



MHEG-5 Middleware Presentation to KIGEiT

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Agenda

- Introduction to IMPALA and members
- Introduction to MHEG-5 Technology
- MHEG-5 and MHP market reach
- MHEG-5 roadmap: MHEG-5 on PVRs, HD, IPTV
- How MHEG-5 is used by broadcasters to enable low cost interactive services
- Case studies: Freeview UK and Freeview New Zealand
- Advanced MHEG interactive applications
- Summary and Contacts

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- The **International MHEG Promotion Alliance** is a not-for-profit organisation whose principal aim is to promote the use of the MHEG-5 international standard in digital TV worldwide.
 - For more information see *www.impala.org*
 - Founder members of Impala are S&T, Echostar Europe and Cabot Communications
 - Supporters include Sony, Samsung, Panasonic, Finlux, Hitachi, TechniSat, TVonics, Ensequence, Neotion, Ali Corp Zinwell, NZ Freeview and TopUpTV

 - IMPALA promotes - Its members compete.



- Independent company
 - Offices in London, Bristol, Denver, Hong Kong
- Works largely in digital interactive TV
- Supplies Redkey™ MHEG-5 engines to receiver manufacturers
- Leads MHEG-5 specification activity in DTG/ETSI
- Supplies MHEG-5 applications and playout equipment (Object Carousels)
 - Customers include Sky (UK), Arqiva, Freeview NZ, Mediacorp Singapore
- Also supplies carousel equipment for MHP and True2way (OCAP)
 - Customers include RAI in Italy (MHP), Time Warner Cable in US (OCAP), RTM Malaysia, Taiwan TV (for MHP trials)



Cabot Communications

- Operate as Independent Software Company
 - Offices based in Bristol (UK) and Urla (Turkey)
- Supplies 'Mercator' MHEG 5 engine to CE manufacturers.
- Lead MHEG HD specification activity.
- Active participant in MHEG 5 Return Channel specification activity.
- Also supply fully integrated DVB Digital TV software solutions for
 - Set Top Boxes (STB), Integrated Digital Televisions (iDTVs), Digital Video Recorders (DVRs) and Combination products.

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Why specify middleware?

For maximum benefit from digital TV (*for both viewers and broadcasters*) a middleware must be specified and deployed on all receivers to support interactive services and applications including:

- Digital teletext and information services
- Enhanced TV formats (programme related)
- Enhanced or Platform EPG
- Games and voting/participation TV formats
- Placeholders and HD Switching (broadcaster control)
- Video stream selection (multi-view)

And with Interaction Channel (return path)

- Additional content – text, graphics, video and audio
- Operator information / account management
- t-commerce for shopping channels

Middleware considerations

- Interactive TV only works when all (or almost all) of the receivers in a market have middleware installed
- Content and services that reach just a small percentage of a broadcaster's audience do not support a viable business / commercial model
- Technical standard considerations are important but not as important as enabling an audience for interactive services – receiver cost, interoperability and availability are the key considerations
- No Audience = No Business!

Using Public Standards

- Use of Public Standards such as MHEG-5 enables:
 - widespread adoption
 - multiple vendors at each part of the industry chain
 - price and performance competition
- Requires an effective conformance scheme to ensure interoperability and ease of use

