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Abstract

This document, part of a set of deliverables D7.1.x, is intended to provide an outline of the project's exploitation plans starting from the business rationale and value proposition perspective, and is a response to the 1st Annual Review recommendations. The value proposition of activities in SUIT is taken as a starting point and rationale for the work. Exploitation of the outcome of SUIT assets on the level of SUIT consortium and on the level of each SUIT partner is based on market analysis in the relevant market segments and Operators expectations. Information on commercial drivers and the potential for integration with partners existing portfolios of products and service are presented. D7.1.3 will be updated by D7.1.4 and afterwards by the TIP, D7.4.

Note : There is one month delay on delivering this report because the operator jointed SUIT on August 1st, 2007.

Keyword list: Technology Implementation Plan (TIP); Dissemination; Exploitation

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Plan for using and dissemination/exploiting knowledge (Dissemination and Technology Uses)

WP7_D7.1.3

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Table of Contents

List of abbreviations & symbols

All-IP	= All-Internet Protocol
AVC	= Advanced Video Communication
ARPU	= Average Revenue Per User
BWA	= Broadband Wireless Access
CC/PP	= Composite Capabilities/Preferences Profile
COST	= European Co-operation in the Field of Scientific and Technical Research
CTC	= Convolutional Turbo Coding
DVB-T	= Digital Video Broadcasting-Terrestrial
DVB-T/H	= DVB-T/Handheld
DVB-RCT	= DVB- Return Channel Terrestrial
ENG	= Electronic News Gathering
ETSI	= European Telecommunications Standards Institute
FEC	= Forward Error Correction
FMO	= Flexible Macroblock Ordering
FPGA	= Field Programmable Gate Array
FTP	= File Transfer Protocol
FWA	= Fixed Wireless Access
HD	= High Definition
HDTV	= High Definition Television
HO	= Hand_Over
IBBT	= Interdisciplinair Instituut voor Breedband Technologie Vzw
IEEE	= Institute of Electrical and Electronics Engineers
IRT	= Institut für Rundfunktechnik GmbH
IPR	=Intellectual Propriety Right
ISP	=Internet Service Provider
IT	= Instituto de Telecomunicações
ITU	= International Telecommunications Union
ITU-R	= International Telecommunication Union Radiocommunication Sector
JVT	= Joint Video Team
LDPC	= Low Density Parity Check
MCTF	= Motion-Compensated Temporal Filtering
MD	= Multiple Description
MDC	= Multiple Description Coding
MD-SVC	= Multiple Description-Scalable Video Coding
MHP/IPTV	= Multimedia Home Platform/ Internet Protocol Television
MMR	= Monthly Management Reports
MPEG21-DIA	= Moving Picture Experts Group 21 Digital Item Adaptation
MPEG AVC	= MPEG Advanced Video Coding
OFDM	= Orthogonal Frequency Division Multiplexing
OFDMA	= OFDM Access
PB	= Project Board
QAM	= Quadrature Amplitude Modulation
RF	= Radio Frequency
QoS	= Quality of Service
R&S	= Rohde & Schwarz
RTP/RTCP	= Real-time Transport Protocol/ RTP Control Protocol
RTSP	= Real Time Streaming Protocol
RUNCOM	= Runcom Technologies Ltd
SDC	= Single Description Coding
SDP	= Session Description Protocol
SDPng	= Session Description Protocol (New Generation)
SIP	= Session Initiation Protocol

MPEG-21 DIA-UED	= Moving Picture Experts Group 21 Digital Item Adaptation – Usage Environment Description
SoC	= System on Chip
SVC	= Scalable Video Coding
TIP	= Technology Implementation Plan
UHF	= Ultra High Frequency
UPA	= Unequal Power Allocation
UPM	= Universidad Politécnica de Madrid
UniS	= The University of Surrey
URL	= Universitat Ramon Llull Fundacio Privada
VITEC	= SA VITEC
WAVECOM	= WAVECOM - Soluções Rádio, Lda
WiFi	= Wireless Fidelity
WiMAX	= Worldwide Interoperability for Microwave Access
WISP	= Wireless Internet Service Providers
WLAN	= Wireless Local Area Network
WP	= Workpackage

1 Introduction

Deliverable 7.1.2, in the aspects of exploitation, has been criticized in the last SUIT review. In order to improve it, SUIT members have taken some initiatives namely the inclusion of an operator in the Consortium. The operator's experience on developing operator business models could help SUIT to meet SUIT reviewers' requirements. Thus, The Consortium followed another strategy, quite different than described in the previous dissemination/exploitation deliverables, D7.1.1 and D7.1.2. It would be good to have a feedback from the Commission concerning the content of this deliverable as soon as possible.

As in any innovative project, SUIT is concerned with the technology and exploitation feasibilities. This deliverable is divided into eight sections:

1- Section 1 describes the SUIT reference model with the requirements, i.e. all advantages of converging WiMAX and DVB-T/H, a market-oriented architecture including all possible reception profiles suited to the market namely to the operators. This Section ends with a compatibility discussion in order convince operators with existing systems to migrate to SUIT concept.

2- Section 2 discusses all recommendations reported by the Commission/Reviewers in the 1st Annual Review as well as SUIT corrective measures.

3- Also as consequence of the Reviews recommendations, Section 3 reports the expectations from three classes of players: operators, terminal manufactures and contents producers. Section 3 forms a feedback signal into Section 5, namely the network deployment Scenarios, Sub-section 5.2. Some operators have not been contacted yet, therefore, Section 5 will be updated in D7.1.4.

4- Section 4 presents a solution to sell SUIT as a whole and how to compensate and protect all Intellectual Property of Consortium partners. Thus, this section starts by describing the nowadays and near future markets and identifies the market opportunities for SUIT, following two perspectives, technological (Quad-Play, WiMAX and MobileTV) and continental (Europe, Africa, America and Asia).

5- Section 5 should describe two business models, one for the operator and another for the integrator. In this deliverable, we just describe the later. The former will be described in D7.1.4.

6- As a consequence of the two previous sections, Section 6 discusses the individual exploitation strategies.

7- Section 7 reports individual dissemination and future plans.

8- Section 8 draws some conclusions.

1.1 SUIT overview

SUIT is well positioned to take advantage of the new era of convergence between Broadcast and Telecommunication ushering new generation of Broadband Wireless Systems and DTV delivery systems, utilizing innovative broadband OFDM/OFDMA access technologies. The most profound revolution is the transition from Fixed Internet to Mobile Internet and enormous number of Mobile subscribers which has exceeded, by now, the number of the fixed subscribers. The huge demand for Multimedia, video streaming and interactive applications, on the move, and the need for reliable, efficient use of the spectrum and just the required bandwidth for each specific application will offer to SUIT partners excellent business opportunities. It is expected that Internet and interactivity will be integrated into television. A good example of network convergence is

UMTS/xDSL and DVB-T/H. Nevertheless, SUIT proposes a wireless broadband convergence in order to deliver scalable TV from hand-held resolution to high definition resolution.

The main idea is to combine in a fruitful manner DVB-T with the broadband wireless access network IEEE802.16e providing a low round-trip delay and robust communications at high mobile speed, above 150 km/h. In this context of network convergence, broadband networks like DVB-T/H and Mobile WiMAX will certainly play an important role, delivering multimedia data namely compressed video to fixed and mobile subscribers. There is a strong movement towards convergence at multiple levels and particularly in view of potential efficiency gains obtained from integration. Therefore, convergence goes through integration of services, networks, systems, platforms and terminals. However, an efficient end-to-end content delivery through heterogeneous networks and terminals requires a serious and deep research in order to guarantee an acceptable QoS.

The other main idea in SUIT is to broadcast and stream scalable and, if necessary, multiple descriptive visual contents in an optimal way through DVB-T/H along with IEEE802.16 (WiMAX) networks to homes and to extended home environments.

The QoS (delay and bandwidth) will also be guaranteed by the intelligent multiplexer at the playout site and by requesting appropriate bit rate and spatio-temporal layers from the scalable servers and live encoders. The proposed novel system will deliver multimedia data to users, including broadcasting, multicasting and unicasting under the big umbrella well known as all-IP.

1.2 Reference model

SUIT reference architecture is shown in Fig. 2, below. The radio interfaces are fed by live scalable contents, pre-recorded scalable contents and Internet data. The playout will dynamically and optimally manage all those resources and adapt them to the network conditions. Once the SUIT terminal interfaces to the WLAN, it will deal locally with instantaneous variations of QoS and thus minimizing the effects by reacting as swift as possible. The connection between the playout and the transmitters will be ensured by the core network, possibly radio links which allow us to implement different field trials easily.

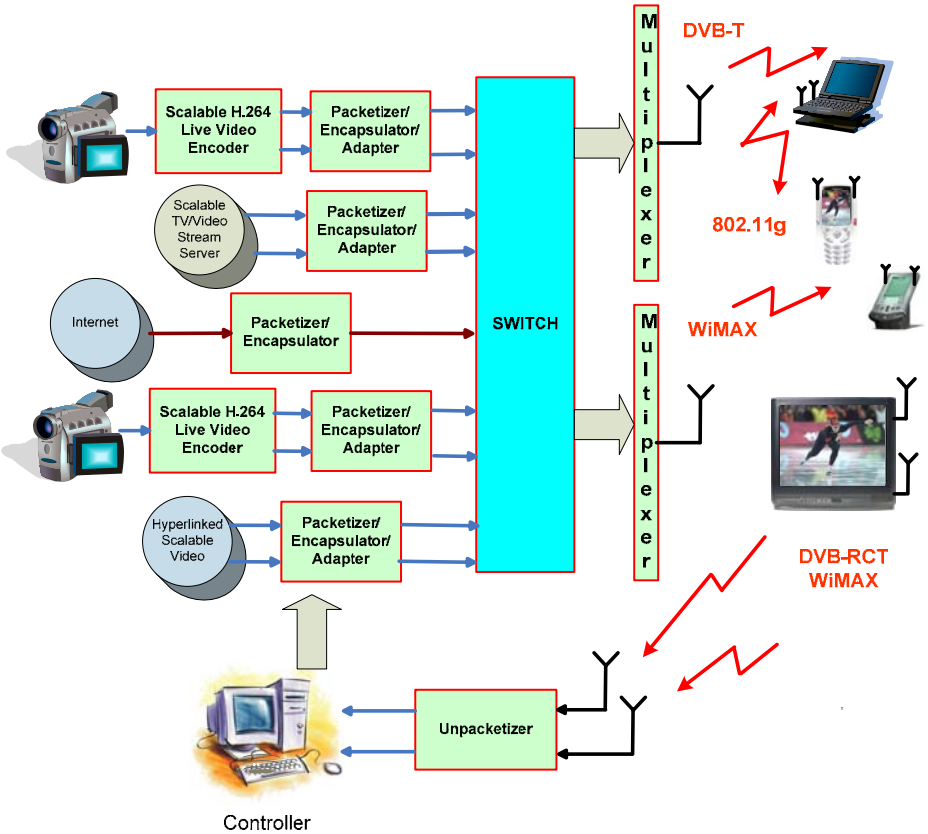


Fig. 1- Overall SUIT Architecture.

Figure 3 shows the gateway/terminal architecture where four RF signals will be tuned and combined through some decoders by making use of the video descriptions. In the case of a gateway, it follows a transcoder to accommodate LAN characteristics fluctuations and a LAN interface.

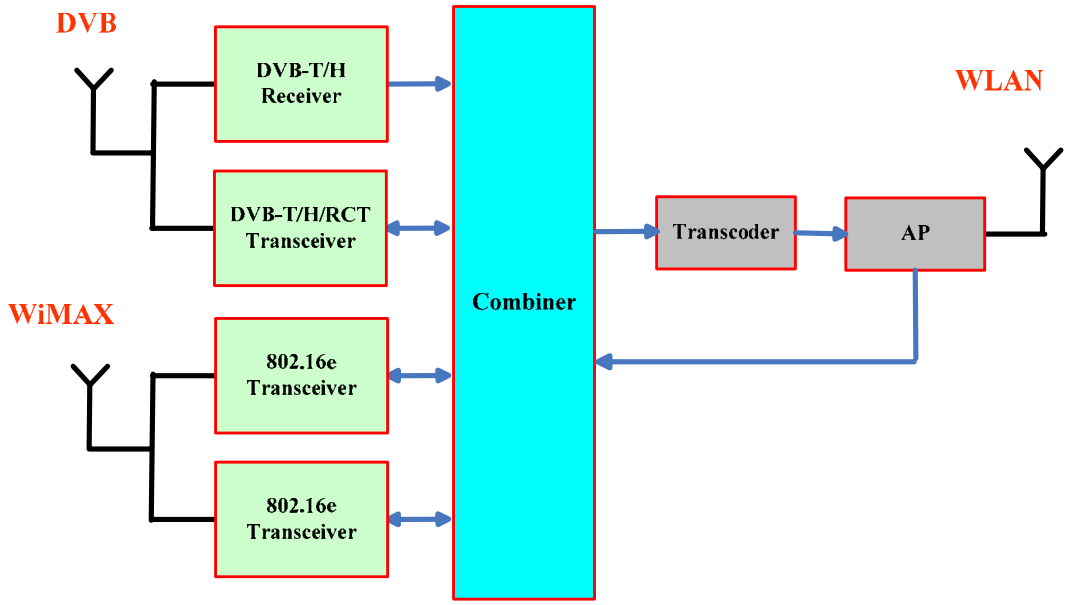


Fig. 2- Gateway.

