

The TV of Tomorrow

Instrumentation seminar Stockholm University, AlbaNova

2006 11 30

Göran Appelquist VP Business Development Edgeware AB

Background Edgeware

- Edgeware was founded in November 2004
- Founders with background from telecom/network and professional video industry (NetInsight, Xelerated, Digital Vision, Ericsson...)
- Today team of 10 people with network and video/TV background, and growing!
- The idea is to address the new challenges emerging as a result of the new TV landscape to be presented
- First product launched in September 2006.
- Outperformes all existing products by orders or magnitudes
- Commericial implementations planned for Q1 2007



Content

- Traditional TV
- Why things are happening now?
- What can we expect?
- Challenges
- Solutions



Traditional TV

Broadcasting

- Linear channels
- > No interactivity
- "Lean-back" viewing
- Limited "on-demand" content (pay-per-view)

Distribution

- > Terrestrial
- > Satellite
- > Cable
- TV is consumed on television sets









TV in 2009



edgeware

© Copyright Edgeware AB 2006

Why now?

- It's possible!
 - New delivery methods (Internet and mobile networks)
 - > New technologies
 - At a reasonable cost!
- Competitive market on new platforms





New delivery methods - Internet

Public internet (Internet TV)

- Reaches global audience
- Low commercial and technical entry thresholds
- Advanced user interfaces
- Allows new types of services
- Opens up markets for long-tail content
- Limited interactivity
- Low quality
- No guaranteed quality of service
- Does not scale (without performance penalties)
- Complements traditional broadcast TV and IPTV
- Target displays

edgeware

- Computers
- Portable devices





SE TV4:S PROGRAM NÄR DU VILL TV4 Anytime är en ny webbtjänst. Här kan du se tv och film på helskärm och med hög kvalitet.







New delivery methods - Internet

Service provider networks (IPTV)

- Reaches limited audience
- Higher commercial and technical entry thresholds
- Advanced user interfaces
- Allows new types of services
- Guaranteed quality of service
- > TV quality
- Full interactivity
- Can scale without performance penalties
- Competes with traditional broadcast TV
- Target display
 - TV sets









New delivery methods - Mobile

- Broadcast TV through digital terrestial networks (DVB-H)
 - ➢ Linear TV
 - No interactivity
 - Similar to traditional TV services
- Interactive streaming through mobile networks (3G)
 - Full interactivity
 - Simple user interfaces
 - Allows new services
- Complements all the other
- Target display
 - Mobile phones (small screens)







New technology

- Efficient compression technology
 - > MPEG-4/AVC, Windows Media9
 - At least 50% more efficient than MPEG2
- Network technology
 - > IP based networks used for all services
 - High-bandwidth networks available (>10Gbps)













Competitive market on new platforms

- Huge investments in internet and mobile networks
- Existing services are low margin
 - Broadband access
 - > IP telephony
 - Mobile telephony
- Declining use of fixed line telephony
- IPTV/Mobile TV open up for new revenue generating services



60 M IPTV subscribers expected world-wide in 2010



© Copyright Edgeware AB 2006

What can we expect?

Interactive – Personalized TV

- Video-on-demand (VOD)
 - Movie rental replacement
 - Pay-per view or subscription
- TV-on-demand or Time shift TV
 - TV when you want
 - Interactivity (pause, rewind, skip...)
- Network PVR
 - Keep your favourites
- New formats and platforms
 - From mobile to HDTV
- User generated content

edgeware

- Global through the internet, eg YouTube
- Local community TV
- Personalized advertisements
 - Based on localisation, behaviour, preferences





© Copyright Edgeware AB 2006

What can we expect?

- Integration of services
 - > TV, phone, internet, mobile
 - Internet on the TV (connected to programs)
 - > IP phone/mail info on TV
- Integration of delivery platforms
 - Similar services on multiple platforms
 - TV, phone and internet access over broadband and mobile networks
 - Transfer programs between platforms



edgeware

© Copyright Edgeware AB 2006

Challenges

Commercial

- Content rights
- Business models
- Inexperienced operators
- Technical
 - New technology
 - Lack of standards
 - Lack of mature products
 - Going from broadcast/multicast to unicast
 - Every user recieves a personal stream/program
 - Bandwidth explosion
 - Scalability issues



Challenges

Bandwidth examples

- Broadcast/multicast of 100 TV channels @ 4 Mbps -> 400 Mbps
- Unicast of 5 000 streams @ 4 Mbps -> 20 Gbps
- Unicast of 100 000 streams @ 4 Mbps -> 400 Gbps!



Solutions (IPTV)

From centralized to distributed server architectures



© Copyright Edgeware AB 2006

edgeware

Example of a distributed system

- 30 000 Concurrent streams
- 2000h Content storage
- 110 Gbps Aggregated bandwidth
- 2.4 Gbps Max core load
- 7.5 Gbps Max streaming capacity per server

edgeware



Solutions

From PC servers to network servers





The Edgeware solution

A network streaming server

- Purpose designed hardware streaming engine
- Solid state flash memory technology for content storage
- Modern network technology



$ORBIT \cdot 2X$



Streaming bandwidth: Streams: Flash content store: Stream interfaces: Power consumption: Size:

edgeware

20 Gbps 10 000, with full concurrency 128 GB – 3 TB (~2000 h) 2 x 10 G Ethernet <100 W 1RUx19", 25 cm deep



Benchmark

10 000 streams @ 2 Mbps or 5 000 streams @ 4 Mbps

PC-based server

- 46 RU height (23*2RU)
- 41 TB storage 138 hard disks
- 575 kg
- Costly external load balancing
- Power consumption: ~5 KW (\$5723/yr)
- 2.1 m



Edgeware Orbit 2x

- 1 RU height ¹/₂ rack depth
- 3.0 TB storage
- 5 kg
- No need for load balancing
- 100 W (\$123/yr)
- 4.5 cm



Challenges with the Edgeware design

Memory architecture

- Get high bandwidth from "slow" flash memories
- Circumvent limited number of flash write cycles
- Fit 3 TBytes onto a limited PCB area
- High speed data path
 - > 20 Gbps throughput
 - > 40 Gbps bandwidth to buffer memories
- High speed serial network interfaces
 - > 2 x 10 Gbps



End

