Impact case study (REF3b)

Institution: BRUNEL UNIVERSITY (H0113)

Unit of Assessment: 15 – General Engineering

Title of case study: **Delivering Real-Time Mobile TV Services**

1. Summary of the impact (indicative maximum 100 words)

The worldwide population of mobile TV subscribers had almost quadrupled from 75 million in 2008 to 271 million in 2011, and it is expected to reach 792.5 million by 2014 according to RNCOS report (an industry and consultancy firm) on Global Mobile TV Forecast to 2013. The recent roll-out of 4G in the UK strongly features its capacity to deliver real-time TV programmes and videos with high-definition image quality on their mobile devices. Brunel Wireless Networks and Communications Centre developed a global schema, DVB-CBMS (Digital Video Broadcast – Convergence of Broadcast and Mobile Service), subsequently adapted as OMA-BCAST (Open Mobile Alliance – Broadcasting Services Enabler Suite), which enables users to access mainstream TV channels at real time through various networks such as DVB-H in Europe, DVB-SH (satellite) in the USA and DVB-NGH in China.

OMA-BCAST has been successfully used in South Africa, Nigeria and Ghana since 2010: a digital satellite TV service provider, DStv Mobile, delivers mobile TV programmes to its 6.7 million subscribers in Africa. In Europe, 3 Italia offered DVB-H customers free access to six TV channels in 2008; 3 Austria had 90,000 subscribers to its DVB-H mobile TV service between 2008 and 2009. Major mobile phone manufacturers such as Nokia, Samsung and LG have launched special mobile TV editions (e.g. Nokia 5330, Samsung, Philips, Garmin, LG, Motorola, Sagem, ZTE, etc) using DVB-H technology and the convergence system.

2. Underpinning research (indicative maximum 500 words)

Prof Cosmas, the Director of Broadcasting Networks at the Wireless Networks and Communications Centre at Brunel University, has been at the forefront of developing a convergence system which enables mobile phone and internet users to stream real-time TV programmes and on-demand videos. All mobile service users, regardless of their device brands, location, and/or network can watch TV programmes live without connection loss because the convergence system enables the delivery of multimedia content through the broadcast mode or cellular (unicast) mode, switching over if one mode is interrupted. Broadcast networks offer better delivery of mainstream TV channels to a large audience whereas cellular networks (unicast) allows the distribution of a large number of channels.

This has become possible through the development and subsequent adaptation of a global schema, OMA-BCAST (Open Mobile Alliance – Broadcasting Services Enabler Suite), an adapted version of the DVB-CBMS (Digital Video Broadcast – Convergence of Broadcast and Mobile Service). The Open Mobile Alliance is the leading global industry forum for developing market-driven, interoperable specifications for mobile services and the full acceptance of the schema of OMA-BCAST was the direct result of the European Commission-funded project, Instinct for Convergence, coordinated by Brunel University and involving 25 industrial and academic partners.

Since 2000, Prof Cosmas and his colleagues, Drs Itagaki and Owens have been leading the development and enhancement of the convergence system through European Commission-funded projects (SAMBITS, CISMUNDUS, CONFLUENT and INSTINCT for Convergence). These provided technical exemplar solutions that were disseminated to industry through trade exhibitions and technical conferences and journals, elements of which were standardised by bodies such as the DVB project and the Open Mobile Alliance (OMA).

The initial attempt to provide multimedia services through the internet (including landline, cable and satellite) began in January 2000 when Prof Cosmas led a research project, SAMBITS (System for Advanced Multimedia Broadcast and IT Services), which brought together European broadcasting companies, including the BBC, and researchers from Philips, Siemens and Queen Mary University. This led to the development of the first convergence system that interoperated internet services and broadcast networks, offering enhanced video image quality and, interactive, personalised information. Subsequent EU projects – CISMUNDUS (2001-2003), CONFLUENT (2002-2003) and

finally 'Instinct for Convergence' (2004-2005) focused on commercial and user needs for handheld devices, with respect to high-speed operation, low-power consumption, simultaneous updating of TV programme schedules, interactivity (online shopping or voting), etc.

The commercial and technical advantages of the convergence system 'DVB-CBMS' (i.e. OMA-BCAST) were proven by its successive adaptation for various broadcast and cellular networks: it was originally developed for the broadcast network DVB-H (Digital Video Broadcasting – Handheld) which is an enhanced version of a terrestrial TV network DVB-T (Digital Video Broadcasting – Terrestrial) with additional features for delivering multimedia contents to handheld devices; the same system was also adapted for 3G and wireless LAN networks (WIMAX).