The advantages of a convergent solution (DVB-T/H + WiMAX) proposed by SUIT in comparison to any divergent solution are:

- Supporting for return channels for interactive services as well as for conversational services like VoIP
- More robust reception for broadcasting signals in urban areas
- Supporting for broadcasting and unicasting services
- Mobility support at high speed above 150 km/h
- Supporting Quad-play (fixed and mobile)
- Intelligent routing of data (like hyperlinked video) using both networks.

Other singular features are:

- For rural areas, SUIT provides Internet services over UHF bands using DVB-T/RCT technology
- Support wide range from HD to Mobile devices

The above advantages along with SUIT scalability functionalities and compatibility with legacy broadcasting networks turn SUIT into an unbeaten solution targeting the next generation broadcasting networks. Therefore, Section 4 analysis the market whereas Section 5.3 develops a SUIT business plan from the point of view of a broadcasting operator which proves that there is a market opportunity for the near future (2008-2012).

1.3 Specific system architecture

Section 3 probes the market. After analysing the needs provided by the market, SUIT tailors the system in order to accommodate them. Accordingly, SUIT proposes, beyond of scalability and multiple description solutions, i.e, network profiles, several reception solutions which are described in Section 5.2. This section presents the particularities of SUIT in comparison to legacy systems. SUIT follows an IPTV structure in spite of not using a pure IP-oriented network (DVB-T). However, WiMAX forced SUIT to make both networks to be IP compatible. The advantages are enormous under the point of view of interoperability at the media contents and networking.

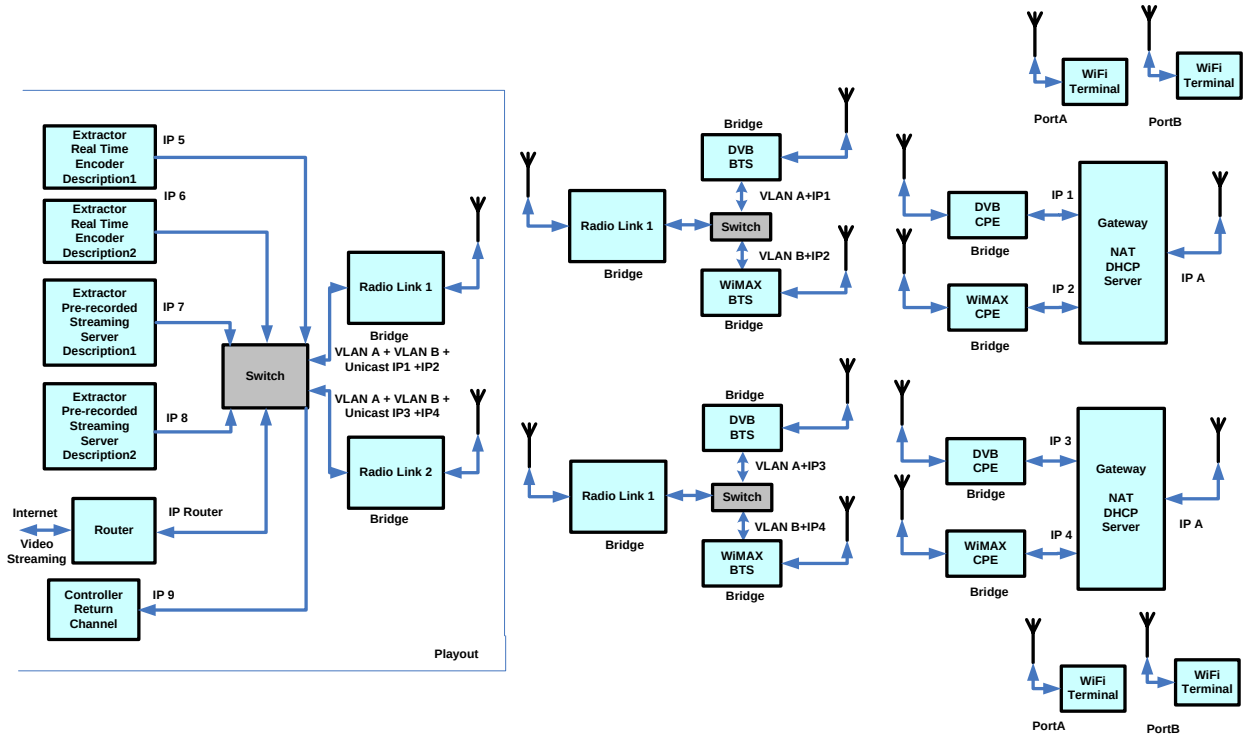


Fig. 3- Field trial architecture.

In Fig. 3, it is shown the field trial architecture which is very close to an operator practical network scenario. Two basestations, one WiMAX and other DVB-T are co-sited in order to assess horizontal and vertical handover. The selection of a specific basestation is accomplished by a Switch. There is a terminal designed in SUIT with the capability of decoding SVC. However, there is no SVC STB available in market at the time of writing this deliverable.

Mainly because the input of each SUIT basestation is IP (Ethernet), the following section discusses the compatibility with existing systems, namely with those of TS based.

1.4 Backward compatibility issues

After some discussions in the Consortium, with operators, spectrum regulators and in particular with the operator, MCT, and after a market analysis (see for instance Section 4.5), SUIT defines a set of requirements to be fulfilled in terms of compatibility between SUIT and existing systems:

1- The existing DVB-T basestations should not be replaced by new ones.

- If the operator requires RCT, we need to replace the exciter for one multiplexer/UHF channel to support RCT. The other multiplexers are unchanged but require IP inserters.

2- The existing STBs should not be replaced by new ones.

- This question is under study. AVC STBs (IPTV) with Ethernet input can still be in operation by using SUIT converter (see Profile 7 in Section 5.2). This converter may require inserting the right signaling (PSI/SI). The usage of PES may also be necessary.
- MPEG-2 STBs with RF (UHF) inputs are actually incompatible with SUIT. We have not found a cheap conversion solution yet. The situation is even worse if we take into account satellite and cable STBs and pay-per-view. This is the most difficult issue to deal with in SUIT.

3- SUIT should support DVB-H mobile devices.

- This question is under study. The DVB-H device will decode the AVC baselayer (one description) but we need to insert DVB-H signaling (INT table). Despite SUIT is IP based, the signal broadcasted over the air must have TS.

4- SUIT should support WiMAX mobile devices.

- This question is under study. The WiMAX device will decode the AVC baselayer delivered over WiMAX (one description). The WiMAX device will access to the contents, in other words, to the Internet TV as an usual laptop/desktop PC.

5- SUIT should use the existing transport infrastructure.

- This question is under study. SUIT will deal with this subject in WP6.

2 Implementation of 1st annual audit recommendations

2.1 Reviewers' recommendations

In both Sections 2.1 and 2.2, we will focus on recommendations related to dissemination and exploitation.

Recommendation 1: The consortium should analyze in more depth the operational constraints and limitations imposed on the market by content providers, mobile operators and manufacturers to ensure that their proposed solution will finally meet a real market demand. The consortium should strengthen the system approach with a strong focus on usability of the system.

Recommendation 2: The project should tune the architecture and service scenarios from feedback provided by its own WP results and a pragmatic exploitation plan based on feedback from the market and customers. It should prepare for discussions with operators (have a clear and understandable way of expressing the content, the meaning and potential of the concepts scalable, Ultra-Fast, Interoperable and Interactive Television etc.). In this respect the demonstrators have to be as realistic and attractive as possible.

Recommendation 3: Optimizations have to be performed taking into account the entire system (DVB-T/H+WiMAX). Individual results (testing and analysis) of each WP/component have to be fed back to the other correlated components and ultimately at system level. The intelligent components of the system have to be brought on the scene: e.g. horizontal and vertical handover solutions, intelligent controller, etc.

Recommendation 4: The project must show evidence that can it catch-up on the committed timeplan and on being able to monitor the financial expenditure, particularly personnel costs.

Recommendation 5: Future deliverables should provide much more technical details on the actual technical solutions and achievements while leaving out well-known technical information when not absolutely needed to understand the project work.

Other Recommendations:

All work packages have made progress, however, the project would have benefited from more progress in WP6 (integration, performance evaluation and validation) and WP7 (use and dissemination). Notably, in providing other WPs with more sophisticated operational use scenarios, a more detailed market constraints survey and in-depth real business models analysis. In more detail:

WP7 (Exploitation and Dissemination) organized an International workshop, published 6 papers and 21 standardization contributions; participated in MPEG/JVT, IEEE80216e and IEEE802.22 and DVB-T2 meetings; participated in a concertation meeting and produced two first cuts of the Dissemination Plan (D7.1.1 and D7.1.2). The dissemination and standardisation part is quite strong, but the exploitation plan very poor.

The content of deliverables has to be kept only for the project's original work without any "copy & paste" from standards and existing systems specifications. Furthermore deliverable 7.1.x is of very low quality and future versions have to improve considerably.

2.2 SUIT corrective measures

The following table shows our corrective measures according to the Reviews' recommendations described in Section 2.1.

Table 1- Corrective measures

Recomendation1 Telecom Operators	Make a presentation to mobile operators (PTCom-Antonio, MCT/TVI-Antonio, VRT-Peter, BT-Stewart, T-Systems+Vodafone R&D-Christoph, Cellcom- Eli, Telefonica-Narciso, France Telecom+Image & Reseau-Olivier)
Recomendation1 Terminal Manufactures	Philips (France-Olivier), NXP (France-Olivier), Siemens (Germany-Olivier), Nokia-Siemens (Germany-Christoph). Panasonic (Germany-Antonio) Huawei (Germany-RUNCOM; China-Stewart)
Recomendation1 Content Providers	BBC (England-Stewart)
Recommendation2	Wait for recommendation 1 Updating architecture scenarios Updating Exploitation plans (D7.1.2)
Recommendation3	Under work, Demonstration in IBC (testbed form R&S- Horizontal HO DVB-T/H-Ready, R&S- Vertical HO Wimax/DVB-T/H-Later)
Recommendation4	The project will ensure to catch-up on the time plan and will monitoring the financial expenditure
Recommendation5	We will do it.
Other Recommendations	D7.1.3 is actually different than D7.1.1 and D7.1.2. We tried to improve the exploitation plan. We have inserted detailed market constraints survey and in-depth real business models analysis in D7.1.3.

3 Operators/Manufactures/Content Providers expectation

3.1 Operators

3.1.1 PTcom (IT)

- Presentation of SUIT_334 on May 11th, 2007 (see Section 7.1.5)
- The attendees enjoyed SUIT and asked me to write a formal letter to PTCom Director to invite them to join SUIT
- PTCom is now strongly involved in TV over ADSL using Microsoft system. The STBs are from Scientific Atlanta
- PTCom is not happy with WiMAX. They made some tests using a basestation and a microstation from Alvarion. They feel there is no market for WiMAX in Portugal. 3GPP can provide all unicast services.
- All PTcom tests on WiMAX were done many years ago, according to a talk, we had with a member of Administration Board of PTCom during the Mobile TV Workshop in Aveiro on July 9, 2007.

3.1.2 MC/TVI (IT)

- Presentation of SUIT_334 on a Friday, May 26th, 2007.
- The attendees enjoyed SUIT and took our invitation to join SUIT to TVI board of Directors.
- An informal positive answer was delivered on the following Monday.
- Technically, the operator questioned about WiMAX capacities, bit rate and coverage.
- The operator mentioned that a gateway should have an ADSL input for unicast delivery and return channel.
- The operator enjoyed SVC and questioned about the conditional access. It should be layered based. VRT (IBBT)

3.1.3 VRT (IBBT)

3.1.4 BT (UniS)

3.1.5 Deutsche Telekom (IRT)

T-Com, a direct subsidiary of Deutsche Telekom, performed WiMAX field tests in the vicinity of the city of Bonn from June 2005 to March 2006 involving about 100 end-users for whom DSL was not available. In these tests, the Deutsche Telekom Group tested WiMAX technology for technical usability and economic efficiency in areas where fixed line connections (e.g. via DSL) are not economically feasible. In a second field test, WiMAX has also been tested as a mobile wireless broadband access solution. Shortly afterwards, Deutsche Telekom declared, that for their German market, WiMAX technology is neither a technologically nor an economically feasible alternative to fixed-line solutions. With T-Mobile's UMTS/HSDPA network infrastructure, Deutsche Telekom

already operates a mobile broadband access network. Consequently, Deutsche Telekom did not participate in the 2006 auction of the German 3.5 GHz band licences for Broadband Wireless Access (BWA) carried out by the Federal Network Agency[1]

3.1.6 Vodafone (IRT)

The Vodafone Group recently announced the deployment of a WiMAX-based network on the island of Malta which represents their first rollout of WiMAX technology. Although, there are no published plans to cover other countries, there have been speculations[2] that Vodafone is thinking of Malta as a classical test market. However, it appears unlikely for Vodafone to install ubiquitous WiMAX infrastructure in countries with operative UMTS networks. Vodafone did not participate in the 2006 auction of the German 3.5 GHz band licences for Broadband Wireless Access (BWA) carried out by the Federal Network Agency. In May 2007, Vodafone joined[3] the WiMAX Forum®, an industry-led non-profit organisation that comprises about 470 companies including 141 operators worldwide. Vodafone declared to remain technology neutral as far as future network options are concerned. Consequently, one can assume that WiMAX could become, from Vodafone's viewpoint, a central technology for future networks in those parts of the world where large numbers of people do not yet have access to fixed and/or mobile broadband networks.

