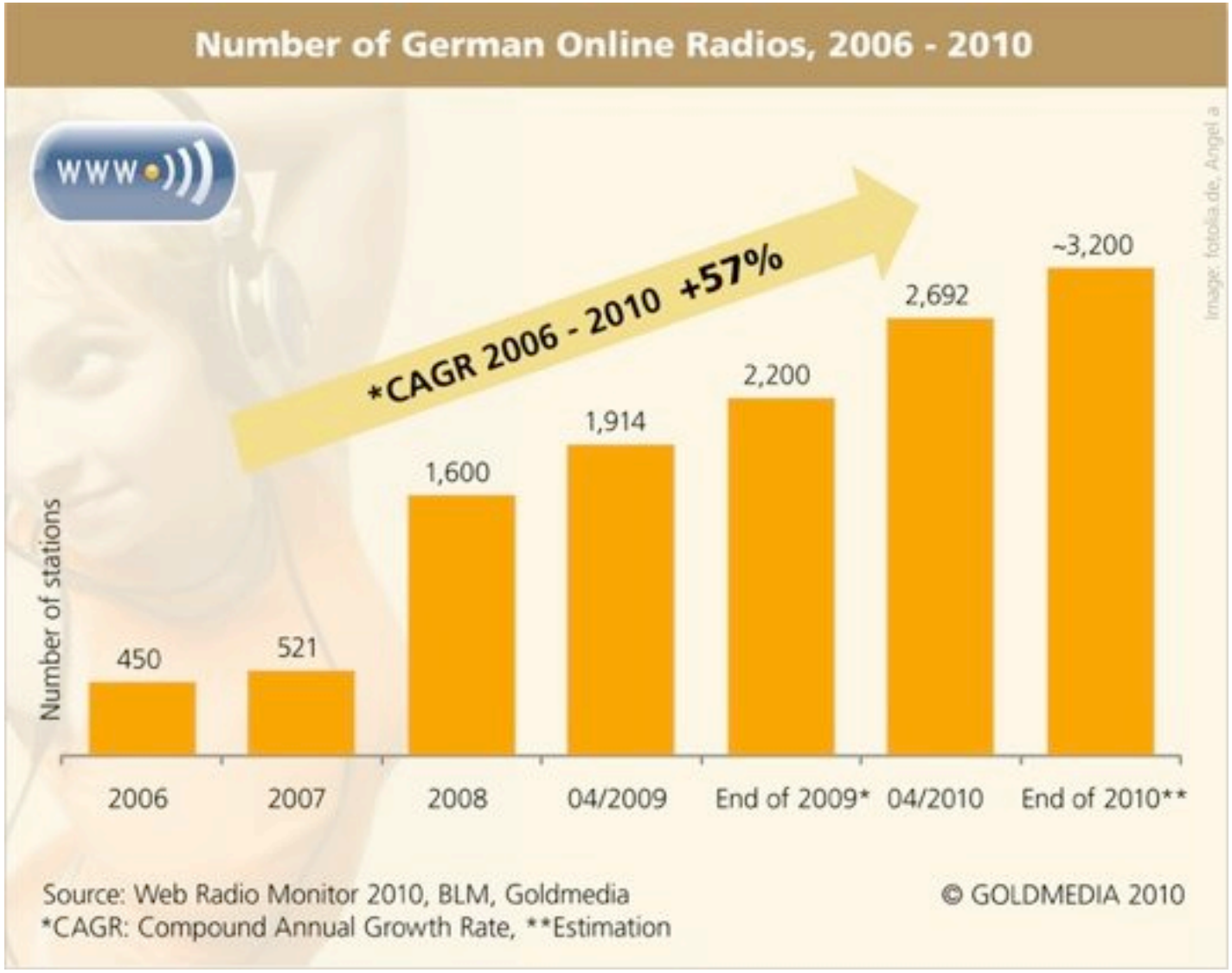
Logitech Squeezebox

DNT IP2go

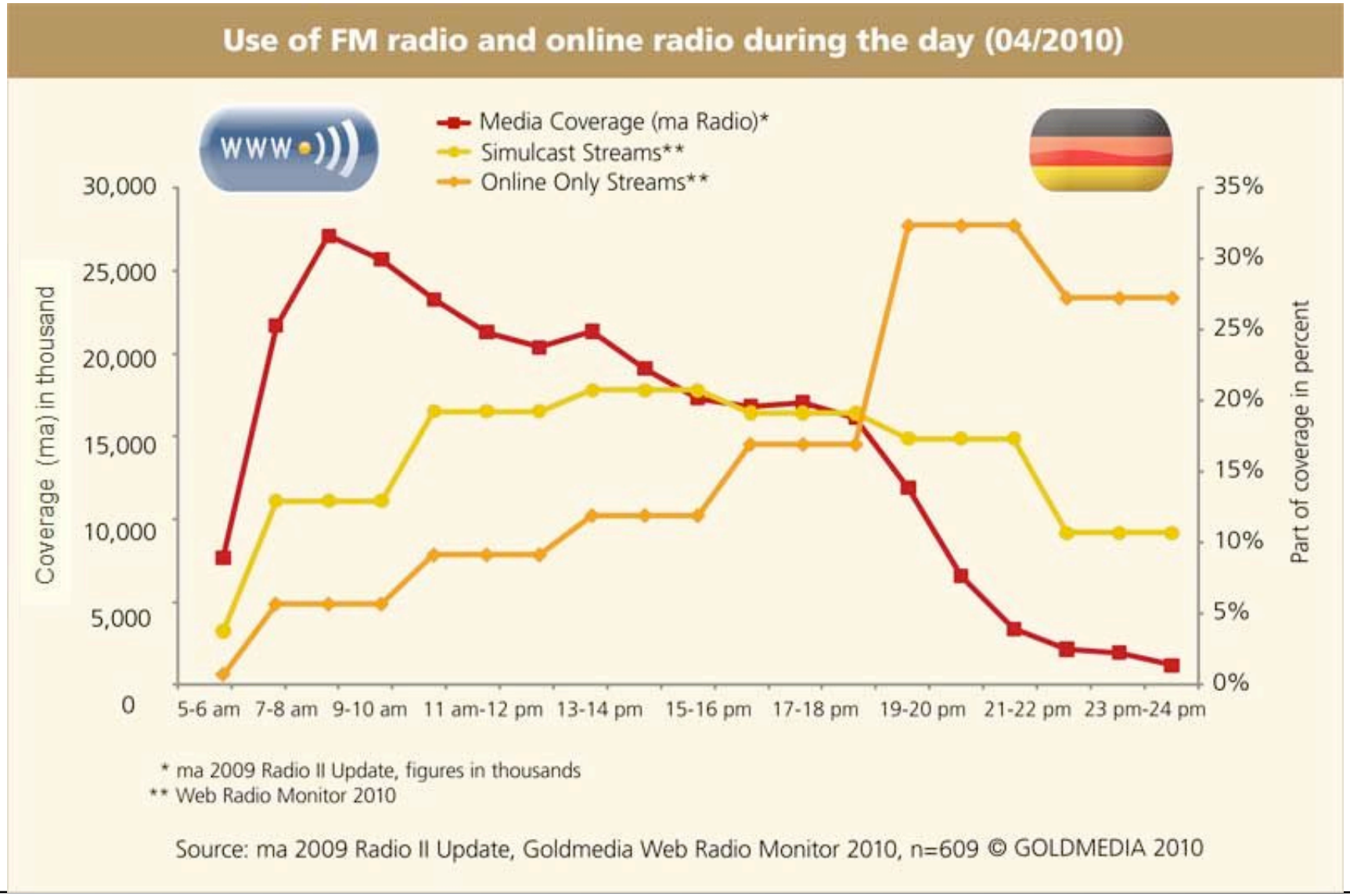