DVB-SH (satellite to handheld) is an evolved version of DVB-H, which delivers mobile TV services on terrestrial networks, satellite networks or hybrid terrestrial and satellite networks, which also uses the DVB-CBMS schema for discovering IP TV services.

The convergence demonstration system was first publicly exhibited at the International Broadcasting Convention 2001 (SAMBITS) and IBC 2003 (CISMUNDUS) and was nominated as one of the best five demonstrations at the exhibition; its improvement was continuously displayed in IBC 2005 (INSTINCT).

3. References to the research (indicative maximum of six references)

1) Fabio Allamandri, Sebastien Campion, Angelo Centonza, Alex Chernilov, John Cosmas, Annette Duffy, David Garrec, Michel Guiraudou, Kannan Krishnapillai, Thierry Levesque, Bertrand Mazieres, Ronald Mies, Thomas Owens, Michele Re, Emmanuel Tsekleves, Lizhi Zheng (2007) Service Platform for Converged Interactive Broadband Broadcast and Cellular Wireless, *IEEE Transactions on Broadcasting,* 53(1-part 2): 200-211
http://dx.doi.org/10.1109/TBC.2007.891706

2) Angelo Centonza, Thomas Owens, John Cosmas and Yong-Hua Song (2007) Differentiated service delivery in cooperative IP-based broadcast and mobile telecommunications networks, *IMA Journal of Management Mathematics*, 18(3): 245-267
http://dx.doi.org/10.1093/imaman/dpm018

3) A. Centonza, P. Casagranda, T.J. Owens, J. Cosmas, Y.H. Song, "Management of Digital Video Broadcasting Services in Open Delivery Platforms", *Int. J. Mobile Communications*, Vol. 5, No. 2, pp186-214, 2007. http://dx.doi.org/10.1504/IJMC.2007.011818

4) Fabio Allamandri, Jean-François Le Boite, Sebastien Campion, Angelo Centonza, Alex Chernilov, John Cosmas, Emmanuel Tsekleves, David Garrec, Michel Guiraudou, Kannan Krishnapillai, Thierry Levesque, Michele Re, Lizhi Zheng "CONVERGED DVB-H AND CELLULAR TELECOMMUNICATIONS SERVICE ARCHITECTURE", World Wireless Congress 2005, San Francisco, USA May 26th – May 28th 2005.

5) Jean-Luc Sicre, Annette Duffy, Raquel Navarro Prieto, Marcello Otte, John Cosmas, Emmanuel Tsekleves, Michele Re, Veronique Leturcq, Ronald Mies "Three user scenarios on the joint usage of mobile telco and TV services for customers on the move" Wireless World Research Forum (WWRF), Canada November 2004.

6) Thierry Levesque, FTR&D, Sebastien Campion, FTR&D, Jean-François Le Boite, FTR&D, Michel Guiraudou, Motorola Labs, David Garrec, Motorola Labs, Fabio Allamandri, Netikos, John Cosmas, Brunel University, Lizhi Zheng, Brunel University "ELECTRONIC SERVICE GUIDE" DVB-CBMS Group, Input to Call for Technology for IP Datacast in DVB-H, 15th September 2004.

Grants

1) SAMBITS - (System for Advanced Multimedia Broadcast and IT Services, EU-IST, £250k, PI: Prof J. Cosmas, Jan 2000 to Dec 2001

2) CISMUNDUS - Convergence of IP-based Services for Mobile Users and Networks in DVB-T

and UMTS Systems, EU-IST, £500k, PI: Prof J. Cosmas, Jul 2001 to Dec 2003
http://dea.brunel.ac.uk/project/Cismundus/

3) CONFLUENT - Enabling commercial application of convergent services in collaborative networks of UMTS & DVB-T systems, EU-IST, £100k, PI: Dr T. Owens, May 2002 to May 2003 http://dea.brunel.ac.uk/confluent/

4) INSTINCT - IP-based Networks, Services and Terminals for Converging Systems, EU-IST, £750k, PI: Dr T. Owens, Jan 2004 to Dec 2005 http://dea.brunel.ac.uk/instinct/

4. Details of the impact (indicative maximum 750 words)

Digital contents get delivered to mobile phones (as mobile TV), PCs (as Web TV), terrestrial TV and satellite TV. The worldwide population of mobile TV subscribers had almost quadrupled from 75 million in 2008 to 271 million in 2011, and it is expected to reach 792.5 million by 2014 according to RNCOS's (an industry and consultancy firm) report on Global Mobile TV Forecast to 2013. Smartphone users spend one fifth of their usage time watching videos and TV programmes on their mobile phones in the UK (Nielsen Mobile Insights, 2012). The recent roll-out of 4G in the UK strongly features its capacity to deliver real-time TV programmes and videos with high-definition image quality on their mobile devices.