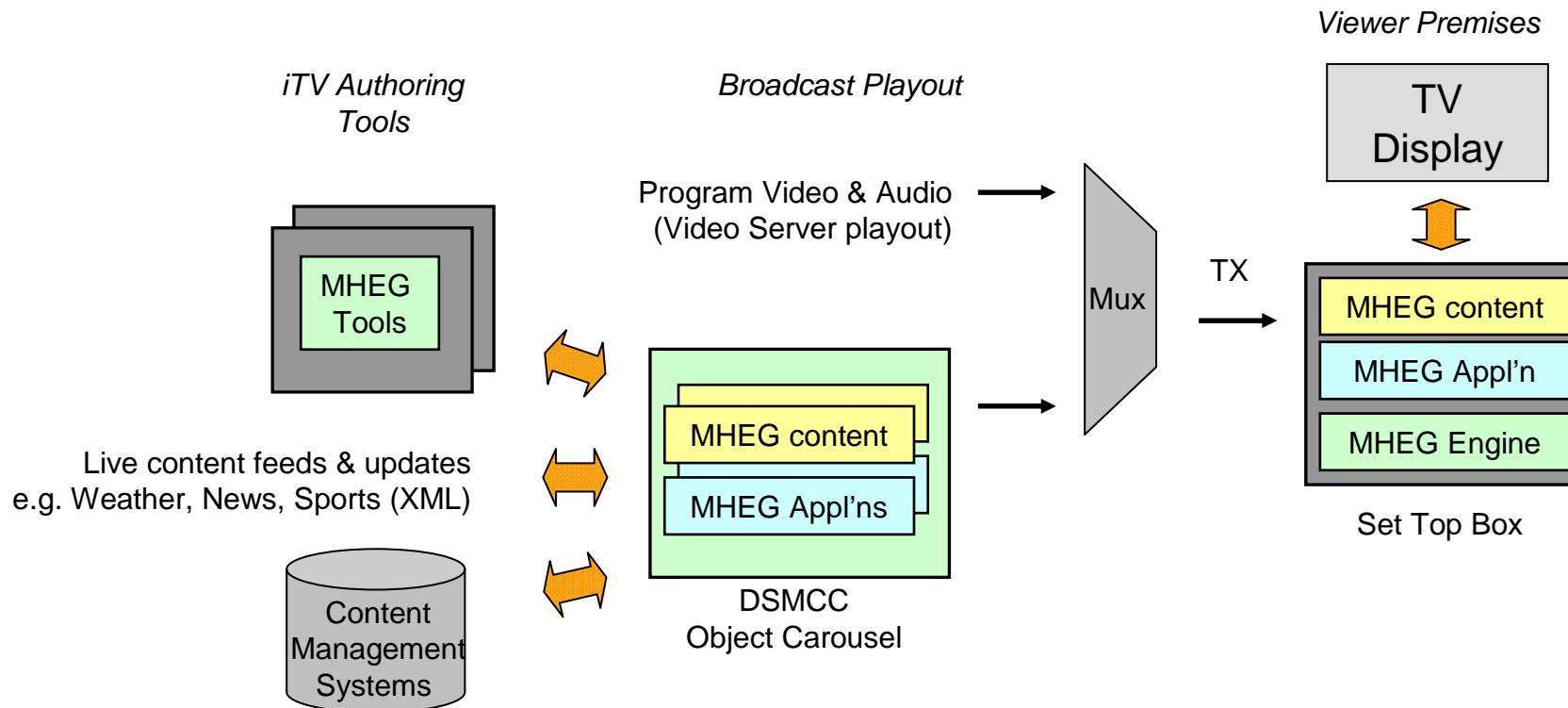
MHEG-5

- Developed in ISO-MHEG group and DAVIC in 1995
 - Intended as UI for DAVIC interactive services and VOD
 - Simple object oriented interpreted language
- Standardised in ISO 13522-5
- Adopted by UK DTG in 1997
- UK Profile includes text, graphics and DSM-CC carousel systems
- Profile evolved to UK Profile 1.06 (current)
- ETSI standard ES 202184
- NZ profile extends to include extra Maori characters and EPG key
- New Hong Kong profile released with support of Traditional Chinese
- Extensions under development for deployment in 2008
 - IP Interaction Channel (return path)
 - PVR support
 - Improved graphics
 - HD compatibility

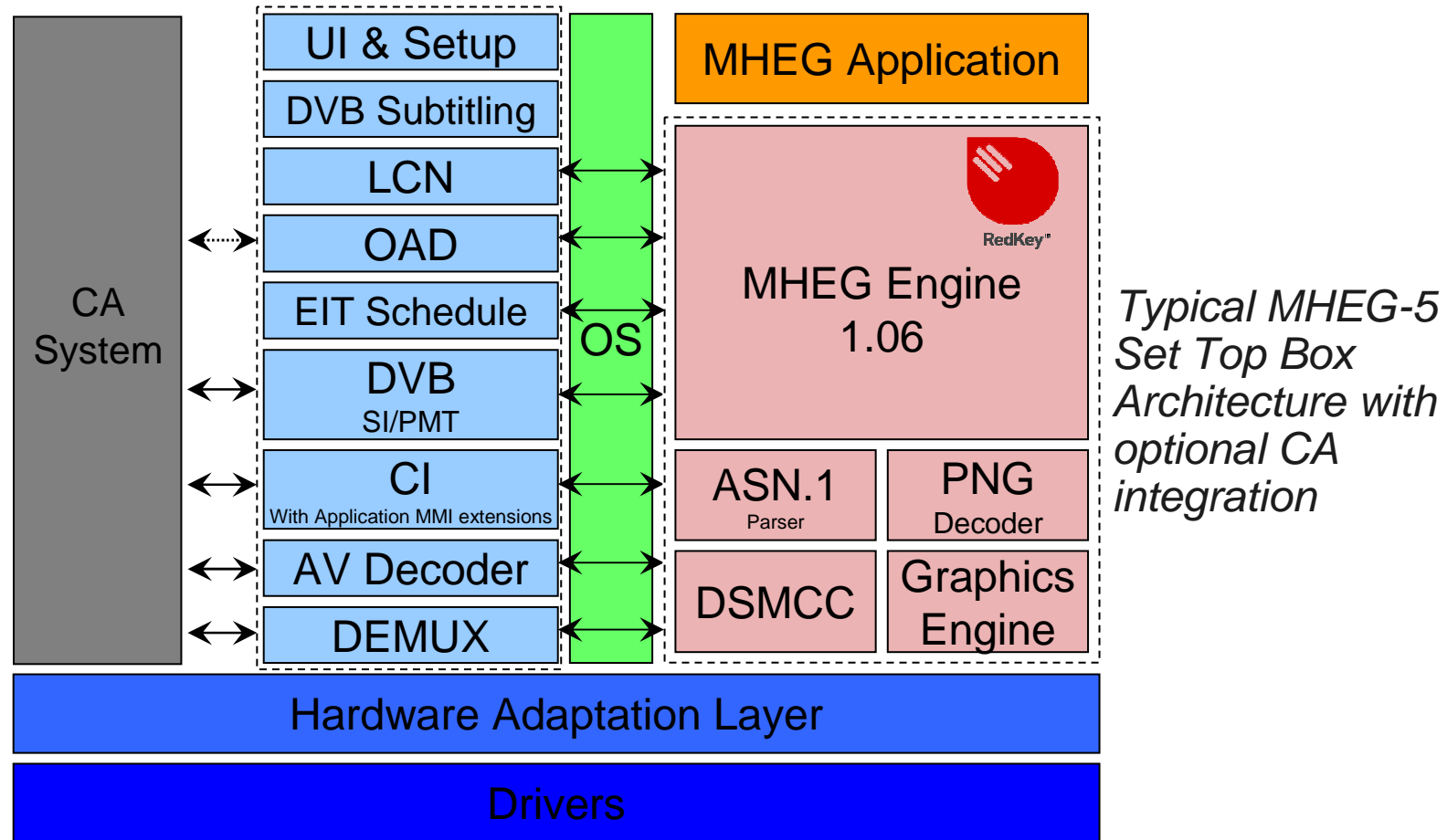
What is MHEG-5?