DNT IPmicro

Sagem My Web Tuner 500

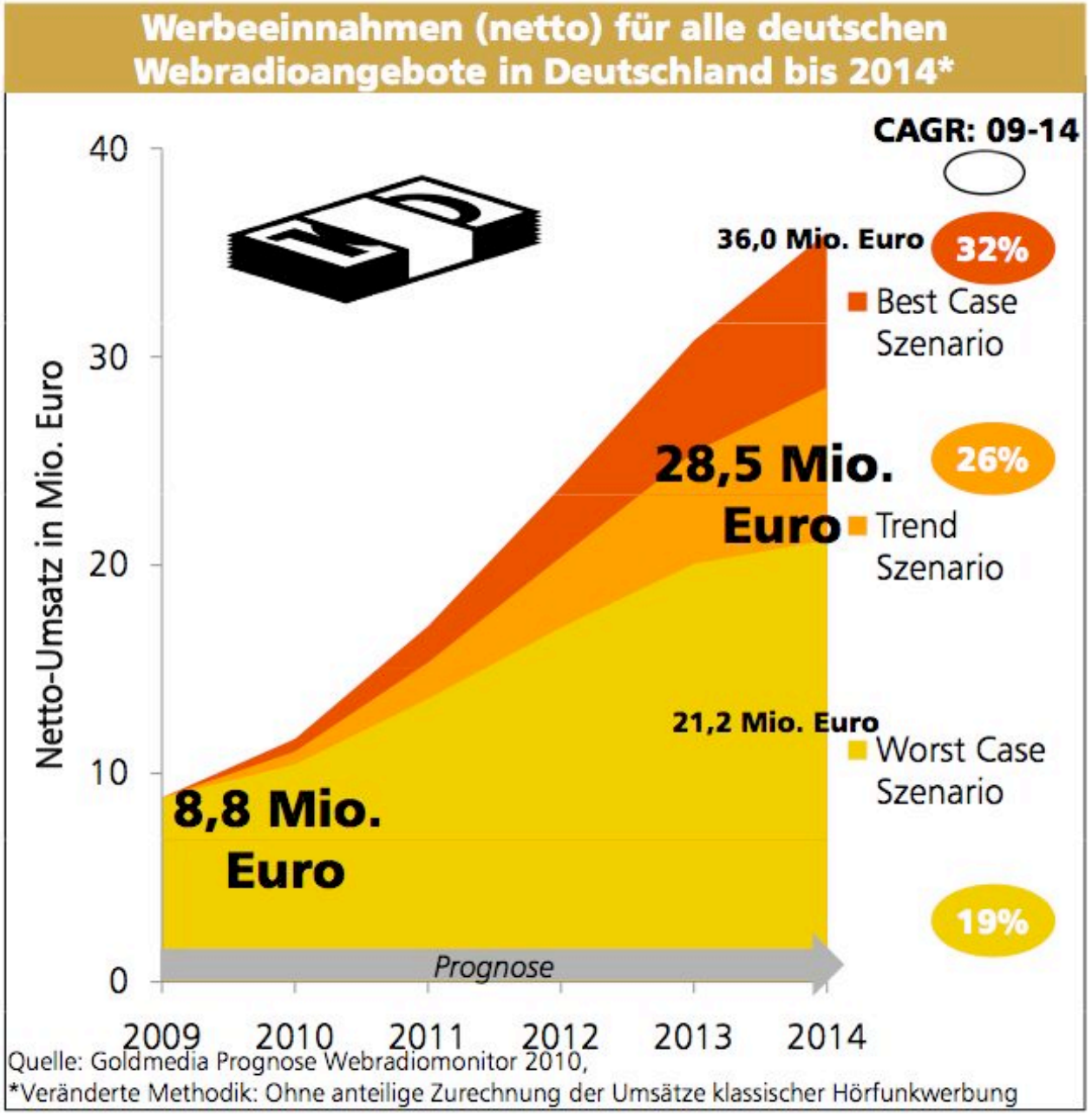
Internet Radio Market (1)