3.1.7 Cellcom (RUNCOM)

Cellcom is the largest cellular service provider with more than 3 million subscribers, and was the first SP to deploy 3G services. Runcom has close relations with Cellcom stemming from joint work and cooperation within the framework of the **Israel 4G Consortium** (REMON) led by Runcom. The presentation prepared by SUIT coordinator was sent to Cellcom representative, and later on was discussed in detail. Cellcom has indicated interest and willingness to put SUIT concept to test utilizing the second phase 4G Demo system which is going to be deployed at Cellcom premises and tested by end of 2008 and early 2009. The first phase OFDMA based Demo system developed jointly by the REMON partners was deployed at Cellcom and tested during June 2007 (Fig. 4).

The same Demo system will be upgraded and MIMO capabilities will the essential upgrade (Fig. 5).

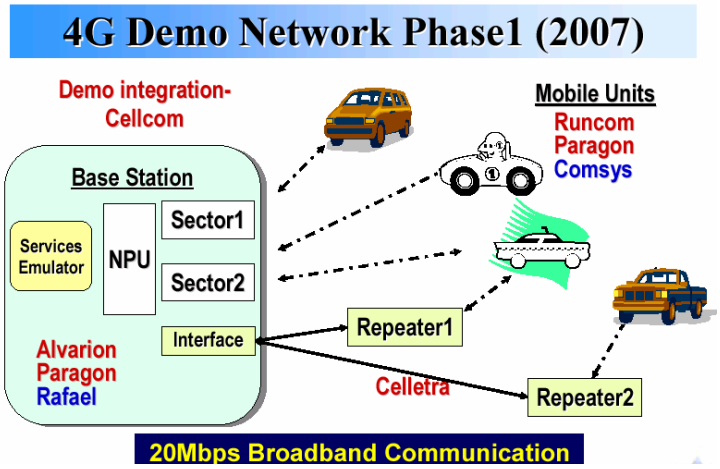


Fig. 4- First Phase DEMO deployed and tested at Cellcom premises

Of special interest is the integration of MIMO Matrix B where only one Base Station can transmit two different data streams, each from a different antenna. SUIT concept could be validated when streaming scalable multiple descriptive visual content from the Base Station and SUIT User Terminal can receive and combine both streams.

The test is pending approval of Cellcom management, which is likely to be granted.

[1] http://www.bundesnetzagentur.de/enid/Frequency_Management/Broadband_Wireless_Access_2yt.html
[2] http://news.zdnet.co.uk/communications/0,1000000085,39287688,00.htm
[3] http://www.vnunet.com/vnunet/news/2196311/vodafone-joins-wimax-forum

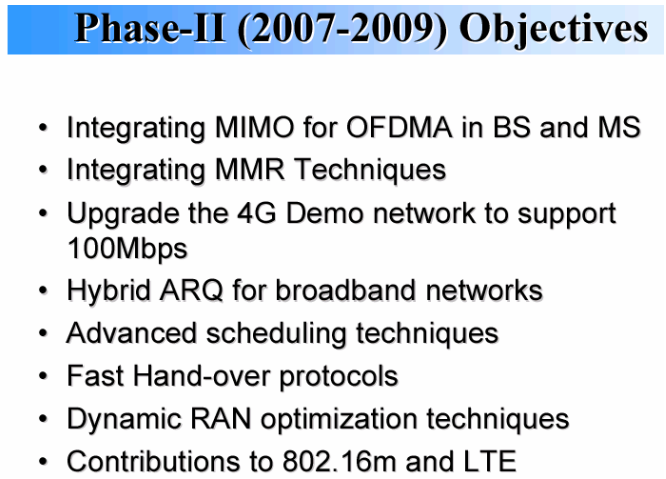


Fig. 5- Demo phase2 with integrated MIMO

3.1.8 Telefonica (UPM)

3.1.9 France Telecom (Vitec)

3.1.10 Image & Reseau (Vitec)

3.2 Terminal Manufactures

3.2.1 Philips (Vitec)

3.2.2 NXP (Vitec)

3.2.3 Siemens (R&S)

3.2.4 Nokia-Siemens (R&S)

3.2.5 Panasonic (IT)

3.2.6 Huawei (RUNCOM;UniS)

3.3 Content Producers

3.3.1 BBC (UniS)

4 Selling SUIT Strategy

4.1 Selling Model

IT proposes the following model for SUIT exploitation (to be approved by PB):

1. Deposit a patent registered by University of Aveiro.
2. An agreement will be signed by all SUIT partners where must be stated how the exploitation royalties are shared amongst all SUIT partners, for instance, in an identical percentage of SUIT project funding. From the patent, it is also possible to identify subsets or components which combined form SUIT as a whole.
3. Find one or even more than one Integrator to exploit the patent and therefore selling SUIT solutions to operators, either as a whole (WiMAX+DVB-T/H) or as subsets or components. The Integrator(s) can come from the SUIT Consortium but it is not mandatory. The agreement must identify clearly which partners contributed to each component in order to share the correspondent royalty (see Section 6).
4. Each partner must support (updating, refining, etc) the Integrator concerning its component in a free of charge basis.
5. Each SUIT partner can also exploit individually any components in case it has been designed by himself in the project. Components designed by more than one partner must follow the rules stated in item 3.

The following figure shows what has been mentioned in the item 3. The Integrator is in the centre, receiving components from each partner, software and hardware pieces. The operator must have the SUIT network installation capability or can subcontract. However, the integrator is responsible for the all subcontracting.

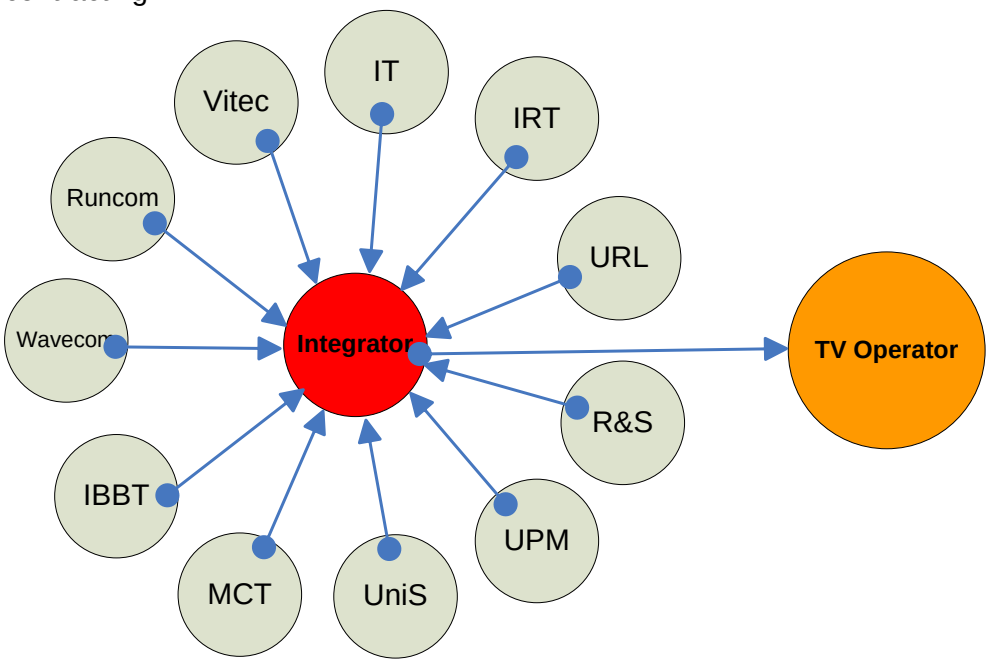


Fig. 6- SUIT consortium, Integrator and Operators interrelation.

4.2 Quad-play

With the digitalization of all different means of communication and the progressive adoption of a single protocol of communication, fixed and mobile services can get independency of transport media. It is now possible to phone over an Internet network (VoIP), to receive TV channels over a wired phone line (TVoADSL) and to exchange data over a broadcast network (Internet over cable or satellite).

As a result, competition set up between Internet Service Providers, Telecommunication Operators and Television Broadcasters. For many of them, revenues dropped down.

Profit margins can then be expected if popular and innovative services are proposed gathered in bundles needing only a single subscription.

Presently main attractive offers refer to triple-play services. They consist in bundles proposed on broadband networks and are commonly composed of the following basic services:

- local and international phone calls;
- broadband Internet access;
- a given bunch of digital TV and radio channels.

Compared to previous passive ways of audiovisual content consumption, innovation in triple-play services stands in proposing interactive services like:

- presence services (push-to-talk and instant messaging);
- unified messaging (text, voice and video);
- service on demand (gaming and video on demand).

There are gathered in the term of IPTV in which interactivity is provided by a simultaneous use of Internet and TV.

Interactive services enabled by broadband access have allowed network providers to slow down the falling of their revenues. But it is focused on a consumer market where margins are remaining low.

Mobility appears then as a new major source of profits. The market is of course presently restricted to a nomadic or a professional part of the population, but that can spend more expenses to keep a continuity of service all along moving.

Dual-band handsets have been recently launched to provide a continuity of service between inside and outside of home environment. Despite WiFi/cellular phones are available, it requires a hotspot for accessing to broadband (WiFi). WiMAX should soon afford a true broadband access that should be widely deployed and that could be efficiently used in conjunction with a DVB-T/H receiver for providing a full bundle of interactive multimedia services, continuously accessible on the move. It would provide a truly usable quadruple-play offer.

Visiongain reports in a recent market analysis and forecast about Quad-Play Fixed Mobile Convergence in 2006-2011 states that if cable and satellite subscribers would remain in the same range between 443.6 million in 2005 and 498.7 million in 2011, broadband (Quad-Play) access connections should raise during the same period from 88.1 million up to 438.2 million, offering in this way a real market for the deployment of IPTV services. Even if Asia-Pacific would represent at the end the wider market for IPTV prospects, Europe would have a pioneering position in the world by showing the fastest growth in the meanwhile. In the most prosperous area, North America, it is expected that 35% of households will get finely a triple-play package and that for 12,5% of households it will include a quadruple-play offer by 2011.

4.3 WiMAX

Mobile WiMAX was selected by SUIT project together with DVB-T/RCT as the preferred platforms for the implementation and demonstration of SUIT concept of streaming scalable multiple descriptive visual contents over heterogeneous networks. The advent of Mobile WiMAX and the emerging 3GPP/LTE will have a major role in advancing the implementation and affordability of broadband innovative services where efficient use of the spectrum and enhanced QoS in delivering rich multimedia content are of prime importance. Several technological trends and industry drivers are favourable towards endorsement and implementation of SUIT concept by Service Providers and ISPs. SUIT business opportunities are not limited by time and window of opportunity exists and wide enough as long as the march for the Mobile WiMAX deployment and LTE later on is proceeding in vigorous steps. Some of these trends are the following- Convergence of broadband communication networks and the on-going development of multi-mode user terminals such as WiMAX-WiFi, WiMAX-EV-DO and in the future WiMAX/LTE. The advent of certified WiMAX wave 2 systems with integrated MIMO and beamforming capabilities. Of particular importance to SUIT is the implementation of MIMO Matrix B aiming at increasing link throughput by a factor of two where two different data streams, each is transmitted from a different antenna of the Base Station antenna matrix. This will be fundamental for SUIT since only one delivery system will be required to transmit the scalable multiple descriptive visual contents from the Base Station to the mobile or fixed users.

The market

Today there are over 250 million broadband users: by 2012 this figure is forecast to grow to over 1.8 billion. Most people today experience broadband via a PC connected over a fixed line (usually DSL or cable). However, for many of the broadband users expected to get online over the next few years, a fixed line is simply not an option and wireless networks will be their primary broadband access method.

Over the last 15 years, mobile communications have revolutionized how we stay in touch with each other and broadband has connected the world in an unprecedented way. The market looks set to continue its expansion by enabling a richer lifestyle with communication for all enabled by broadband everywhere connectivity for individuals, enterprises and the society as a whole. Broadband access is a natural part of our daily lives and an integral part of business, thanks to the convenience and benefits of ‘always on’ high-speed Internet access.