- Simple object orientated programming language
 - to control presentation of content made up from audio, video, text and still graphics objects
 - to provide user interaction with the application
 - supporting real time video and audio presentation
 - focussed on TV requirements
 - low overhead and high speed
- A complete environment including
 - Authoring tools and data systems
 - Broadcast transmission using DSMCC Object Carousel standard and optional IP-based connectivity
 - Middleware – the MHEG middleware or ‘stack’ that is resident in the STB. This provides an API on which interactive applications can run

MHEG System Architecture



MHEG-5 STB Architecture



The DTG and MHEG-5

- DTG
 - The **industry** association for digital television in the UK. It is independent, platform neutral and technology agnostic.
 - Members include broadcasters, retailers, manufacturers and regulators.
 - Publishes and maintains the D-Book – the technical requirements for receivers including MHEG-5
 - Has many working groups on emerging technologies, including HD, IP, VoD, etc
- DTG Testing
 - Interoperability testing – tests all receivers
 - Owns and licences the conformance test suites
 - Gives broadcasters confidence that they can deliver to a well characterised set of receivers that meet the interoperability requirements
 - Covers MHEG-5, SI, RF, AFD, subtitles & digital TV recorders

Receiver Conformance Testing

- An independent conformance test regime is strongly recommended in horizontal markets
- Publish a 'Minimum Profile Specification' for receivers that product must be tested against with an effective conformance test suite
- Engage the retailers in this process. (The customers will complain to them!) Have some form of branding to show the product conforms:



Conformance Regime

- In UK the conformance regime was weak until 2005/6.
 - Many problems arose from this, especially for retailers
- A tough conformance regime, using Pass/Fail tests to achieve brand acceptance, is recommended for
 - SI, Subtitles, MHEG-5, RF, OAD, AFD, etc
- OAD capability is essential for all receivers
- Much can be derived or licensed from DTG in UK
 - Including subcontracting work
- MHEG 1.06 has ~ 350 tests
 - Stable, managed, licensable test suite
 - Development programme in place for extensions

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- UK – Freeview report over 26.8 million receivers sold to Q4 2007

3.16 Between Freeview's launch in October 2002 and Q3 2007, almost 23.0 million DTT units have been sold. This includes over 7.2 million IDTVs and over 15.7 million DTT set-top boxes.

Figure 15: DTT cumulative sales since launch of Freeview in 2002



Source: Sales figures from GfK, as adjusted by Freeview.

- Q4 3.8m receivers product split: 2.1m iDTVs; 1.7m STBs

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- Joint venture between BBC and ITV
 - Launched in UK in May 2008
 - Over 80 channels in SD and HD
 - Free to view – no subscription
 - Standards:
 - DVB-S/S2
 - SD/HD MPEG-4 H.264 AVC
 - MHEG-5 (enhanced profile)
 - Available to 98% of UK homes

MHEG-5 Rollout

- Successfully deployed in UK Freeview
 - >30m receivers sold; >3.8m receivers sold in Q4 2007
 - 99% UK Freeview platform penetration
- Launched on UK Freesat – over 20,000 receivers shipped in 2 weeks!
- Launched in New Zealand in May 2007
 - DVB-S receiver sales over forecast so far (already >60,000 units)
 - DTT launched April 2008 with MPEG-4 H.264 HD and MHEG-5
- Will launch in India and in Hong Kong in 2008
- Trials and evaluations in Ireland, Malaysia, Singapore, Turkey, India and Taiwan with interest from other countries in Europe, Asia and Africa
- No known essential IPR
- MHEG middleware software typically less than US\$1 per receiver
- Lowest retail price in UK <€25 (MPEG-2)
- Wide integration into iDTVs in Europe
 - 50% of receiver sales now iDTV...MHEG all products in most leading brands
- MHEG is proposed as the UI for new Common Interface spec (CI+)

MHEG-5 Country Profiles

- Only specify what is required for each market to reduce font license costs and memory requirements.
- Based on UK Profile 1.06
 - New Zealand (adds Maori character set & EPG key)
 - Malaysia (adds EPG key)
 - India (adds Indian character sets and EPG key)
 - Ireland (adds Gaelic character set and EPG key)

Standards Comparison - MHEG-5

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 - Simple object oriented interpreted language
- Standardised in ISO 13522-5
- Adopted by UK DTG in 1997 with UK Profile covering:
 - text
 - graphics
 - DSM-CC carousel systems
 - Stream events
- ETSI standard ES 202184
- No known IPR or licensing required
- MHEG Middleware costs approx US\$1 per receiver
- Basic MPEG-2 STB costs US\$35 (retail)
- Wide availability of MHEG-5 in iDTVs

Standards Comparison - MHP

- Specification developed by DVB Project from 1998
- Includes
 - DSM-CC Carousel, stream events, text and graphics from MHEG
 - Java, Java TV from Sun
 - Extensions by DVB
- ViaLicensing IPR fees are up to US\$100,000 per annum per broadcaster for commercial use
- US\$1.75 per receiver device (manufacturer pays)
- Sun Java license also required
- MHP middleware software costs approx US\$8 per receiver
- Note that the IPR issues are unresolved at the current time
 - Key companies still register concerns at DVB re IPR issues
- Typical basic MPEG-2 set top box cost US\$100 (retail)
- Very few iDTVs have MHP included