Internet Radio Market (2)



Internet Radio Market (3)



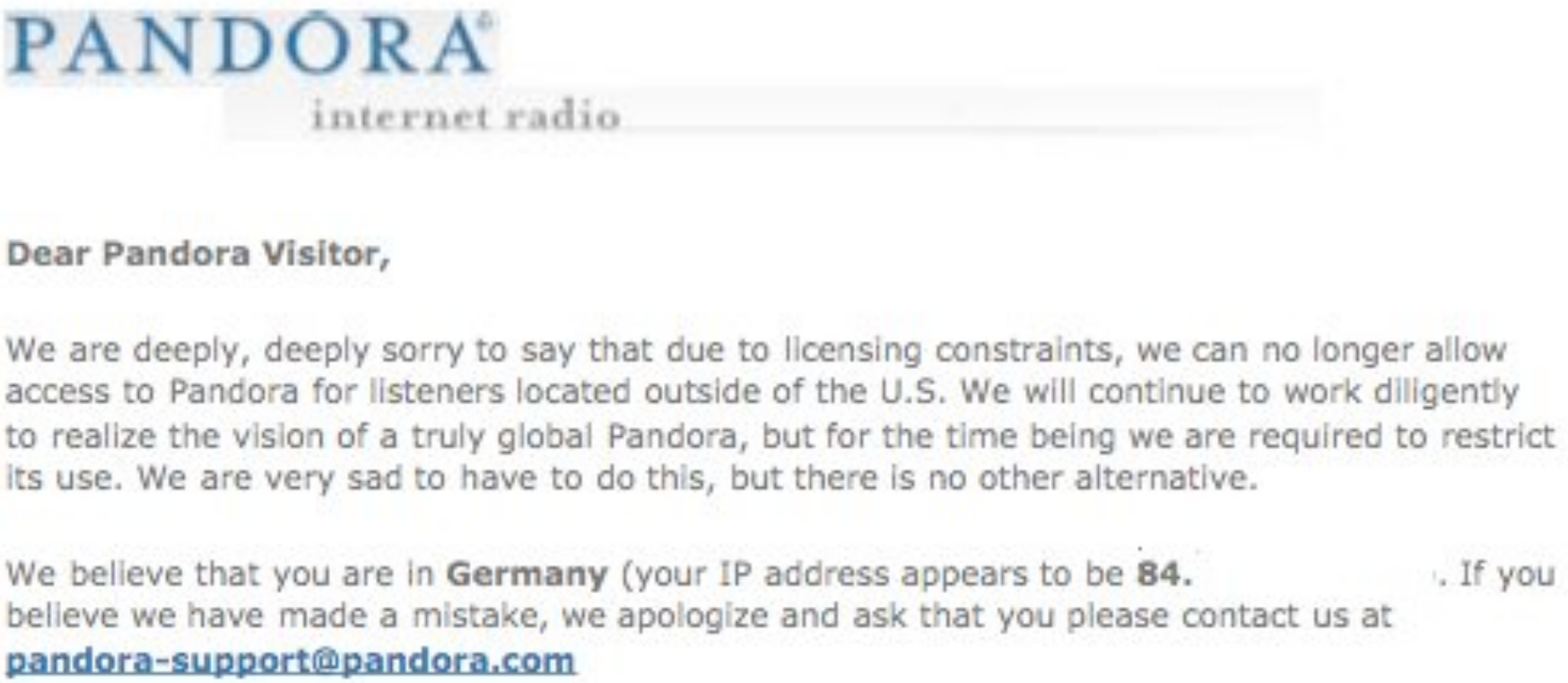
Copyright and Web Radio

- 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



Radio and Visual Information

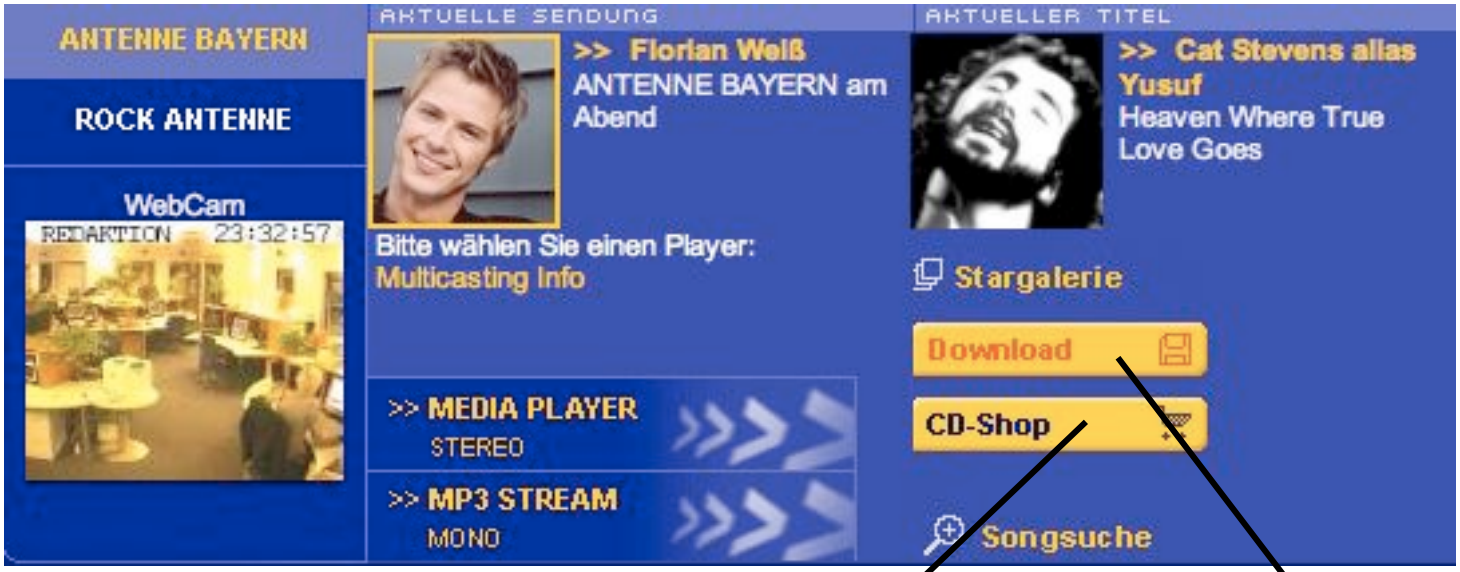
- **Traditional radio** is a medium for the ears only
  - Most adequate interaction forms are also based on audio
    - » Telephone participation of listeners
  - Additional information may be shown visually (e.g. RDS)
- **Web radio** can be used as hybrid audio/visual medium
  - On PC, Smartphone, TV 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
- Selection of additional information vs. proper two-way interaction