In an increasingly global economy, businesses are under intense pressure to perform. The need to control costs, boost productivity and enhance customer satisfaction has never been greater. New technologies are providing the solutions to meet these challenges. Telecoms are reshaping business models and the boundaries between enterprise and carrier, wireline and wireless, voice and data are increasingly blurred. Mobilizing the enterprise improves efficiency, creates more flexible working conditions and provides a competitive edge.

As the distribution of content on physical media (CDs, DVDs, etc.) continues to decline, content distribution over networks is growing fast, which is having a profound effect on the market. Broadband connections are becoming the key interface for delivering and managing media, as well as for enjoying entertainment services such as TV, music and gaming. Like many other new services that started in the fixed networks, broadband is migrating into the mobile world. Mobile broadband will be a larger part of this future broadband growth – helping to deliver the ‘broadband everywhere’ vision.

Mobile WiMAX- The global technology of choice

Meeting these challenges and the expectations of consumers requires cost-effective, proven and reliable solutions. Mobile WiMAX and the emerging 3GPP/LTE have the potential to meet the needs for economies of scale, global reach and innovation ecosystem.

Multi-Mode radio devices (Converged radio)

The integration of multiple radios into single device means that users will have access to broadband everywhere. Users will be able to access the same services using the same device whether at home, in the office or on the move. Convergence between Mobile-WiMAX and HSPA-Evolved, Mobile WiMAX and LTE in next decade and plurality of deployed WBA systems at the premises of the Service Provider will pave the way for the implementing SUIT concept.

The need for Added Value services coupled with a higher QoS requirement, the efficient use of the spectrum and the plurality of BB delivery system operated by same SP/ISPs will make SUIT a highly attractive business proposition.

Capacity Enhancement

Use of MIMO Matrix B (Spatial Multiplexing) to increase throughput by a factor of 2 will offer an excellent opportunity for the implementation of SUIT utilizing only one delivery system instead of two.

4.4 Mobile TV (DVB-T/H)

As the industry matures the dash for diversification begins. The mobile industry generates more than a trillion dollars and has well over 2 billion customers. It has for several years been seeking for a new killer application. Mobile internet, machine-to-machine communications, MMS are just new services that mobile operators have tried to popularized. One of the latest, greatest hopes of this industry is mobile television.

The industry players believe that customers will be able to watch a news channel on their phones before they get into the office, or an entertainment channel to amuse them and kill the time. Broadcasters, telecom operators and handsets manufactures are strongly engaged in opening new market opportunities. Broadcasters want new way for selling contents and increase their revenue, telecom operators are looking for new added services in order to boost their ARPU and manufactures want to sell new products with new features that granted them differentiation from competitors.

Companies have invested large sums in developing mobile television solutions so far, and has been much debate over the best approach. What should be done? Should they stream to individual devices or broadcast? And about contents? Should be created new contents specifically for mobile devices? Should the operator charge a fee for the service or rely on advertising? So many questions, so little answers.

Television is an inherently passive medium, best consumed when the viewer is sitting back and comfortable immersed. Mobile, by contrast, is an active medium, used in dynamic circumstances and for purposes that demands interaction. Another issue is the screen size of a high end mobile phone that is limited to about two inches if measured diagonally. We know video needs size and the bigger, the better.

Trials of the mobile TV service is taking place in several countries in an attempt to ensure high quality upon launch and discover correct pricing models with which to attract subscribers. Parallel to these trials, many consumer surveys have been conducted and have shown widely varying results. Some of that surveys reveal consumers interest on service and others show public apathy. For example, in a mobile TV trial in UK 76% of those trialists stated that would pay for this service and 83% went further stating that they were very happy with the service. However, a survey in US revealed that 75% of the respondents had no interest in viewing TV on mobile phones.

A new Datamonitor report, “Opportunities in the mobile broadcast TV market, 2006-2012,” finds that mobile broadcast television has the opportunity to combine two popular consumer technologies — namely TV and mobile telephone, but a number of competing bearer technologies, including MediaFLO, DMB, DAB-IP and DVB-H, have made the direction of the market unclear. Datamonitor is forecasting that Europe will have 42.7 million mobile broadcast TV subscribers in 2012, making it the second largest subscriber base in the world after Asia.

Commercial experiences have been launched in some countries around the world, namely, Japan, Korea, Vietnam, Italy and Finland since May 2007. Vietnam, Italy and Finland have adopted DVB-H as technological platform.

Italy is the most advanced Mobile TV market in Europe and possibly the most advanced market outside of Japan and Korea. Three of the four major operators have Mobile TV services, with 3 being the first to launch. The company saw significant growth with Mobile TV during the World Cup. Now, additional subscriber growth has been harder to attain. It seems to be the most popular mobile tv services outside of Japan and Korea.

The increasing number of deployments, is an indication that market players believe that the service has potential and there will be notable opportunities in the sector. However, there are still significant barriers for mass adoption for mobile broadcast TV including spectrum availability, device functionality, lack of a standard certification process for DVB-H chipsets and business model.

4.5 Europe

Overview

The European market is crucial to the success of SUIT. If we can sell it in Europe, we will be able to sell it around the world. To sell SUIT as a transport and transmission technological solution, the consortium should take into account some important issues, namely, backward compatibility, high definition and quad services. The compatibility between SUIT and the existing DVB-T infrastructure is one of the most important aspect.

Legacy compatibility

As we know, the migration to digital terrestrial television is taking place across the Europe. Since 1998 a significant number of European countries has launched commercial DTT services. Three business models have emerged in meantime. Pay-tv platform was the original business model in UK, Spain and Sweden. This solution has not succeeded and DTT did not take-up. After those unsuccessful experiences, a new business model has appeared. The FTA (free-to-air) business model, offering a variety of free channels, financed either by public funds or advertising revenues, has been adopted in Italy, Finland, Germany and in UK since May 2002. The FTA offering has been the key to the take-up of the DTT platform. For instance, in UK, digital terrestrial television has shown very healthy growth in recent years, with 6.4 million homes switch from analog reception. In most of these countries, it is now taking place a migration to an hybrid business model combining FTA with some form of pay-TV.

DVB-T with MPEG-2 is the standard behind DTT platform across Europe. If SUIT development process takes into account this legacy, it will be successful in Europe. In fact, finding a viable business model with SUIT technology should be carefully addressed. In most European countries, operators have made large investments in DVB-T technology and are focusing on achieving the return on these. Certainly, they are unwilling to invest in another technology before the potential of their investment is realized, despite SUIT providing unique technical advantages.

High Definition

According ScreenDigest report “European TV Homes get HD-Ready”, at end 2006, 12.8m households were equipped with HD-ready televisions-an average eight per cent penetration of TV homes. They expect the number of HD-ready households to grow to 94m at end 2011 (56 per cent

of TV households). Of the current 12.8m HD-ready homes, they estimate that only 520,000 were already viewing HD-quality broadcasts at the end of 2006, mostly from pay TV (390,000). So about 12m households have an HD-ready set, but are not viewing HD pictures.

Major broadcasters are now attracted by the prospect of extra revenues from premium HDTV services and the contribution can make towards retaining existing subscribers in face of increased multi-platform competition. Developments that are likely to drive HDTV services across Europe include:

Rapid sales growth of wide screen televisions;

High penetration of multi-channel television leading to the search of next innovation in broadcasting;

Consumers increasingly accustomed to pay for innovations, like high definition such as, home cinema and widescreen television.

Europe took its first steps to introducing HD broadcast services. BBC and other public UK broadcasters has conducted a temporary HD trial on DTT platform in a small region of London, limited to a 450 trialist households since early June 2006. The free-to-air HD service has showcased a wide range of HD content from each of the public service broadcasters, from a range of key genres. The HD content shown has exceeded the already high expectations of the majority of the consumers involved in trial, and their reactions have been very positive. Genres like News, Sports and films were seen to benefit from being in HD satisfying trialists expectations of quality viewing experience.

With the adoption of the SUIT technology, the broadcast operators can delivery HDTV services with low investments.

Mobility

It is expected that there will be a strong demand for TV services on handled terminals, thought a variety of other terminal may also be used.

DVB-H is a technology developed by the European DVB project that enables mobility reception of TV and multimedia contents. Some key challenges lie ahead on DVB-H developments, including, spectrum allocation and the significant network investments required to rollout the DVB-H service. In addition, incorporating receivers into handsets implies an incremental cost that manufactures may need to support. The lack of a standard certification process for DVB-H chipsets is another challenge. All these issues may put the outcome of DVB-H projects at risk.

SUIT solution is a good answer for the market mobility demands, which, by using a robust receiver system, allows reliable mobility reception even at high speed. With a DVB-T and a WiMAX network, the broadcasters are able to offer mobile services to their customers. It could be a very interesting solution for receiving television in cars, trains and bus, as well.

SWOT Analysis

Strengths

- State of art technology;
- Innovative TV solutions;

- Legacy compatibility;
- Affordable Price;
- Excellent technical staff;

Weakness

- Informal organization;
- No sales force;
- No market presence or reputation;
- Development process focused on technology instead of market product/solution;

Opportunities

- Market demand for HD services;
- Market demand for mobility;
- Quad services market growth;
- Manufactures are incorporating WiMAX receivers on laptops and handled terminals;
- Growing development of DTT;
- Regulatory environment;

Threats

- Operator switching costs;
- Infra-structure investment (WiMAX);
- Reactions of the other platforms operators and 3G mobile operators;
- Adoption of the other wireless broadband (like 3G LTE) by the local body regulator;

4.6 America

Overview

In the next five years, WiMAX will become a mature technology for mobile broadband access and will be ready to take one the challenge from LTE. Initially, the largest opportunity for WiMAX lies in the fixed-access and nomadic market in emerging countries and in a few developed countries like the US. This will give WiMAX the opportunity to gain a strong foothold in the market, as mobile devices become commercially available and affordable to the mass market.

Legacy compatibility

With time, mobile access will gain more traction, as mobile operators commit to deploying high-capacity, low-latency, all-IP mobile broadband networks.

By the end of the forecast period, most subscribers will use WiMAX as a mobile technology. In developed countries, WiMAX is a natural evolution beyond 3G; in emerging markets, it may represent the first mobile broadband data network for subscribers. In all cases, WiMAX subscribers will increasingly use multiple devices linked to a single account, depending on where they are and which applications they are using.

It is not yet clear which technology, WiMAX or LTE, will win the battle to conquer the mobile broadband mass market. The stakes are high, as mobile broadband has the potential to become as pervasive as cellular voice. Both WiMAX and LTE use a similar set of technologies at their core so the performance will be comparable. However, unlike LTE, WiMAX is ready now.

High Definition

In the United States, all U.S. television broadcasts will be exclusively digital as of February 17, 2009, by order of the Federal Communications Commission. This deadline was signed into law in early 2006. Furthermore, as of March 1, 2007, all new television sets that can receive signals over-the-air, including pocket-sized portable televisions, must include digital or HDTV tuners so they can receive digital broadcasts. Currently, most U.S. broadcasters are beaming their signals in both analog and digital formats; a few are digital-only. Citing the bandwidth efficiency of digital TV, after the analog switch-off, the FCC will auction off channels 52–59 (the lower half of the 700 MHz band) for other communications traffic, completing the reallocation of broadcast channels 52–69 that began in the late 1990s. The analog switch-off ruling, which so far has met with little opposition from consumers or manufacturers, would render all non-digital televisions dark and obsolete on the switch-off date, unless connected to an external off the air tuner, analog or digital cable, or a satellite system. The FCC has determined that an external tuning device can simply be added to non-digital televisions to lengthen their useful lifespan. However, as of May 2007, external tuning devices are not widely available, are relatively expensive, and require bulky AC power supplies. Starting in 2008, the government will take requests from households for up to two coupons to reduce the price of some converter boxes by $40. Currently, even the earliest televisions continue to work with present broadcast standards. This mandate was designed to help provide a painless transition to the new standard.

The Canadian Radio-television and Telecommunications Commission (CRTC) has adopted the same digital television standard for Canadian stations as the United States. The CRTC initially decided not to enforce a single date for transitioning to digital broadcasts, opting to let the economy decide when the switchover will occur. However, a later decision settled on the date of August 31, 2011.

CITY-TV Toronto was the first Canadian station to provide digital terrestrial service. As of 2005, other digital stations on-air included the CBC and Radio-Canada stations in Toronto and Montreal, as well as CTV's CFTO Toronto and CIVT Vancouver, and CKXT (*SUN TV*). This list is not necessarily exhaustive and other station launches are pending, although all are in the major markets of Toronto, Vancouver and Montreal. Also, this does not include digital or high definition versions of specialty services.

Mexican television company Televisa made experimental HDTV broadcasts in the early-1990s, in collaboration with Japan's NHK. Some events now broadcast in high definition.