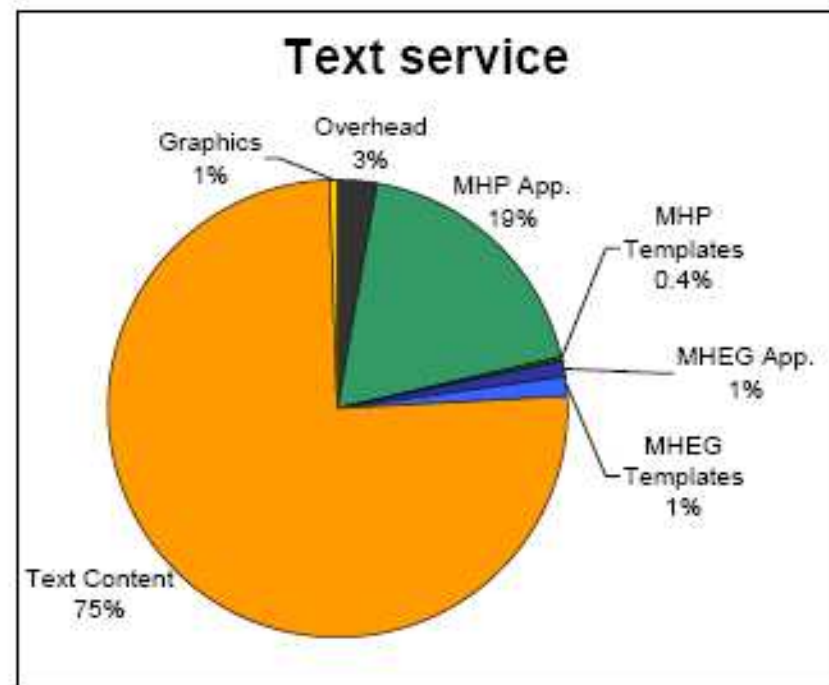
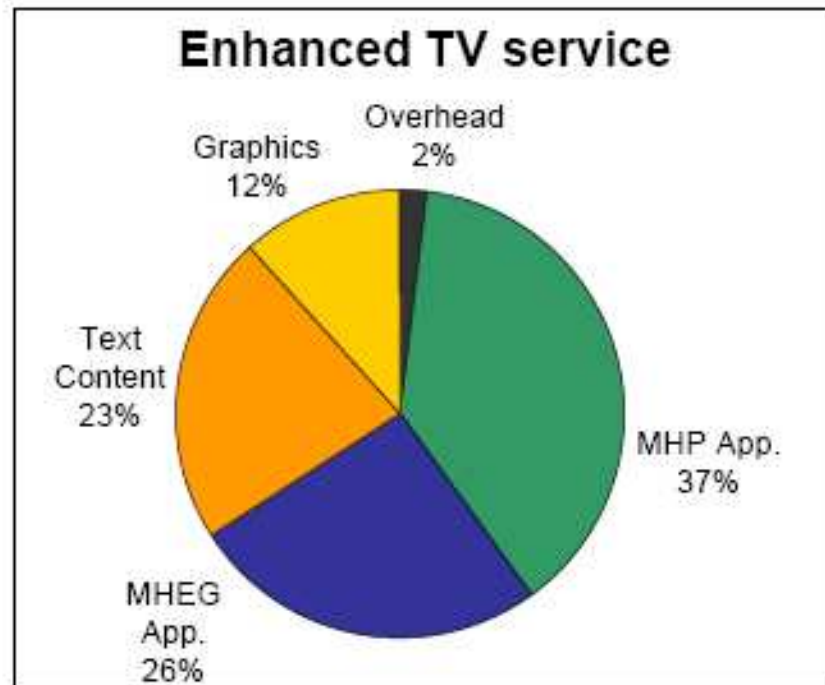
Standards comparison

| | MHP | MHEG 5 |
|---|--------------------------------|--------------------|
| CPU | 200 MIPS+ | ~ 100 MIPS |
| MEMORY | 32MBytes | 8-16MBytes |
| iDTV support | No | Many brands |
| IPR Licence/receiver | \$1.75/receiver | \$0 (No known IPR) |
| Broadcaster Licence (Commercial use >2.5m receivers) | \$50,000/yr to \$100,000/yr | \$0 (No known IPR) |
| Middleware Software Licence / receiver | ~ \$8 | ~ \$1 |
| Typical basic STB cost (MPEG-2 SD) | \$100 | \$35 |

MHEG vs Java

- MHEG-5 is designed specifically for TV presentation
 - Remote control operation
 - Displays built on TV layout
 - Works in its own safe memory space
 - Robust interpreted language
- Java is a complex general purpose tool with adaptations for TV
- As illustration of comparable complexity
 - MHP has >13000 unit tests
 - MHEG has <350
- But there are very few, if any, broadcast applications for TV that can be done in MHP and not MHEG-5
- MHEG-5 loads and runs faster

MHEG applications are smaller



Source: MHP/MHEG Coexistence project. BBC Research.

- Smaller applications means faster start and lower cost transmission

MHP rollout

- Italy
 - 6m+ units, 95% STB MHP enabled; iDTV almost zero
 - Initial market had large government STB subsidy
 - Government MHP services mostly stopped
 - No security implemented
- Spain
 - 9.7m+ DTT units. < 5000 MHP enabled so no audience
- PayTV
 - Poland – TVN - 320k
 - Belgium - Telenet cable TV - 400k+
 - South Korea - SkyLife PayTV - 2m
 - Switzerland - Telegeneve - <20k
- Recently launched in Austria and Norway
 - but not a mandatory part of the receiver specification so audience penetration relatively small

MHP cancellation

- Very limited penetration (<2% of audience) in other markets (Finland, Sweden, Germany, Australia, Denmark) despite several years of operation
- Major German (ZDF & RTL) and Finnish (MTV3) broadcasters have stopped broadcast MHP services
 - no market in MHP receivers (<2% audience reach)
 - application authors out of business
 - major network in Germany now planning MHEG-5
- Unsuccessful trials in Taiwan, Malaysia, Singapore
 - Taiwan is now considering MHEG-5 for 'second generation' HD receiver specification
 - Singapore is currently trialling MHEG-5
 - Malaysia has announced MHEG-5 for their DTT network.

MHP Problems

- Relatively limited manufacturer support, especially in iDTVs, due to the high cost of licensing, implementation and conformance (>13,000 individual tests).
- EBU has withdrawn its recommendation for MHP. Broadcasters object on principle to paying a license fee. Both the EBU and ASEAN asked the DVB for clarification at DVB World....
- Sun has announced 'Ginga', a Java open-source alternative to MHP, primarily to "work around the MHP Patent Pool" necessitated "...by the unreasonable patent pool terms"

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MHEG Extensions for 2008

- Specification work underway within DTG working groups that will output to ETSI for standardisation:
 - Interaction channel (Return path)
 - HD support
 - Conformance tests being built by DTG Testing
- In addition work is underway elsewhere:
 - PVR Support
 - Proposed new version of Common Interface, CI+ will use MHEG for user interface