Sophisticated Interaction Forms for Web Radio

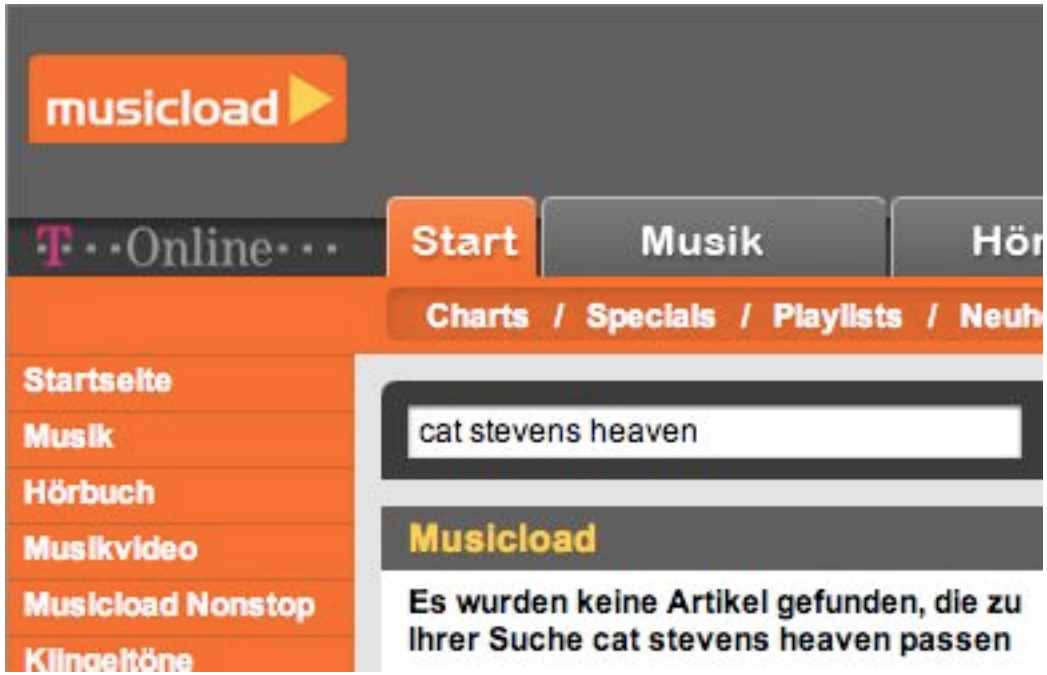
- *Interaction highly integrated with programme*
- Interactive playlists
  - "Wunschkonzert" (musical request programme)
    - » Individual requests or democratic voting
    - » Automatic overall optimization of playlists
  - Requests may be sent in via Web, email, SMS, ...
- Upload of music and speech 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-commmerce offers

Web Radio / Music Shop Integration 2004

Web Radio / Music Shop Integration 2007 (1)



Web Radio / Music Shop Integration 2007 (2)



musicload

iTunes

Web Radio / Music Shop Integration 2011

Vision of a “Killer Application”?