During the first half of 2005, at least one cable provider in Mexico City (Cablevision) has begun to offer 5 HDTV channels to subscribers purchasing a digital video recorder (DVR).

In 2005, TV Azteca signed a deal with Harris Corporation's broadcast communications division for digital TV transmitters and HDTV encoding equipment to bring high-definition TV to nine Mexican cities.

The launch will be carried out in two phases. By the third quarter of 2006, HDTV transmissions will be available in Mexico's largest markets: Mexico City, Guadalajara and Monterrey. Phase Two of the national rollout will bring HDTV services to six cities along the Mexico-U.S. border (Matamoros, Reynosa, Nuevo Laredo, Ciudad Juarez, Mexicali and Tijuana) through the first half of 2006. This rollout takes advantage of HDTV receivers already in place thanks to an earlier HDTV rollout by stations on the American side of the border.

Argentina selected the ATSC standard back in 1998 (Res.2387/98) and has been conducting experimental broadcasts since 1999 but the government later overruled the decision. The current government in Argentina appears to be reconsidering its earlier decision. ATSC and DVB-T are apparently both being considered, but there appears to be no interest in ISDB-T. The governments of Argentina and Brazil had decided independently which digital TV standard each nation would deploy, but have recently agreed to work together to implement a single standard for the Mercosur customs union. While HDTV-ready TVs sales are increasing in this country, no single HD feed is currently available. Local cable company "Cablevision" will start HDTV transmission on January 20, 2007. Major TV broadcasters, namely Canal 13 and Telefe, started to show some HDTV samples in electronic shows. Canal 13 has invested in ATSC equipment, and the recent decision by the government to review this in favour of DVB added some turmoil in an already clogged scenario for such decision. Due to lack of clear directives, consumer electronic market offers LCD and Plasma equipment without digital tuners, only NTSC/PAL analog ones are included at the moment (may 2007). At the same time, some equipment were marketed as "HD-ready" when, in fact, they offered only a 852x480 pixel resolution, clearly insufficient to fulfill that claim.

The SBTVD standard was proposed by government in the end of 2005 - being able to be compatible with either ISDB, ATSC or DVB. The Brazilian government took a while to decide which standard to choose, but on June 29th 2006, President Luis Inácio Lula da Silva signed a decree choosing ISDB-T as the national standard. Various criteria were taken into account, including better technical quality, robustness, and a US$2 billion investment on construction of a semiconductor factory in the country financed by NEC, Sony, Panasonic and Toshiba (which would allow for the TV sets and decoders to be built in the country). The terrestrial standard, which will be free and accessible "country-wide", is slated for commercial launch December 2007. The transition to ISDB is expected to take at least 9 years. The analog system will be shutdown in 2016. Manufacturers will adopt the new standard for new TV sets and will also make converters (set top boxes) available for older analogue PAL-M TV's.

In the Uruguay, on August 27, 2007, the government issued a decree stating that the DVB-T and DVB-H standards will be adopted.

Chile has recently announced that the Standard will not be decided because the cabinet changes in April 2007. HDTV-ready TVs are available quite long. TVN has made HDTV tests in 1999, Canal 13 is now broadcasting only in Santiago a test transmission in the three HDTV formats (ATSC, DVB and ISDB), in Valparaiso UCV in making only ATSC broadcastings tests only for the Valparaiso area and Canal 13 also has made tests in DVB format in April 2007 exclusive for the Valparaiso area.

Mobility

The nature of wireless communications dictates that the antenna design will have a substantial impact on what is achievable. Typically, Fixed WiMAX networks have a higher-gain directional antenna installed externally at the customer's premises which results in greatly increased range and throughput. Mobile WiMAX networks comprise mostly of indoor CPEs such as desktop modems, laptops with integrated Mobile WiMAX or other Mobile WiMAX devices. Mobile WiMAX devices typically have an antenna design which is of lower-gain by nature due to their inherent omni-directional (and portable) design. In practice this means that in a line-of-sight environment with a portable Mobile WiMAX CPE, symmetrical speeds of 10 Mbit/s at 10 km could be delivered, but in urban environments it is more likely that these devices will not have line-of-sight and therefore users may only receive 10 Mbit/s over 2 km. Higher-gain directional antennas can be

used with a Mobile WiMAX network with range and throughput benefits but the obvious loss of practical mobility.

Like most wireless systems, available bandwidth is shared between users in a given radio sector, so performance could deteriorate in the case of many active users in a single sector, especially if proper capacity planning has not been undertaken. In practice, many users will have a range of 2-, 4-, 6-, 8-, 10- or 12 Mbit/s services and additional radio cards will be added to the base station to increase the capacity as required.

Because of this, various granular and distributed network architectures are being incorporated into WiMAX through independent development and within the 802.16j, mobile multi-hop relay (MMR) task group. This includes wireless mesh, grids, network remote station repeaters which can extend networks and connect to backhaul.

Some cellular companies are evaluating WiMAX as a means of increasing bandwidth for a variety of data-intensive applications; Sprint Nextel announced in mid-2006 that it would invest about US$ 5 billion in a WiMAX technology buildout over the next few years.

In line with these possible applications is the technology's ability to serve as a high bandwidth "backhaul" for Internet or cellular phone traffic from remote areas back to an Internet backbone. Although the cost per user/point of WiMAX in a remote application will be higher, it is not limited to such applications, and may be an answer to reducing the cost of T1/E1 backhaul as well. Given the limited wired infrastructure in some developing countries, the costs to install a WiMAX station in conjunction with an existing cellular tower or even as a solitary hub are likely to be small in comparison to developing a wired solution. Areas of low population density and flat terrain are particularly suited to WiMAX and its range. For countries that have skipped wired infrastructure as a result of prohibitive costs and unsympathetic geography, WiMAX can enhance wireless infrastructure in an inexpensive, decentralized, deployment-friendly and effective manner.

4.7 Africa

Overview

Africa remains the least connected continent in the world both from the view of the total bandwidth feeding the entire continent and from an Internet penetration perspective. Restrictive regulatory policies, state monopolies, high costs and a shortage of local skills in information and communication technologies have been responsible for the slow development of African telecoms.

Legacy compatibility

For the past years, a wave of deregulations and the prioritization of the telecoms sector through pan-African initiatives such as the NEPAD have boosted the creation of independent regulators and the entry into the market of competing services providers.

Initially, those operators were dominated by either small and local ISPs (Internet Service Providers) or new mobile operators attracted by a huge demand for voice services not met by the state monopoly. By 2010 most of the countries will be open to competition. All these facts make the African continent one of the most viable for telecom application using BWA especially for WiMAX which will bring the standardization's low cost advantages and allow new entrants and ILECs to compete and construct viable business cases when addressing residential and business customers.

African operators who have deployed DECT or Wireless Local Loop will use existing networks to the limits before investing in any new fancy wireless technology. Money or the lack of it is an issue

in Africa. Other challenges include entities that have won licenses and either do not know what to do with them or lack the cash to invest in the required network.

High Definition

In Namibia's, public broadcasters still rely on analogue transmission and have not announced a transition date to digital television. Actually, the operator Multichoice already operates a digital television service using the DVB-T standard. Reaching approximately 3000 subscribers, the transition occurred on 18 February 2005 without the use of a dual-illumination period due to the lack of spare frequencies.

The first digital television implementation in South Africa was a satellite-based system launched by pay-TV operator Multichoice in 1995. On 22 February 2007 the South African government announced that the country's public TV operators would be broadcasting in digital by 1 November 2008, followed by a three year dual-illumination period which would end on 1 November 2011.

Mobility

IP Wireless, although not a WiMAX player, has been very active in Africa through its partner Axcera with substantial deployments reported. The largest of those deployments is in South Africa with operator Sentech. Sentech is a state owned enterprise that provides broadcast signal distribution, international telephony and broadband services. The network is composed of about 50 base stations (or 130 sectors) and serves about 5,000 users in the 2.5GHz band. The service named "MyWireless" targets both residential and business users with fixed and portable data services.

Sentech also deployed VectaStar fixed wireless access equipment at 3.5GHz from UK-based Cambridge Broadband's. Sentech is the only operator in South Africa other than the incumbent telecom operator to have a 3.5GHz fixed wireless license. The company plans to use the spectrum to provide Broadband Wireless services to business and residential customers, as well as for backhauling traffic from other network components.

In Nigeria, IP Wireless/Axcera deployed a network with Netcom Africa in the 2.5GHz band. The service name "MyNetcom" is initially offered in the largest cities including Lagos and Abuja. In Tanzania, Axcera reports that CatsNet, a local ISP has deployed a commercial network in the 1.9GHz. Other actives in the continent include trials in Douala (Cameroon) and with EmilNet in Mozambique.

In April 2005, Wireless Business Solutions (WBS) officially launched its iBurst mobile broadband service in South Africa, after six months of pre-commercial operation. WBS' network using Arraycomm iBurst equipment is now operating in Johannesburg, Cape Town, Pretoria, Durban, and Robin Island. WBS will continue to intensify its base station roll-out in metropolitan areas and is currently looking at beginning roll-out to rural areas.

Connections to the iBurst network can be made through a desktop modem or PCMCIA card, providing full subscriber mobility.

Alvarion is the largest pure BWA/WiMAX system vendor so far with activities in all continents. Its presence in Africa is strong. According to company sources, there are 50 Alvarion BWA/WiMAX networks in Africa. Alvarion claims a presence in the following countries: South Africa, Ivory Coast, Congo, Burkina, Faso, Kenya, Namibia, Nigeria, Botswana, Swaziland, Madagascar, Eritrea, Benin, Tanzania, Uganda, Angola, Zimbabwe, Uganda, Angola, Ghana, Guinea, Liberia Mauritania. Networks have been deployed using a variety of licensed and unlicensed spectrums to provide voice and data services to residential and business users.

4.8 Asia

Fixed WiMAX networks have already started being deployed throughout the world as have pre-mobile WiMAX networks. Initial certified mobile WiMAX deployments will begin towards the end of 2007 as this is when certification from the WiMAX Forum will happen. Currently there are nearly 200 operators trialing both mobile and WiMAX technology globally.

Countries which show a high market demand for portable and mobile services such as South Korea and Japan will initially drive the markets throughout the developed world.

Both India and China are viewed as large market opportunities for WiMAX technology as they have relatively poor telecommunications infrastructure and booming markets.

Many parts of India are still without access to a standard telephone service. The Indians view the 700MHz frequency band as suitable to deliver both mobility and broadband services such as rich multimedia content, Video and VoIP telephony over WiMAX throughout the country. This frequency has not been certified by the WiMAX Forum and even if it is, this will not happen for another two years. It is expected that by the year 2010 there will be 70-100 million broadband subscribers in India. This is a huge increase from the current 1.7 million.

Aircell Business Solutions, which is a subsidiary of the Aircell cellular provider in India, has recently agreed to deploy a WiMAX network to serve small and medium enterprises in fifty Indian cities throughout the Northern and Eastern regions of the country using equipment from Alvarion. The platform will operate in the 3.3GHz band as this frequency band is currently allocated for WiMAX use in India.

China also has issues with spectrum surrounding the 2.5GHz band because of the launching a C-band satellite transmission system by the end of H1 2007. However Samsung has announced that it is in an agreement with Beijing Airway Communications to deploy WiBro. It is believed that Samsung is also in negotiations with other Chinese telecom operators for the same service. The deployment of WiBro throughout several provinces is a clear indication that the Chinese government is becoming more flexible on spectrum issues.

The Korean and Japanese markets are well known for their high demand for portable and mobile services. Korea Telecom was the first global operator to deploy mobile WiMAX (WiBro) in June 2006, however, the service has not been very successful to date. It is expected that this will change once deployments become more extensive, more handsets are available and the technology is more mature. In Japan mobile WiMAX has been trialled by four operators. Australia, New Zealand, Malaysia, Singapore and Taiwan are also rolling-out WiMAX networks. The Asia-Pacific region therefore seems to be enthusiastic on the technology. The chart below shows the forecasted number of subscribers between 2007-2012 for this region.