MHEG Interaction Channel

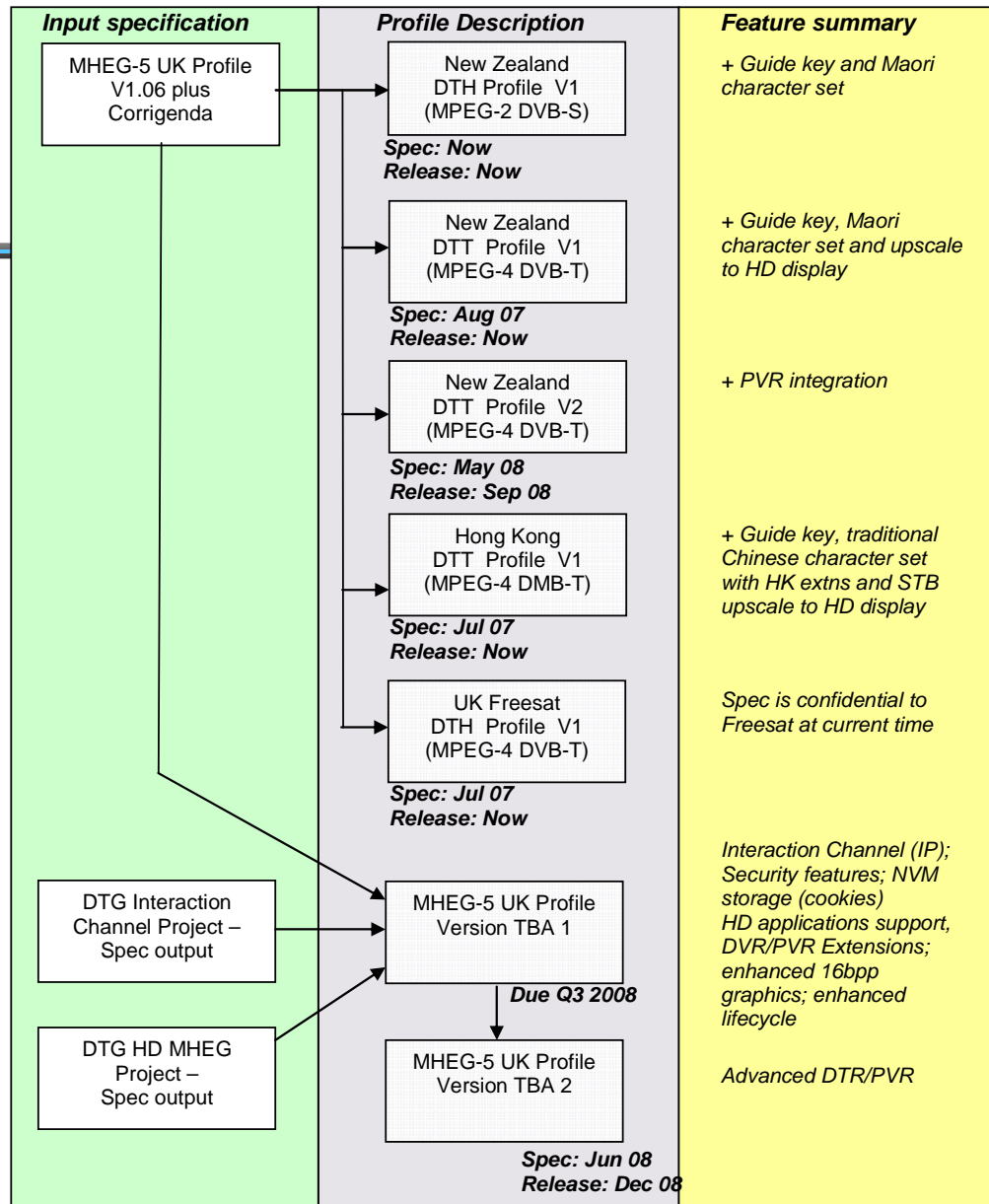
- Extension of Profile to add ‘always on’ IP connection
 - Connected to home broadband network
- Enables
 - Seamless extension of interactive services
 - Content from broadcaster-defined servers
 - Commercial transactions
 - Security
- Specification in final draft within DTG for use in 2008
 - Including confirmation test regime
- IPTV extensions under discussion
 - MHEG control of presentation of streamed and possibly downloaded a/v from IP source
 - BBC have announced that I-Player “catch-up TV” will be supported on Freesat later this year

HD MHEG

- DTG Working group established in 2007 with terms of reference to determine the changes required for the MHEG sections of the D-Book to allow receivers to implement MHEG in an HD broadcast environment.
- Maintains backward compatibility for legacy receivers
- Specification is **now completed** and will now be added to the HD D-Book
- Additional features include:
 - H.264/AVC video support for I-Frames
 - Adds JPEG graphics support in addition to PNG
 - Intelligent text rendering and square pixel format
 - Automatic selection between SD and HD assets depending on display capability
 - Assumes 720 minimum vertical display resolution as ‘HD Ready’

PVR Support

- Extensions to MHEG-5 have been specified to enable control of PVR engines for booking of recordings from an MHEG-5 application
- Maintains compatibility with Freeview Playback specification with use of CRIDs for accurate recording control with series linking and recommendation extensions
- Successful BBC/Cabot PushVOD trial completed in 2007
- Freeview New Zealand will launch an integrated MHEG EPG / PVR solution later this year based.



MHEG-5 Profile Specification Roadmap as at May 2008

MHEG in CI+

- S&T is cooperating with Neotion, Sony and others to demonstrate the capability of MHEG-5 as a UI for CI+
- Specification is based on the CI AppMMI extension first used by OnDigital for their CA modules in the UK.
- MHEG-5 will allow PayTV operators to provide a more feature rich presentation than has been previously capable with DVB-CI MMI, including graphics and more extensive text capability with support for more complex applications.
- The profile specifies the most frequently used facilities of UK MHEG but removes many of the more complex parts to ease the implementation and conformance requirements.