- 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

10 Web Radio, Web TV and IPTV

10.1 Web Radio

10.2 Web TV

10.3 IPTV

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?

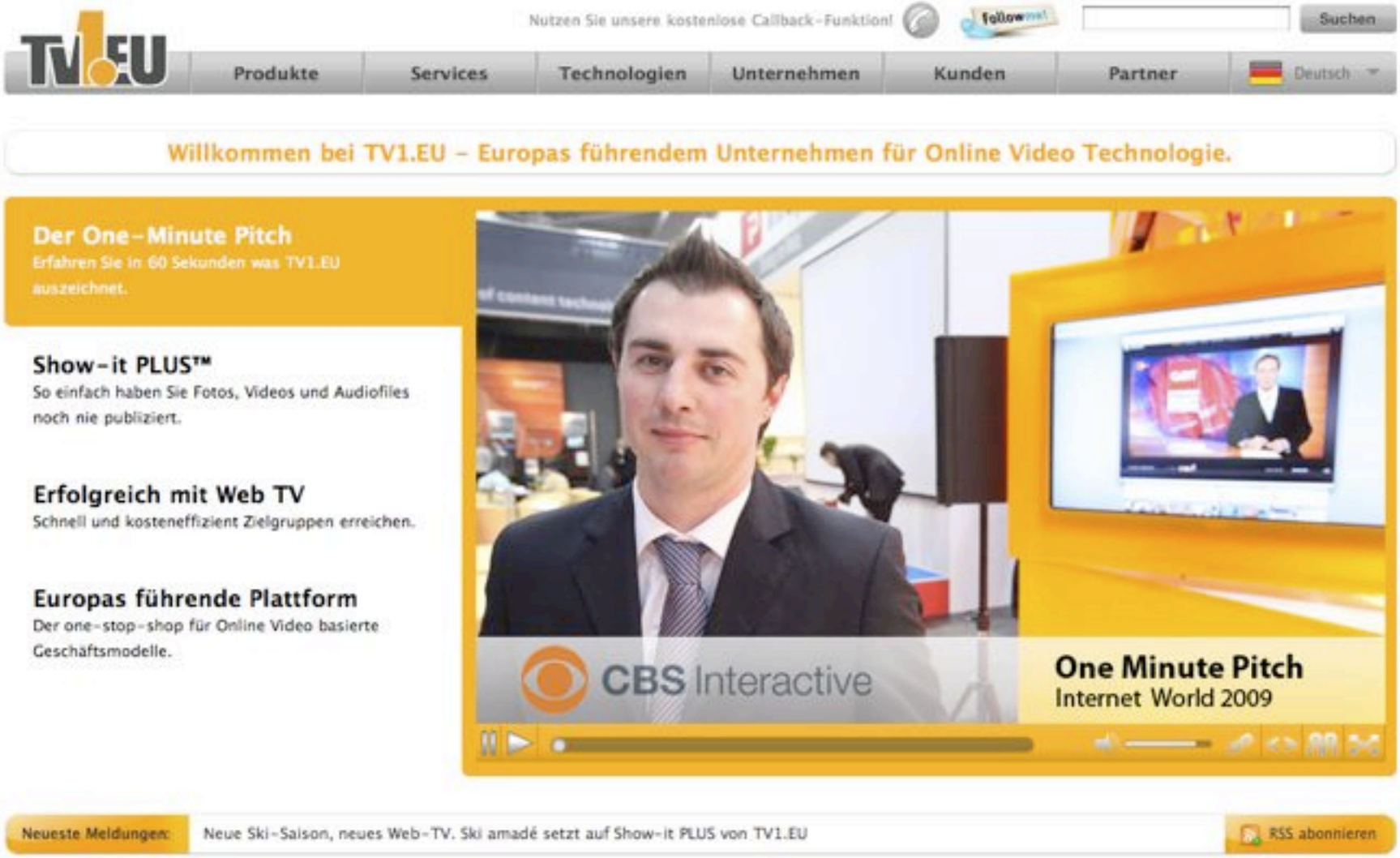
Web TV Simulcast

- Many streams available
  E.g. de.wwiTV.com
  lists 110 TV streams
  only for Germany