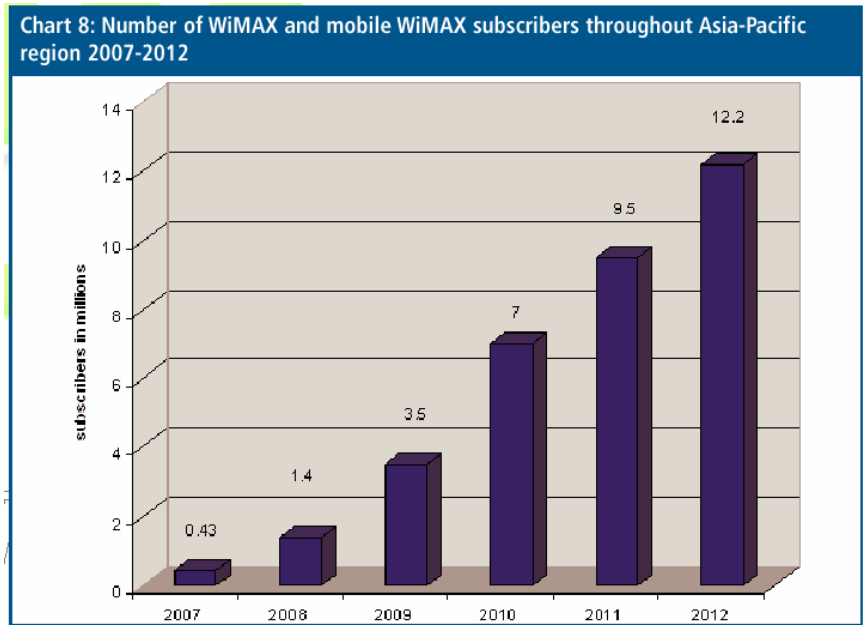


Fig. 7- Forecasted number of subscribers between 2007-2012 for Asia-Pacific region

During the years 2007 and 2008 the vast majority of these users will be fixed WiMAX subscribers. However, after the year 2009 the number of mobile WiMAX subscribers will rise and be equal to the number of fixed WiMAX subscribers throughout this region of the world. After the year 2010 the number of mobile WiMAX subscribers will increase as the technology will have matured, wider coverage and more roaming agreements will have been realised and more, user terminal devices will be commercially available.

Nortel Networks and Alcatel are also collaborating with Runcorn and are integrating their 802.16e compliant chipsets for their MIMO enabled WiMAX network infrastructure and terminals.

5 SUIT Business model as a whole

5.1 SUIT services model

Suit is firstly pushed by the society needs supported by business models (see Sections 4 and 5. Then, SUIT engineers met those needs through the developments of new technology-based solutions. In this spirit, and using some feedback from the operators, as described in Section 3, SUIT has proposed one services model despite being implemented in three different options (MDC-1, MDC-2, MDC-3) depending on the amount of redundancy of broadcasting services over WiMAX. The first one, MDC-1, repeats the baselayer. The second, MDC-2, generates two descriptions for all layers at the expense of 50% redundancy. The third, MDC-3, is similar to MDC-1, but both descriptions at the baselayer have 50% redundancy instead of 100% as occurring in MDC-1. As described in some previous deliverables (for instance D4.4), herein three table services associated with service bitrates:

MDC-1 (repeating information)

*Table 2- **MDC-1**, Network/services scenarios*

DVB-T		WiMAX	
Service	Bit Rate (Mbps)	Service	Bit Rate (Mbps)
1 D SVC HD Real Time Broadcasting	4 – 6	2 D SVC HD Real Time Broadcasting	0.5
1 D SVC HD Recorded Broadcasting	4 – 6	2 D SVC HD Broadcasting (on QoS demand)	0.5
1 D SVC SD Real Time Broadcasting	1.5 – 2	2 D SVC SD Real Time Broadcasting	0.5
1 D SVC SD Recorded Broadcasting	1.5 – 2	2 D SVC SD Recorded Broadcasting	0.5
1 D CIF Hyperlinked Video	0.5	2 D CIF Hyperlinked Video	0.5
Internet	1 p.u	Internet	1 p.u
VoIP	0.080 p.u	Streaming (VoD)	0.5-4 p.u
		VoIP	0.080 p.u
Total	11-17.5	Total	2-20

D= Description;

SVC= HD: 1280x704p-25 Hz (4 Mbps); SD: 640x352x25 (1.5 Mbps); CIF: 320x176x25 (0.5 Mbps)

MDC-2 Quantization (EMDSQ)

Table 3- MDC-2, Network/services scenarios.

DVB-T		WiMAX	
Service	Bit Rate (Mbps)	Service	Bit Rate (Mbps)
1 D SVC HD Real Time Broadcasting	4.5	2 D SVC HD Real Time Broadcasting	4.5
1 D SVC HD Recorded Broadcasting	4.5	2 D SVC HD Recorded Broadcasting (on QoS demand)	4.5
1 D SVC SD Real Time Broadcasting	1.5	2 D SVC SD Real Time Broadcasting	1.5
1 D SVC SD Recorded Broadcasting	1.5	2 D SVC SD Recorded Broadcasting	1.5
1 D CIF Hyperlinked Video	0.375	2 D CIF Hyperlinked Video	0.375
Internet	1 p.u	Internet	1 p.u
VoIP	0.080 p.u	Streaming (VoD)	0.5–4 p.u
		VoIP	0.080 p.u
Total	12.5-17.5	Total	12.5-20

D= Description;

SVC= HD: 1280x704p-25 Hz (4 Mbps); SD: 640x352x25 (1.5 Mbps); CIF: 320x176x25 (0.5 Mbps)

Table 3 describes transmission bit rates in MDC-2 mode. With a 50% overhead, i.e., 6*1.5=9 Mbps, contents are sent over both networks, resulting in half bit rate to each network, 9/2 Mbps in DVB and 9/2 Mbps in WiMAX.

MDC-3 Splitting

Table 4- MDC-3, Network/services scenarios.

DVB-T		WiMAX	
Service	Bit Rate (Mbps)	Service	Bit Rate (Mbps)
1 D SVC HD Real Time Broadcasting	3.875 - 5.875	2 D SVC Real Time Broadcasting	0.375
1 D SVC HD Recorded Broadcasting	3.875 - 5.875	2 D SVC Broadcasting (on QoS demand)	0.375
1 D SVC SD Real Time Broadcasting	1.375 - 1.875	2 D SVC SD Real Time Broadcasting	0.375
1 D SVC SD Recorded Broadcasting	1.375 - 1.875	2 D SVC SD Recorded Broadcasting	0.375
1 D CIF Hyperlinked Video	0.375	2 D CIF Hyperlinked Video	0.375
Internet	1 p.u	Internet	1 p.u
VoIP	0.080 p.u	Streaming (VoD)	0.5-4 p.u
		VoIP	0.080 p.u
Total	9.6-17.5	Total	1.5-20

D= Description;

SVC= HD: 1280x704p-25 Hz (4 Mbps); SD: 640x352x25 (1.5 Mbps); CIF: 320x176x25 (0.5 Mbps)

In the MDC-3 mode, we considered that two descriptions are generated for the baselayer at the CIF resolutions and consequently required baselayer bit rate is lower than in MDC-1 and MDC-2 modes.

Each table describes the service types, the transmission network and the correspondent bit rate range. The service described in the first row is a real time broadcasting composed by two descriptions, each delivered to a particular network. In the case of transmission over error prone channels a terminal receiving both descriptions will be able to display a better quality video. In the second row, a pre-recorded material will be broadcasted over DVB and its second description can be unicasted over WiMAX to a particular terminal requesting better video quality. In other words, this service is multicasted to all terminals requesting a better video quality. This situation can occur mainly in the cities where WiMAX can cover DVB dead zones or when the mobile is moving at high speed. This main pre-recorded material has a hyperlink to a short video. For instance, the viewer is watching a football match and wants to watch a short spot (<10 min) of the best goal scored by one player. The hyperlinked video will then be displayed on a corner on the top of the main video.

Third and forth rows describe the real time and pre-recorded broadcasting services in the standard resolution (SD) version. As described before, these services use both networks in order to reach higher performance and video quality, and to cover DVB dead zones.

In the fifth row is described the hyperlinked video service, as described above, which requires a low delay communication and is unicasted to a particular terminal. There are two cases, depending whether the Terminal/Gateway has storage units or not. For the former case, the playout downloads the hyperlinked video to the Terminal/Gateway. In the later case, the hyperlinked video is streamed to the Terminal. Therefore, the intelligent playout will upload the hyperlinked video descriptions through both networks, selecting them intelligently in order to ensure low latency. The

terminal/gateway may compose one video stream with 1D slices from each description. In other words, it is not required that the terminal/gateway has to compose a stream from both full descriptions. Besides, If needed to ensure low latency, the playout should reduce the bit rate allocated to each broadcasted service described in previous rows in the tables, up to the minimum limit, i.e. for MDC-3, it means 3.875 (1.375) Mbps. This is also a strategy for Internet as described below.

In sixth row, the SUIT playout will serve (unicast), again intelligently, a terminal with internet contents. Unused bandwidth by the first four services (Real Time Broadcasting, Recorded Broadcasting, SD Real Time Broadcasting and SD Record Broadcasting) will be used to serve internet service requests. If this available bandwidth is fully used, then playout will select the most appropriate network depending on available empty slots (packets) in each network or by reducing the bit rate associated to the broadcasted material with negligible quality loss. However, under a combined network solution (WiMAX+DVB-T) and the same channel conditions, it is expected that most of Internet traffic will be delivered over WiMAX.

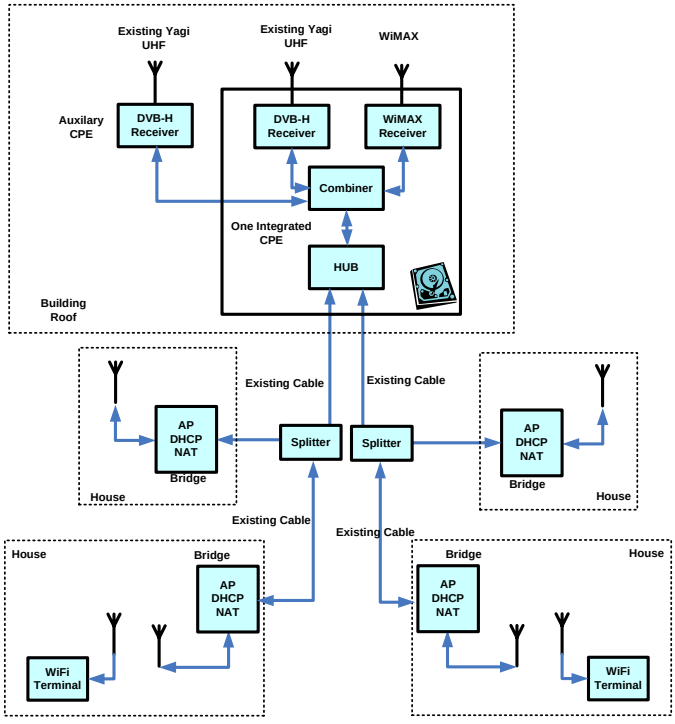
Finally, last row defines VoIP service in DVB network and Streaming in WiMAX network. VoIP service needs a low network bandwidth since each phone call requires just about 80 kbps. Over WiMAX network, any terminal may request a video streaming service from the playout server or even from outside the playout. Again, the playout may need to reduce the bit rate associated to the broadcasted material delivered over WiMAX, especially in MDC-2.

The set of services presented in the above tables will be used in the operators (SUIT clients) business model in order to evaluate their business perspective.

5.2 Network/reception deployment scenarios

All network scenarios, especially reception profiles have been designed from probing some representative operators (See Section 3). Seven profiles are reported hereafter.

1. Urban Building Profile



The gateway (GW) showed in the top block with a 300 GHz disk can feed a row of buildings. It uses the WiFi terminal type defined in D1.1 (except MHP terminal removed from the project). We should emphasize that this profile does not include RCT since the TV return channel will be implemented over WiMAX. As one GW can feed many buildings, a household can have a VoIP call to its neighbour via the GW saving the last mile network bandwidth.

This profile has been designed in consequence of some calculus have show that WiMAX may not be able to provide full Internet to highly density cities, unless a lot of basestations are deployed. MiMO WiMAX may mitigate this problem (see Section 3.1.7 - MIMO Matrix B).

So, based on RUNCOM info:

Assuming 30% penetration, therefore, the number of potential subscribers is 60 in 200 households. Out of 60 only 10% will go active in the same time, therefore one can expect 6 active users in 200 households. Each basestation can have 6 sectors and 3 bands delivering a total of 360 Mbps.

Let us consider 2 cities, Lisbon and Aveiro. The conclusion is: Aveiro can have HD wireless streaming just with WiMAX whereas Lisbon requires SUIT GWs with disks on the building roofs to have HD streaming at homes. Besides, Lisbon can have up to SD wireless streaming in the streets.

Lisbon:

-84 km2

-564 thousands population

-140 thousands householders

-6518 people/km2

-1630 houses/km2

-200 households - 12 Mbps (6 usersx2Mbps each)

Solution 1 for Lisbon:

- 3 Basestations covering 30x3= 90 km2

- 300 households -18 Mbps

- number of households/sector = 140k/18 =7777

- Requires 26 bands. Impractical !

Solution 2 for Lisbon:

- Feeding only mobile users corresponding to 5%. So, 7777 is now 390.