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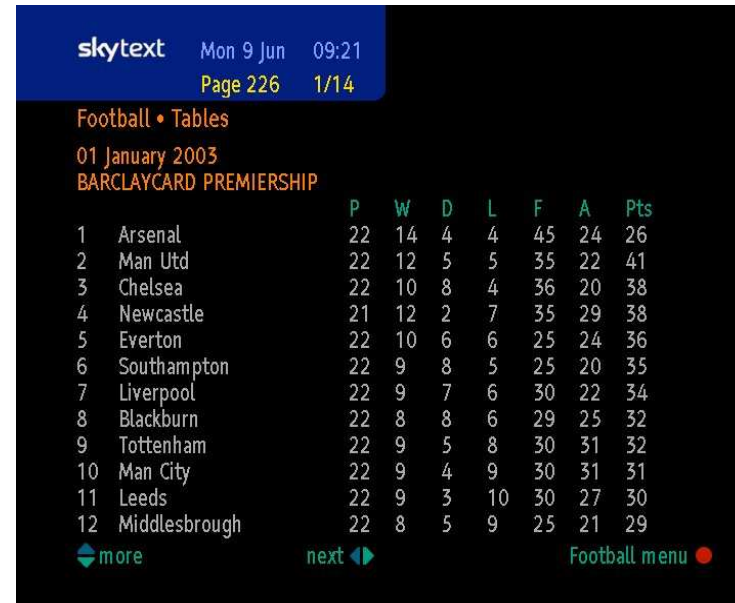
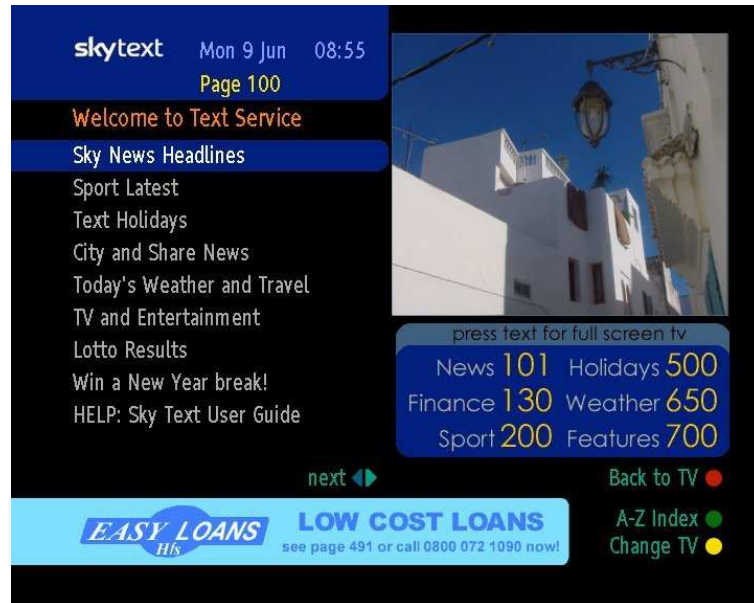
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BBCi on Freeview UK



- Digital teletext – same content and page numbers as analogue teletext but much better presentation
- Trusted, reliable and now faster than analogue teletext

Skytext on Freeview UK



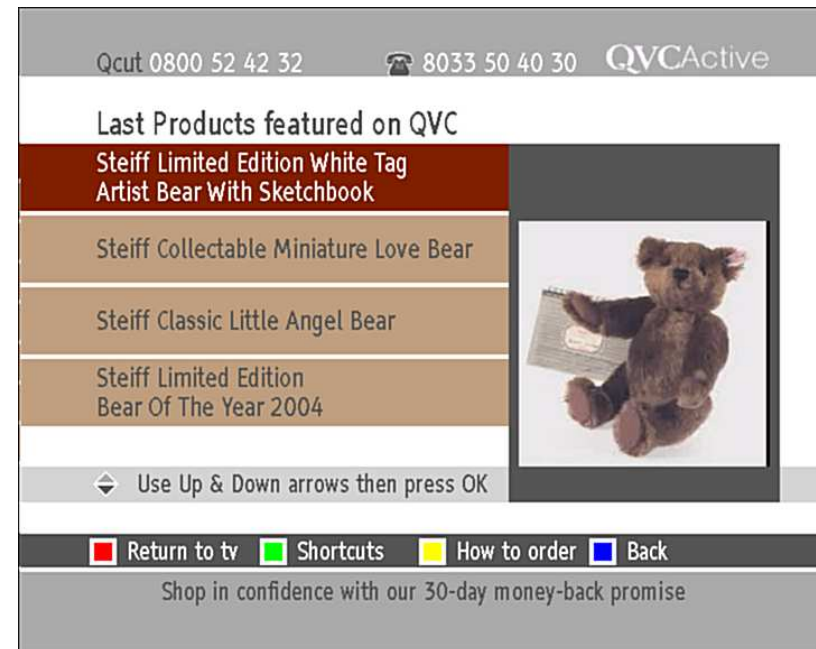
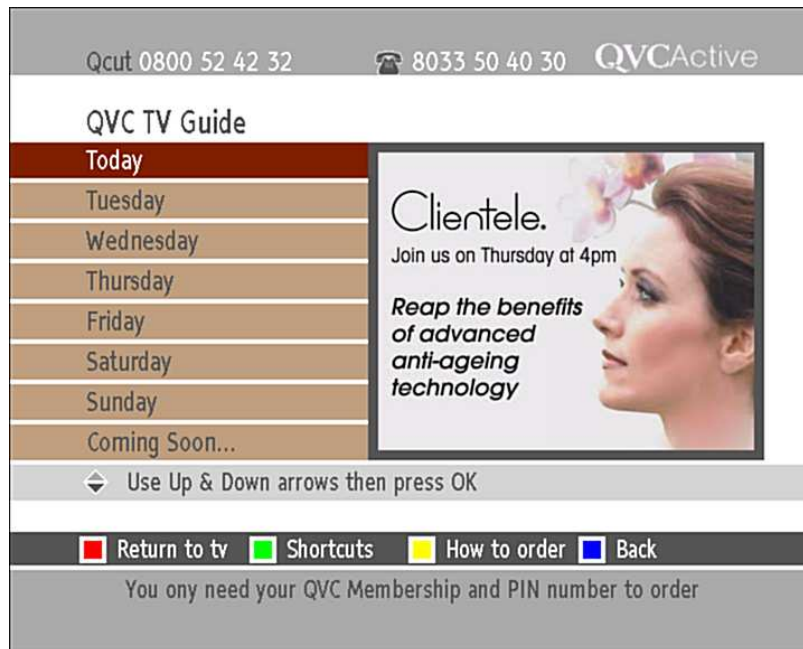
- 500 'pages' with frequent content updates (mostly automatic)
- Integrated with SysMedia content management and production system
- Profit generating (though advertising)