n-tv 2004

Web TV Simulcast – Seven Years Later

Web TV as Business Model



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

Levels of Interactivity in TV

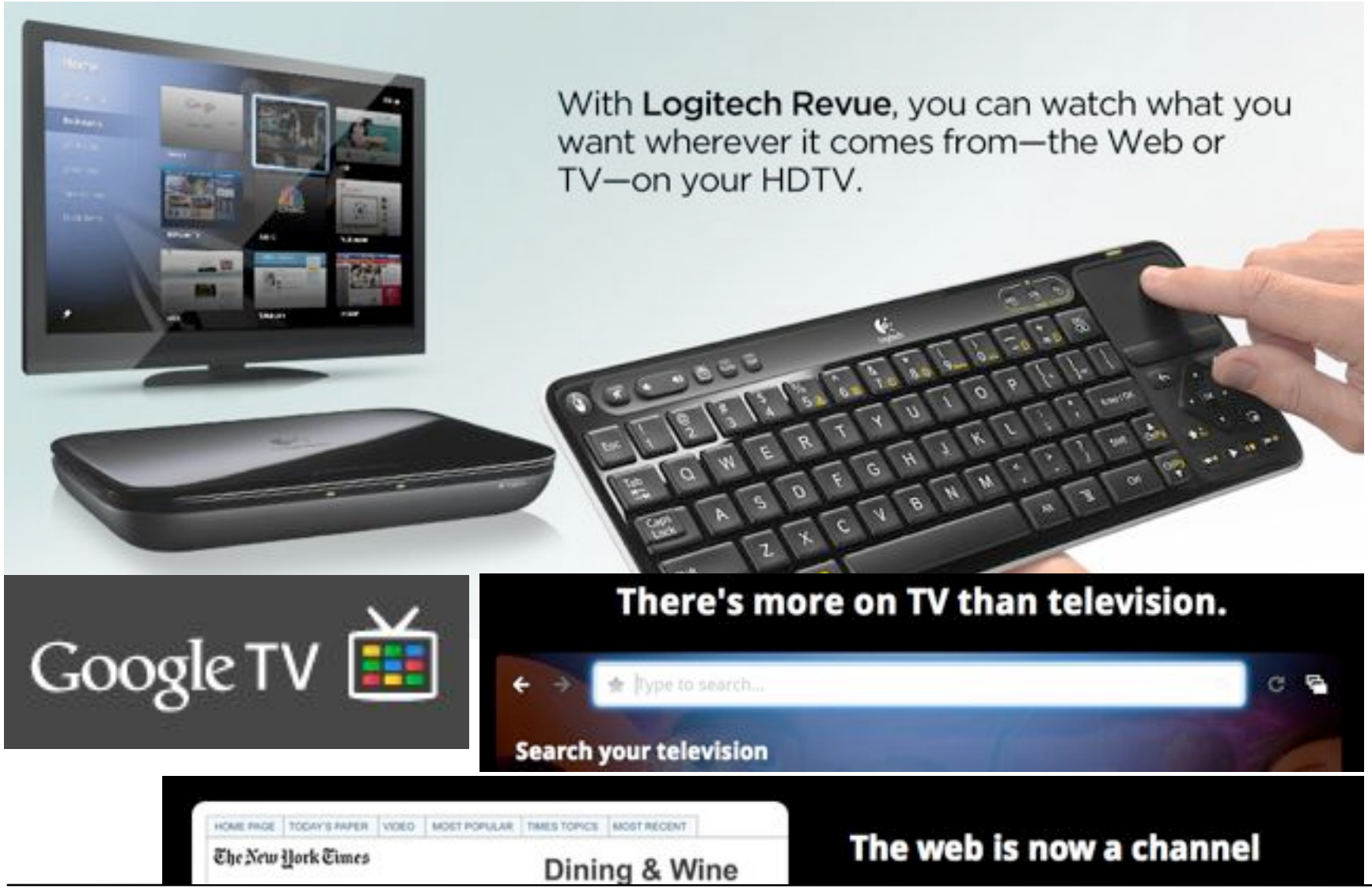
(according to Johan Hjelm 2008)

- 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?