The Open Mobile Alliance, the leading global industry forum for developing interoperable specifications for mobile services, publicly stated in 2012 that its schema, OMA-BCAST, was adapted for various networks: DVB-H in Europe, DVB-SH (satellite) in the USA and DVB-NGH in China. The document called for further enhancement of OMA-BCAST for 4G and LTE networks, attesting to its agility and adaptability, following the technical advancement of networks.

Rapid evolution of technologies in the field of communication networks means that technologies need to be both agile and easily upgradable.

From the time of its official endorsement by the European Union in March 2008, DVB-H, the broadcasting network that delivered digital contents to handheld devices, enjoyed the privilege of being the most preferred method in Europe until its service came to halt in early 2012. The network used the convergence system schema known as DVB-CBMS, which was designed by Prof Cosmas and his team along with their industrial partners, to provide users with access to live TV programme channels. For example, according to the General Manager in Institut fuer Rundfunktechnik (the research centre of the German, Austrian and the Swiss public broadcasters), DVB-H network was available in Austria since the start of the UEFA European Football Championship 2008 until the end of December 2010. In Feb 2009, 3 Austria announced that it had 90,000 subscribers to its DVB-H mobile TV service since its first launch in June 2008. In Switzerland, DVB-H was launched in mid-May 2008 by Swisscom (*Bluewin TV mobile*), before the UEFA European Football Championship 2008 and the service continued until March 2010. [corroborating source 1]

In Germany, Mobile DVB-H phones were announced in accordance with the OMA-BCAST, for example, Samsung SGH-P960 supported both DVB-CBMS and OMA-BCAST. [corroborating source 1]

In June 2008, 3 Italia announced its offer to provide DVB-H customers with free access to six TV channels. In Feb 2009, Italy launched a full OMA-BCAST compliant service delivery platform to operate worldwide. Major mobile phone manufacturers such as Nokia, Samsung and LG have launched special mobile TV editions (e.g. Nokia 5330, Samsung, Philips, Garmin, LG, Motorola, Sagem, ZTE, etc) using DVB-H technology and the convergence system. [corroborating source 1]

In Africa (South Africa, Nigeria and Ghana), DVB-SH and OMA-BCAST (DVB-CBMS) has been a huge success since its launch in 2010. A digital satellite TV service provider, DStv Mobile provides real-time TV programmes via Walka 7, a portable TV with a 7" viewing screen. The countries use an Electronic Programme Guide, which updates scheduling information for current and upcoming broadcast programmes and this can only be interfaced with OMA-BCAST. In 2013, DStv subscribers across Africa reached 6.7 million, with 4.5 million from South Africa. [corroborating source 2]

5. Sources to corroborate the impact (indicative maximum of 10 references)

1. A letter received by the General Manager of Collaborative Research, Institut fuer Rundfunktechnik GmbH (IRT), confirming the use of OMA-BCAST and DVB-H network in Austria, Italy, Germany and Switzerland

2. A letter received by Product Line Manager, ENENSYS Technologies, France, confirming the use of OMA-BCAST in Africa

3. MWC news: 3 Italia launches OMA BCAST service (19/02/2009) http://www.csimagazine.com/news-19-02-2009-oma.php /

4. Use of the Digital Video Broadcasting to a Handheld (DVB-H) network: http://www.digitag.org/DTTResources/DVB-H.php

5. Work Item 270, approved by the OMA Technical Plenary WID – 270 Enhancement of OMA BCAST enabler BCAST 1.3 (BCAST 1.3) Approved on 4 Sept 2012 http://technical.openmobilealliance.org/tech/OMAWP/Current/RPT_Work_Item_details.pdf direct link to the document: http://member.openmobilealliance.org/ftp/Public_documents/TP/Permanent_documents/OMA-WID_0270-BCAST-V1_3-20120904-A.zip