- 2x300/390=1.5 Mbps to each mobile subscriber

- Each mobile subscriber can watch SD and have Internet at

1.5 Mbps.

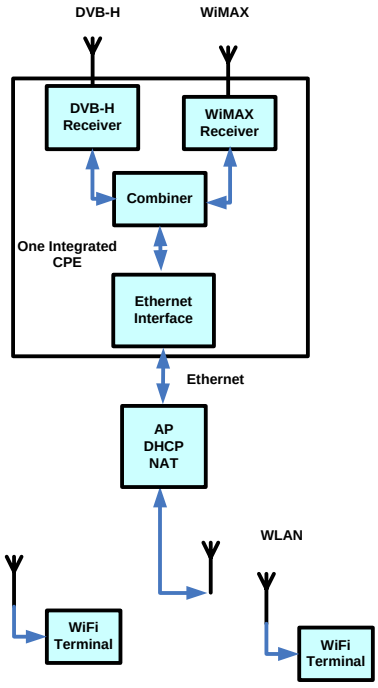
Aveiro:

- 200 km2

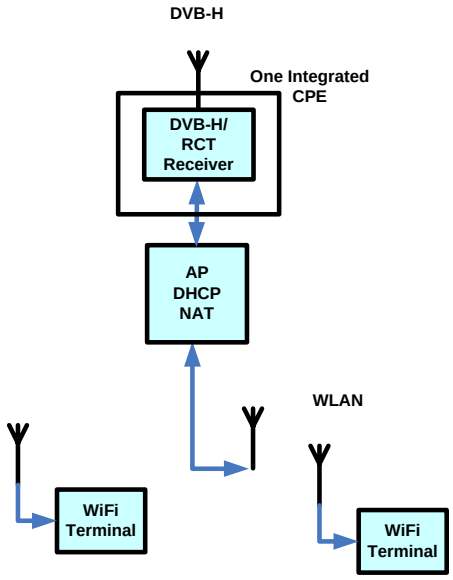
- 73350 population
- 18340 households
- 367 people/km2
- 92 houses/km2
- 200 households - 12 Mbps

Solution 1 for Aveiro:
- 7 Basestations covering 30x7= 210 km2
- 300 households -18 Mbps
- number of households/sector = 18340/(7x6) =437 households/sector
- Requires 2 bands.
- Bit rate/householder =2.7 Mbps
- With 3 bands - > 4.12 Mbps -> HD Wireless streaming

2. Urban IP-STB Profile

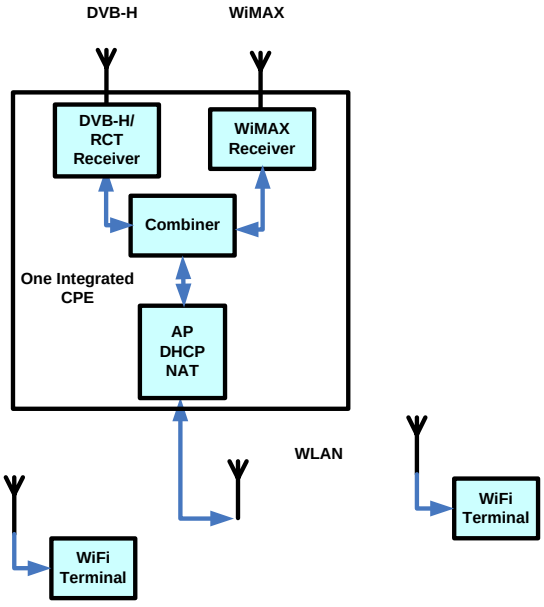


3. Rural House Profile



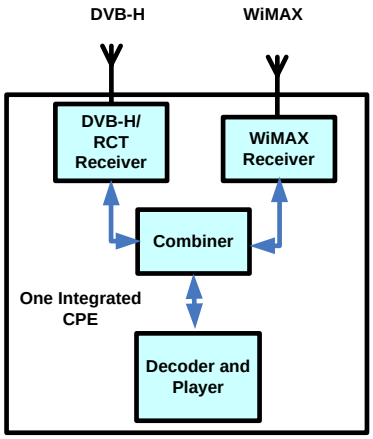
This profile uses RCT as return channel since WiMAX is not available. It can support more than one UHF downlink channel by adding DVB-T CPEs as in urban building profile but no combiner is required.

4. Vehicular Profile



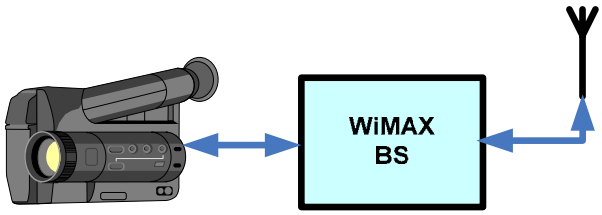
This is most complete front-end system is SUIT because it is similar to urban building profile but adds RCT. It can support more than one UHF downlink channel by adding DVB-T CPEs as in urban building profile.

5. Hand-held + Laptop Profile



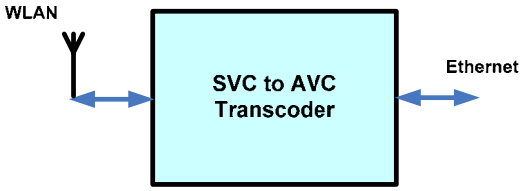
SUIT have been implementing the laptop profile. The hand-held profile requires collaboration with the big mobile devices players.

6. ENG Profile



This is a promising usage of WiMAX in the up-link. SUIT is designing this profile after IRT's broadcasting partners had shown strong interest on it.

7. Transcoder profile



This converter is able to deliver SVC signals to AVC STBs. This is a solution to keep compatibility with legacy systems.

5.3 Operator's Business Plane

5.3.1 Services

The TV Broadcaster company has a developed mix of services targeting the entire market. TV Brodcast innovative service offerings, supported by SUIT technologies, provide the following advantages to customers.

Appealing multi-channel offering;

- Service availability anyplace anywhere;
- Interactivity;

- Internet services:
- High Definition (HD) channels;
- Affordable price;
- Real VOD from CIF to HD resolutions;

Our offer include the following bundles (like MDC-x, see Section 5.1)

- TV + NET 40 €/month
- TV 20 €/month
- NET 30 €/month
- VOD 8 €/month

All packages include Voice over IP (VoIP) free of charge. We have assuming a pay-per-view case. The business model for free-to-air is slightly different than what we proposing in the following sections.

5.3.2 Market Analysis Summary

In order to assess the economics of a SUIT bundle of services, we have considered one Portuguese Broadcast Company operating to the Portuguese market. This specific market has 3.5 Million of households. To cover 95% of population, 150 DTT transmitters and 400 WiMAX base stations will be required. We estimated 150000 € on average for each DTT station and about 75000 € for each WiMAX base station. These numbers are intended to be indicative. More exact numbers will be obtained as soon as we finished the WiMAX and DVB-T coverage project. Thus, as mentioned in Section 5.3.4.2, the transmitters and transport equipment is estimated in 29.169.757+8.000.000+4.000.000 euro.

We expect 20% rate of penetration.

In Portugal, two DTT licence awards are expected, one for Pay TV and one for Free to View TV.

The Portuguese Government has announced that will award one WIMAX licence in January 2008, and two TV multiplexers also in the beginning of 2008.

The company is already in business, so this business plan is for an **ongoing** business.

5.3.2.1 Target Market Segment Strategy

TV Broadcaster sources of revenue are derived from the sale of bundles of TV services, Internet and VOD services to the individual consumers market.

5.3.2.2 Competition and Buying Patterns

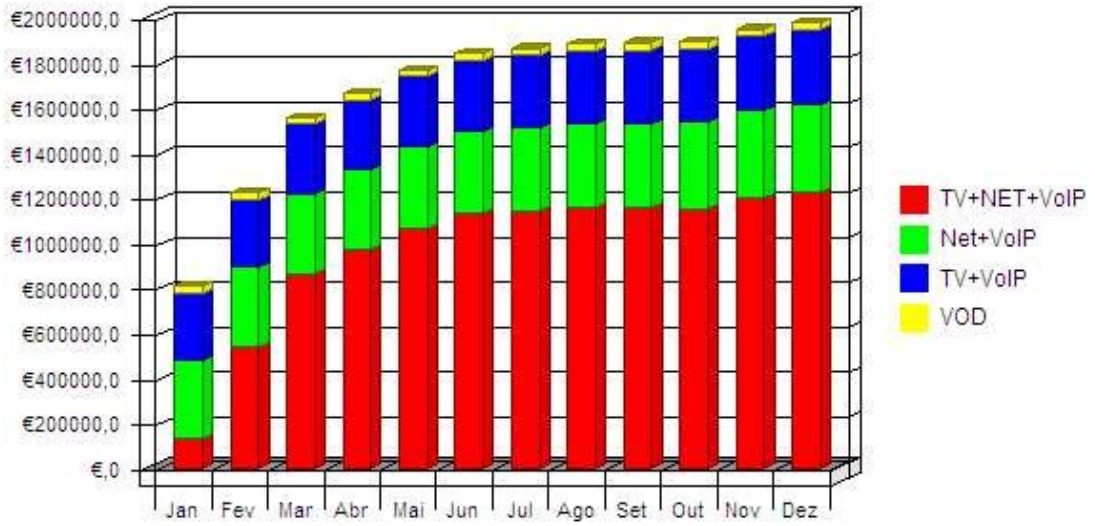
The main competitors in the Portuguese television market are TV Cabo, CaboVisão and others operators with small market share. TV Cabo is both cable and satellite operator and has the biggest market share. CaboVisão is a medium cable operator. Others operators are delivering TV services based on IPTV. All of them offer a mix of tv services, internet and Voice. Typically a bundle with 40 channels, internet access and voice is charged at 40 euros month.

5.3.3 Sales Forecast

The following table and chart illustrates the projected sales forecast of TV Broadcaster.

Sales Forecast					
	2008	2009	2010	2011	2012
Sales					
TV+NET+VoIP	€11.750.880	€25.670.450	€30.569.654	€33.626.619	€34.989.280
Net+VoIP	€4.438.876	€9.345.753	€10.670.500	€11.737.550	€12.011.305
TV+VoIP	€3.804.751	€7.968.500	€8.650.600	€9.515.660	€10.067.226
VOD	€380.475	€960.000	€1.080.600	€1.188.660	€1.307.526
Total Sales	€20.374.982	€43.944.703	€50.971.354	€56.068.489	€58.375.337
Direct Cost of Sales	2008	2009	2010	2011	2012
TV+NET+VoIP	€5.707.126	€15.402.270	€18.341.792	€20.175.971	€20.993.568
Net+VoIP	€2.219.438	€5.607.452	€6.402.300	€7.042.530	€7.206.783
TV+VoIP	€1.902.375	€4.781.100	€5.190.360	€5.709.396	€6.040.336
VOD	€190.238	€576.000	€648.360	€713.196	€784.516
Subtotal Direct Cost of Sales	€10.019.177	€26.366.822	€30.582.812	€33.641.093	€35.025.203

Sales Monthly



5.3.4 Financial Plan

The following sections outline the financial plan for TV Broadcaster.

5.3.4.1 Projected Profit and Loss

The financial projections present the company's expected financial position, results of operations and cash flow for the five years ending December 31, 2012. Accordingly, the forecast reflects its judgment as of 10 August, 2007, the date of this forecast, of the expected conditions and its expected course of action. There will usually be differences between forecasted and actual results, because events and circumstances frequently do not occur as expected, and those differences may be material.

Revenues are derived from sales of TV Services, Internet access, VOD services and wireless services.

Sales and Marketing Expenses: We group advertising, promotions, and campaigns under this category.

Advertising and Promotions: We are allocating 10% of sales for marketing expenses in our projections.

Maintenance: This is an estimated figure which is expected to grow with the growth of the DTT network and WiMAX network.

Salary: Figures are estimated based on the national average for similar positions.

Legal and Professional Expense: Figures are estimated.

Utilities: Figures are estimated.

Miscellaneous/other Expenses: Figures are estimated. Management foresees that these expenses outside of the common budgeted items will run at a flat rate per year.