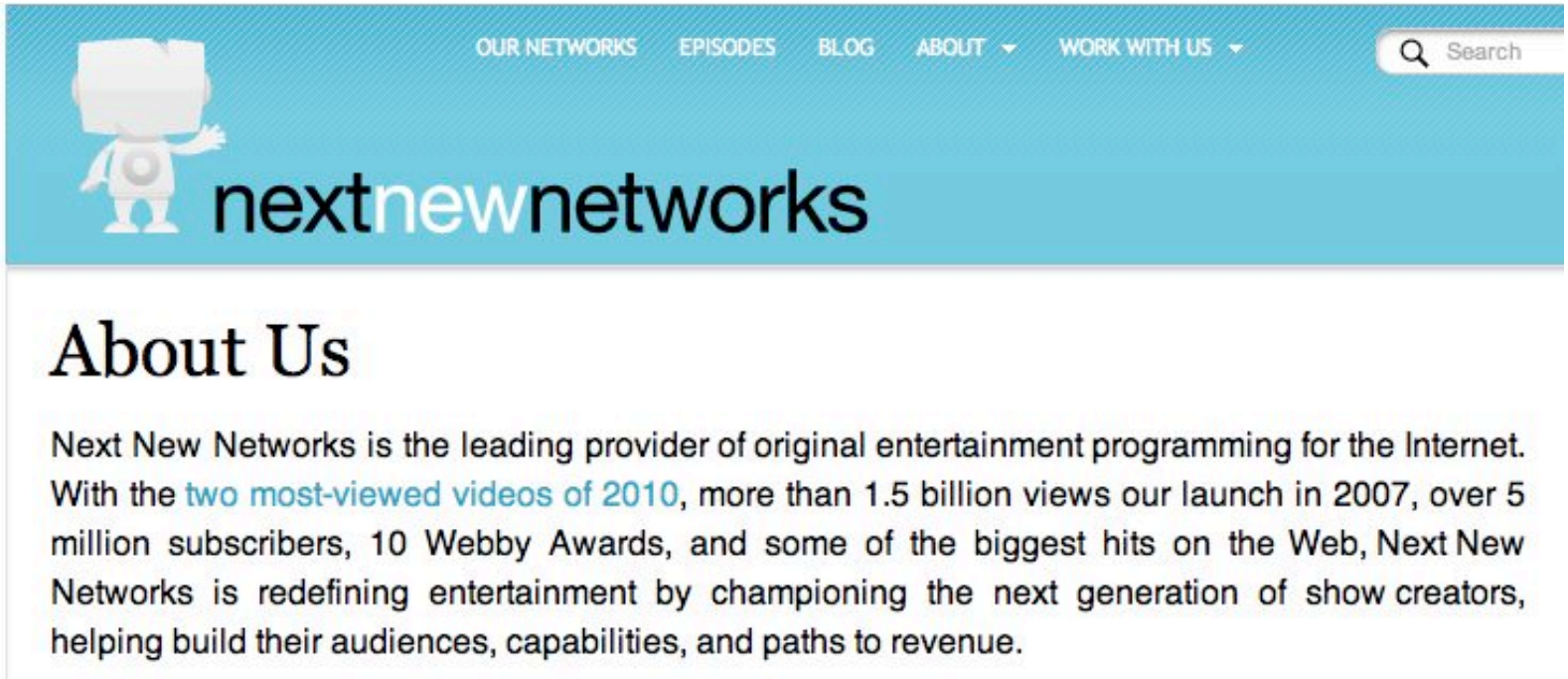
- Voting is popular:
  27 % of all young European users of mobile phones have voted or otherwise participated in interactive game shows via phone
- BBC:
  During 2004 Olympics, more than 60% of viewers watched the event in an interactive way
- Johan Hjelm, based on research of EU project LIVE:
  - Interaction 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?



Trends in Web TV 2011

- 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)
- Hardware/user interface integration between computer and TV set still not fully satisfying



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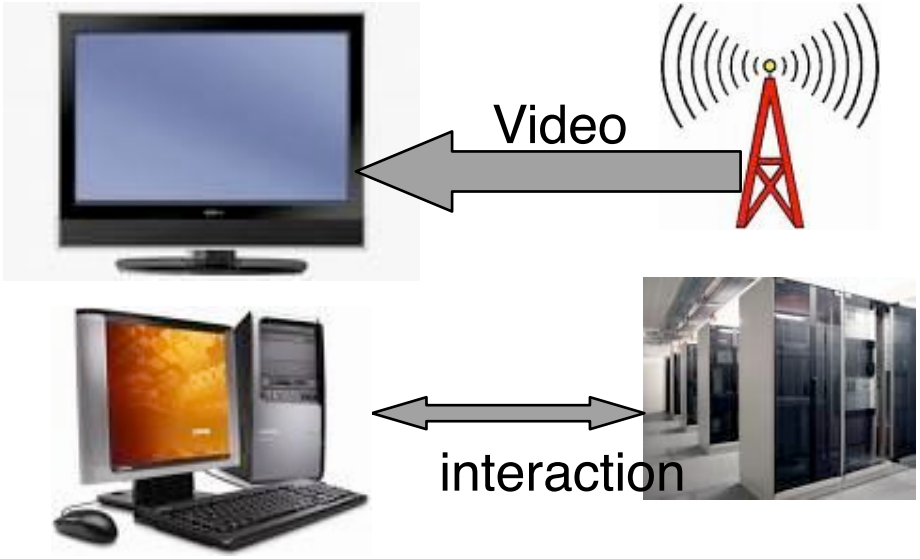
Traditional TV, Web TV and IPTV (1)