Multiscreen Services

- MHEG controls the presentation and choice of multi-screen services
 - User chooses which to view
 - Has access to information on each event
 - 40%+ of digital sports viewers in UK use these applications

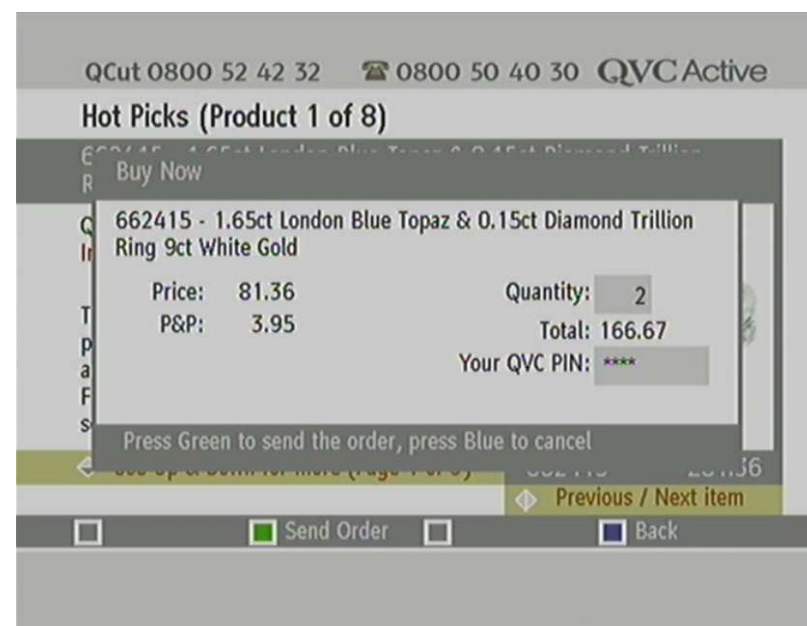


Shopping - QVC (Freeview UK)



- Integrated with QVC's existing CMS using XML
- Runs completely automatically using a data-driven model
- Profit generating through sales increases
- Can be extended to include transactions

QVC prototype with online purchase



Green 'Buy Button' leads to online purchase via the IP interaction channel

Games - Tetris

- Stand-alone gaming application:
- Free-to-play or pay-per-play via premium rate phone



Games “Studio Runners”



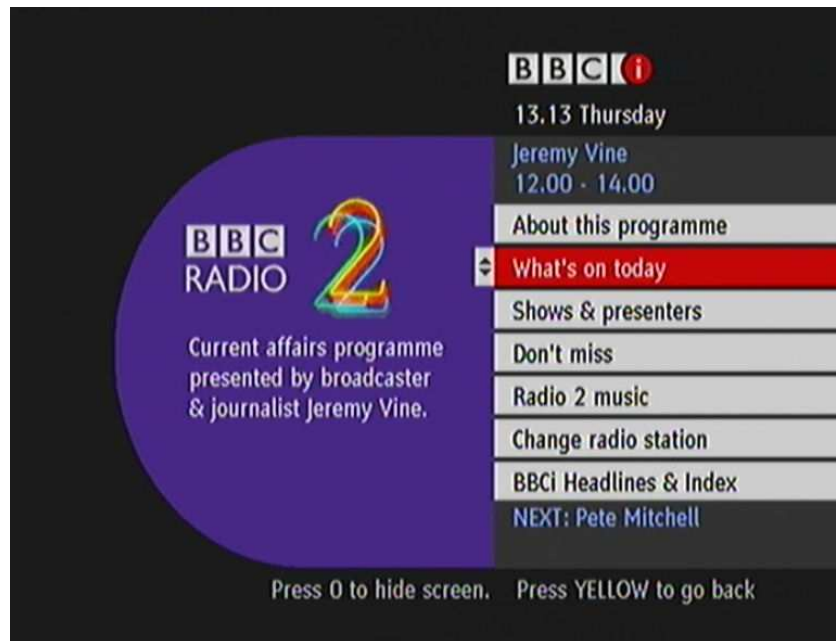
‘Sokoban’ maze game for BBCi

Placeholders



- All receivers have MHEG-5 middleware in UK market
- Bandwidth is switched between services at different times of the day
- MHEG applications display channel info in a few kbits/sec when the service is not on air. Avoids a black screen!

Radio channels



- Many radio services carried on Freeview
- Avoid the black screen by providing 'RadioText'
- Provides information on channels, playlists, presenters, etc.

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- Demonstration of MHEG-5 application from recorded transport streams



Freeview New Zealand

IMPALA

- Free to air DTH platform (May 2007) and DTT platform (Spring 2008)
- Required a platform EPG that:
 - Gave all broadcasters equal prominence in the guide
 - Provides same presentation and behaviour on all receivers
 - Supported both platform and broadcaster branding with logos
 - Provided 7+1 day listings and also a 'Now/Next' display

New Zealand EPG

Channel logo



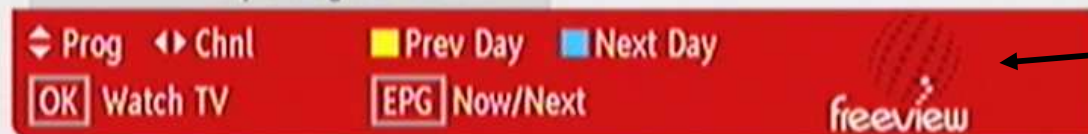
Programme Listing (scrolls)

| | |
|---------|--|
| 12.20am | Sit amet consectetur |
| 1.00am | Enim ad minim veniam quis |
| 2.20am | Nisi ut aliquip |
| 2.45am | Ea commodo consequat |
| 3.25am | Veniam quis nostrud exercitation ullamco |
| 4.30am | Nisi ut |
| 5.55am | Consectetur adipisicing elit sed do |



Adipiscing elit sed do eiusmod tempor incididunt ut labore et dolore magna aliqua ut enim ad minim veniam quis nostrud exercitation ullamco laboris nisi ut.