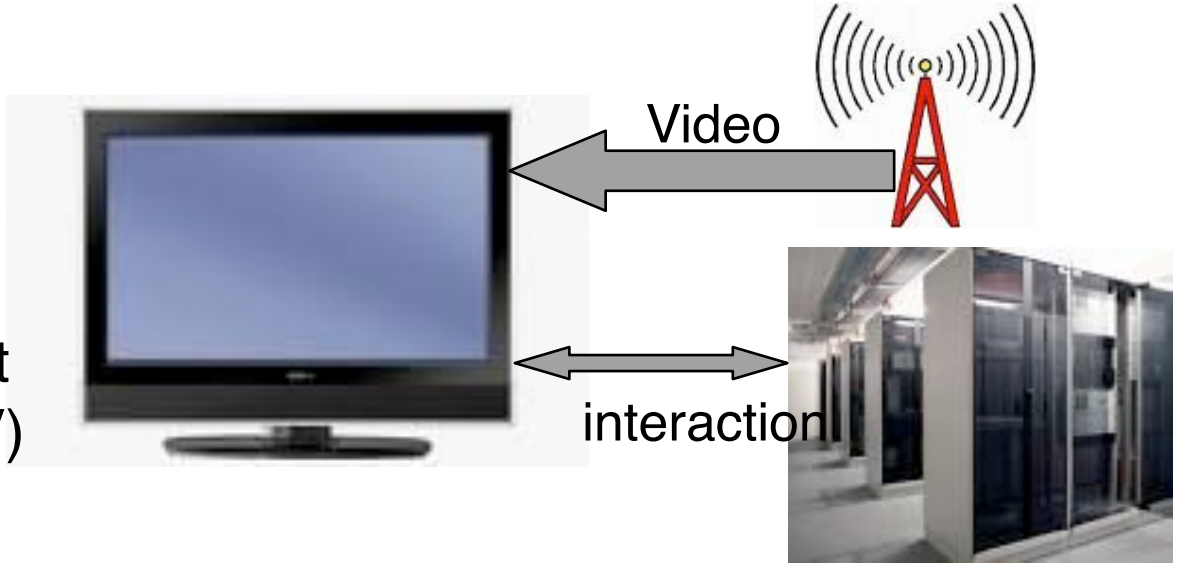


Traditional
interactive TV

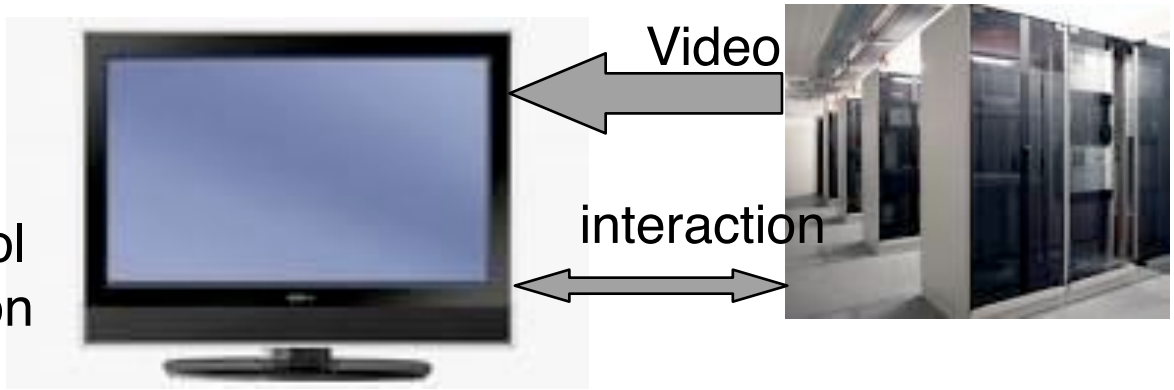
Web TV
on PC

Traditional TV, Web TV and IPTV (2)

Web on TV set
(eg. GoogleTV)



IPTV =
Internet Protocol
Based Television

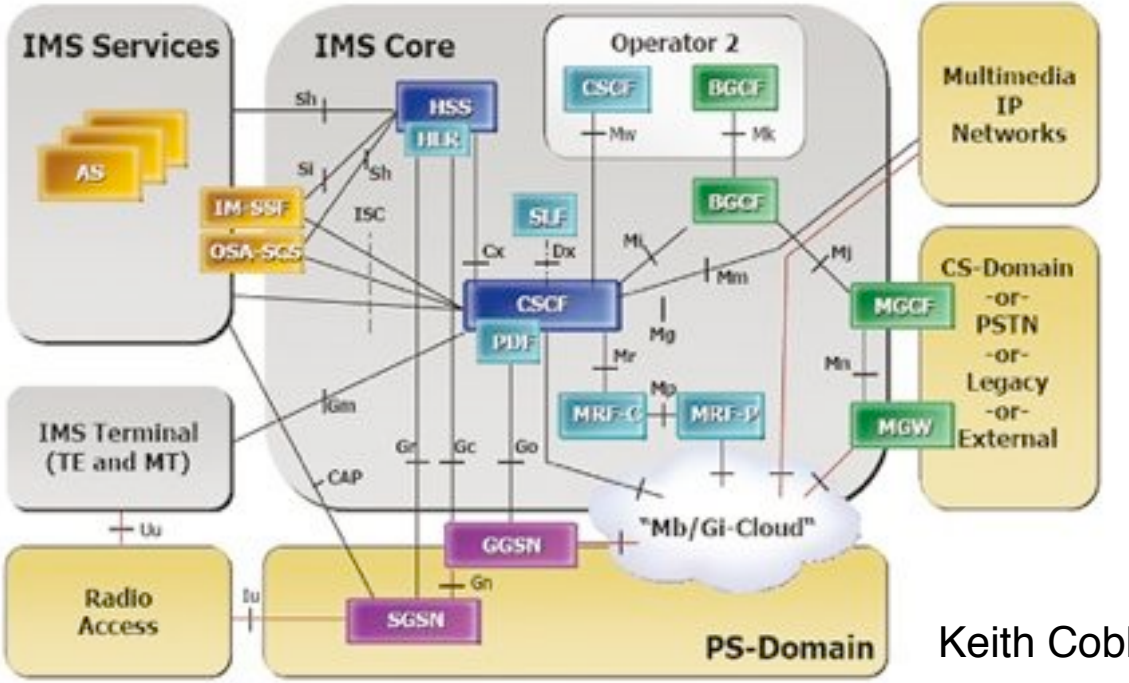


TV programme is carried over Internet, no radio broadcasting or TV cable

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)