PGR 




Video window of channel viewed when EPG launched

Programme synopsis and metadata

Platform/ operator logo or advertising

New Zealand EPG



What's on now/next. 0.21am Sat 26 May

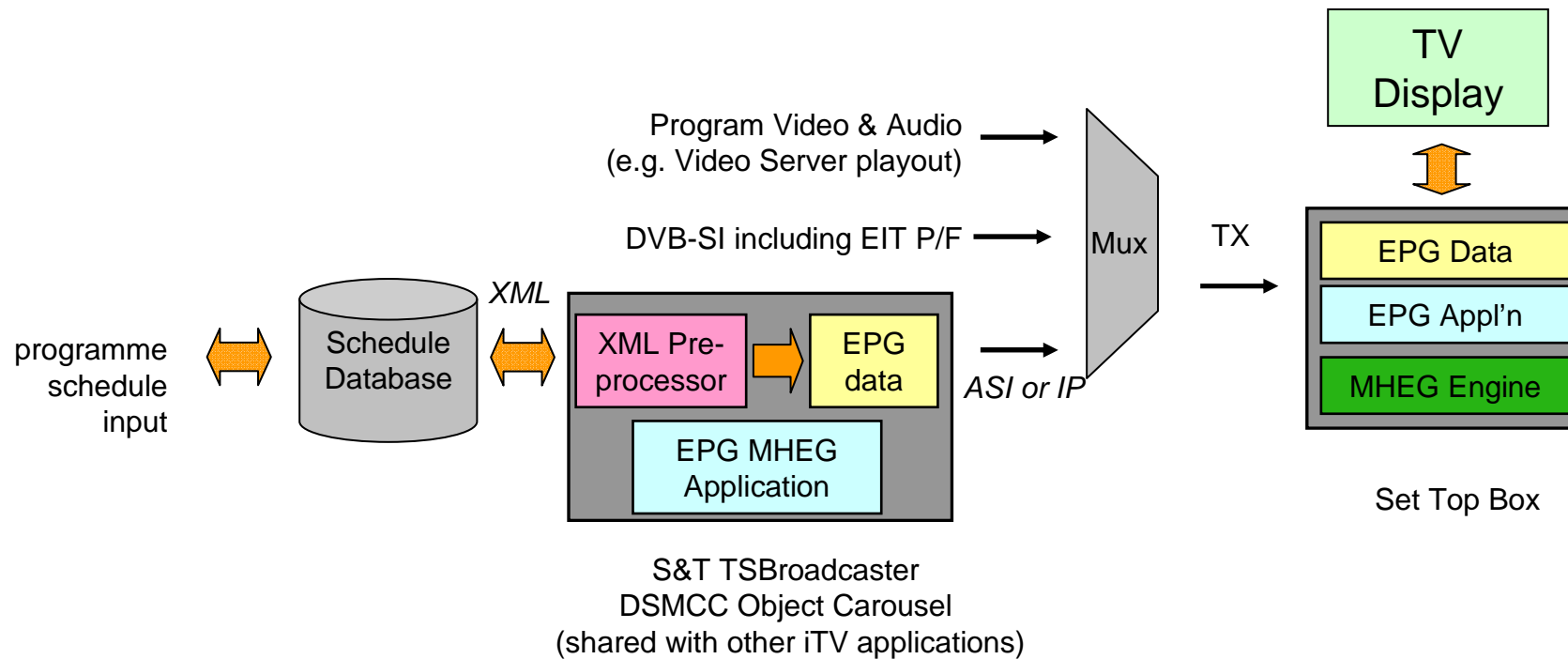
| | | | |
|---|-----------------|--------------|------------------------------------|
| 1 | TVONE | Now 10.45am | Dolor sit amet consectetur |
| | | Next 11.40am | Ut enim |
| 2 | TV2 | Now 10.50am | Exercitation ullamco laboris ni... |
| | | Next 11.35am | Ut enim ad minim |
| 3 | TV3 | Now 11.10am | Tempor incididunt ut labore et |
| | | Next 12.05pm | Do eiusmod |
| 4 | C4 | Now 12.00am | Blender |
| | | Next 2.00pm | Twice As Nice |
| 5 | MaoriTelevision | Now 11.00am | Minim veniam quis nostrud |
| | | Next 11.55am | Et dolore magna |

Chnl
 OK Watch TV EPG Listings freeview

Now/Next view across several channels

Now/Next Program Listing (scrolls)

Platform/operator logo or advertising





New Zealand



- The S&T MHEG EPG uses a private data stream broadcast using the object carousel. This offers the benefits of:
 - Compression – the data is efficiently compressed so requires approx one quarter of the broadcast bandwidth required by EITschedule
 - All viewers get the same EPG (rather than each receiver manufacturers EPG implementation) so is ideal if a consistent 'platform' EPG is required
 - All channels get equal prominence on the EPG as it always launches to the schedule of the channel you are watching
 - The EPG is under the broadcaster's control (not the receiver manufacturer) so can include advertising and sponsorship or other customised features

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PushVOD

- Demonstration of Cabot/BBC PushVOD Trial PVR



CATCH-UP TV CONTENT
A-Z NAVIGATOR



CATCH-UP TV CONTENT
GENRE NAVIGATOR

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Summary

- MHEG-5 has achieved very significant success in the UK and NZ with Freeview and Freesat UK
- Ireland and Hong Kong DTT will both launch later this year as significant markets, with other territories likely to follow
- PayTV operators are also adopting MHEG-5 – Digicable in India will launch later this year
- No known essential IPR licensing
- MHEG-5 Receiver cost is low enough to enable **all** receivers in a market to include the middleware, enabling broadcasters and operators to build business models around near 100% audience penetration
- Conformance testing is straightforward and effective
- PVR, High-definition and IP support will **all** be available in MHEG-5 this year

Thank you!

Web site: www.impala.org

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