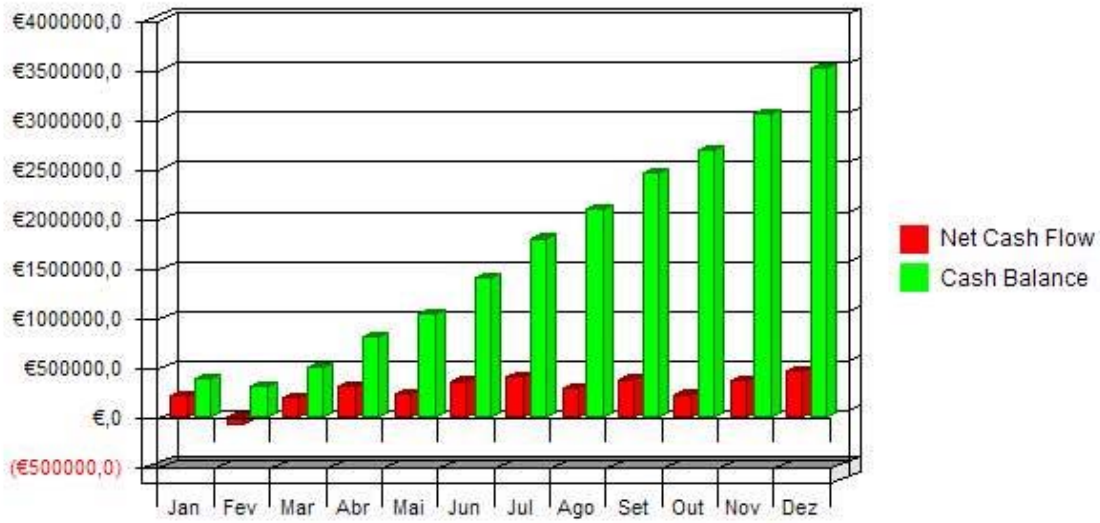
Pro Forma Profit and Loss					
	2008	2009	2010	2011	2012
Sales	€20.374.982	€43.944.703	€50.971.354	€56.068.489	€58.375.337
Direct Cost of Sales	€10.019.177	€26.366.822	€30.582.812	€33.641.093	€35.025.203
Other	€1.432.541	€1.575.000	€1.732.500	€1.819.125	€1.910.100
Total Cost of Sales	€11.451.719	€27.941.822	€32.315.312	€35.460.218	€36.935.303
Gross Margin	€8.923.263	€16.002.881	€18.656.042	€20.608.271	€21.440.034
Gross Margin %	43,80%	36,42%	36,60%	36,76%	36,73%
Expenses					
Payroll	€1.704.052	€1.880.775	€1.985.570	€2.084.848	€2.189.089
Sales and Marketing and Other Expenses	€1.832.073	€521.100	€625.300	€750.000	€750.000
Depreciation	€2.666.000	€2.666.000	€2.666.000	€2.666.000	€2.666.000
Maintenance structure	€260.044	€312.052	€374.463	€449.356	€539.227
Utilities	€22.400	€57.600	€76.800	€84.480	€92.928
Energy	€1.610.000	€3.000.000	€3.000.000	€3.000.000	€3.000.000
Call center	€42.000	€78.000	€134.000	€147.400	€162.140
Payroll Taxes	€2.187.373	€142.725	€196.575	€216.205	€237.825
Other	€0	€0	€0	€0	€0
Total Operating Expenses	€10.323.941	€8.658.252	€9.058.708	€9.398.289	€9.637.209
Profit Before Interest and Taxes	(€1.400.677)	€7.344.629	€9.597.334	€11.209.982	€11.802.825
Interest Expense	€339.000	€411.000	€311.000	€223.000	€185.000
Taxes Incurred	€0	€1.733.407	€2.360.277	€2.746.746	€2.952.864
Other Income					
Interest Income	€0	€0	€0	€0	€0
Extraordinary Items	€0	€0	€0	€0	€0
Total Other Income	€0	€0	€0	€0	€0
Other Expense					
Account Name	€0	€0	€0	€0	€0
Extraordinary Items	€0	€0	€0	€0	€0
Total Other Expense	€0	€0	€0	€0	€0
Net Other Income	€0	€0	€0	€0	€0
Net Profit	(€1.739.677)	€5.200.222	€6.926.057	€8.240.237	€8.664.961
Net Profit/Sales	-8,54%	11,83%	13,59%	14,70%	14,84%

5.3.4.2 Projected Cash Flow

The following table and chart shows the projected cash flow of TV Broadcaster.

Pro Forma Cash Flow					
	2008	2009	2010	2011	2012
Cash Received					
Cash from Operations					
Cash Sales	€20.374.982	€43.944.703	€50.971.354	€56.068.489	€58.375.337
Subtotal Cash from Operations	€20.374.982	€43.944.703	€50.971.354	€56.068.489	€58.375.337
Additional Cash Received					
Non Operating (Other) Income	€0	€0	€0	€0	€0
Sales Tax, VAT, HST/GST Received	€3.193.168	€7.626.767	€8.846.268	€9.730.895	€10.131.257
New Current Borrowing	€3.460.000	€0	€0	€0	€0
New Other Liabilities (interest-free)	€0	€0	€0	€0	€0
New Long-term Liabilities	€0	€0	€0	€0	€0
Sales of Other Current Assets	€0	€0	€0	€0	€0
Sales of Long-term Assets	€0	€0	€0	€0	€0
New Investment Received	€25.365.006	€8.000.000	€4.000.000	€0	€0
Subtotal Cash Received	€52.393.156	€59.571.470	€63.817.622	€65.799.384	€68.506.594
Expenditures	2008	2009	2010	2011	2012
Expenditures from Operations					
Cash spending	€1.704.052	€1.880.775	€1.985.570	€2.084.848	€2.189.089
Bill Payments	€15.282.451	€31.897.973	€38.667.452	€42.742.870	€44.705.831
Subtotal Spent on Operations	€16.986.502	€33.778.748	€40.653.022	€44.827.718	€46.894.920
Additional Cash Spent					
Non Operating (Other) Expense	€0	€0	€0	€0	€0
Sales Tax, VAT, HST/GST Paid Out	€1.585.883	€4.576.060	€5.307.761	€5.838.537	€6.078.754
Principal Repayment of Current Borrowing	€500.000	€1.000.000	€1.000.000	€760.000	€0
Other Liabilities Principal Repayment	€0	€0	€0	€0	€0
Long-term Liabilities Principal Repayment	€0	€0	€0	€0	€0
Purchase Other Current Assets	€814.850	€50.000	€200.000	€200.000	€200.000
Purchase Long-term Assets	€29.169.757	€8.000.000	€4.000.000	€0	€0
Dividends	€0	€400.000	€1.000.000	€2.000.000	€3.000.000
Subtotal Cash Spent	€49.056.992	€47.804.808	€52.160.783	€53.626.255	€56.173.674
Net Cash Flow	€3.336.164	€11.766.662	€11.656.839	€12.173.129	€12.332.920
Cash Balance	€3.511.164	€15.277.826	€26.934.665	€39.107.794	€51.440.714

Cash



5.3.4.3 Projected Balance Sheet

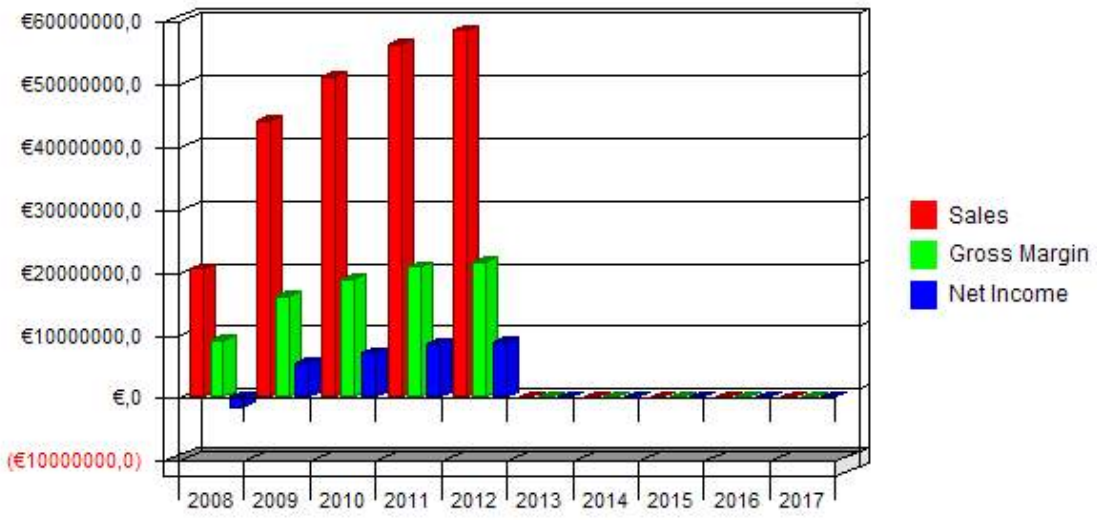
The following table is the projected balance sheet.

Pro Forma Balance Sheet					
	2008	2009	2010	2011	2012
Assets					
Current Assets					
Cash	€3.511.164	€15.277.826	€26.934.665	€39.107.794	€51.440.714
Other Current Assets	€817.850	€867.850	€1.067.850	€1.267.850	€1.467.850
Total Current Assets	€4.329.014	€16.145.676	€28.002.515	€40.375.644	€52.908.564
Long-term Assets					
Long-term Assets	€29.219.757	€37.219.757	€41.219.757	€41.219.757	€41.219.757
Accumulated Depreciation	€2.666.000	€5.332.000	€7.998.000	€10.664.000	€13.330.000
Total Long-term Assets	€26.553.757	€31.887.757	€33.221.757	€30.555.757	€27.889.757
Total Assets	€30.882.771	€48.033.433	€61.224.272	€70.931.401	€80.798.321
Liabilities and Capital	2008	2009	2010	2011	2012
Current Liabilities					
Accounts Payable	€2.480.254	€4.779.988	€5.506.262	€5.937.748	€6.131.082
Current Borrowing	€2.960.000	€1.960.000	€960.000	€200.000	€200.000
Other Current Liabilities	€1.607.285	€4.657.992	€8.196.499	€12.088.857	€16.141.360
Subtotal Current Liabilities	€7.047.539	€11.397.980	€14.662.761	€18.226.605	€22.472.442
Long-term Liabilities	€1.650.000	€1.650.000	€1.650.000	€1.650.000	€1.650.000
Total Liabilities	€8.697.539	€13.047.980	€16.312.761	€19.876.605	€24.122.442
Paid-in Capital	€25.365.006	€33.365.006	€37.365.006	€37.365.006	€37.365.006
Retained Earnings	(€1.440.097)	(€3.579.774)	€620.447	€5.546.505	€10.786.741
Earnings	(€1.739.677)	€5.200.222	€6.926.057	€8.240.237	€8.664.961
Total Capital	€22.185.232	€34.985.453	€44.911.511	€51.151.747	€56.816.708
Total Liabilities and Capital	€30.882.771	€48.033.433	€61.224.272	€71.028.352	€80.939.150
Net Worth	€22.185.232	€34.985.453	€44.911.511	€51.054.796	€56.675.879

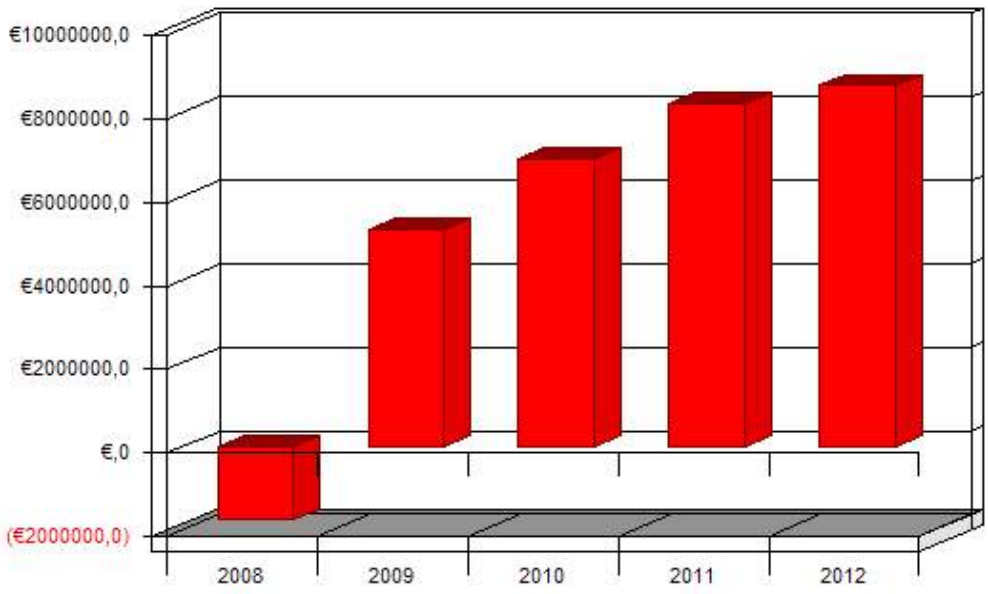
5.3.4.4 Business Ratios

Ratio Analysis					
	2008	2009	2010	2011	2012
Sales Growth	2180,28%	115,68%	15,99%	10,00%	4,11%
Percent of Total Assets					
Other Current Assets	2,65%	1,81%	1,74%	1,79%	1,82%
Total Current Assets	14,02%	33,61%	45,74%	56,92%	65,48%
Long-term Assets	85,98%	66,39%	54,26%	43,08%	34,52%
Total Assets	100,00%	100,00%	100,00%	100,00%	100,00%
Current Liabilities	22,82%	23,73%	23,95%	25,70%	27,81%
Long-term Liabilities	5,34%	3,44%	2,70%	2,33%	2,04%
Total Liabilities	28,16%	27,16%	26,64%	28,02%	29,86%
Net Worth	71,84%	72,84%	73,36%	71,98%	70,14%
Percent of Sales					
Sales	100,00%	100,00%	100,00%	100,00%	100,00%
Gross Margin	43,80%	36,42%	36,60%	36,76%	36,73%
Selling, General & Administrative Expenses	58,41%	45,60%	40,45%	0,00%	0,00%
Advertising Expenses	10,00%	10,00%	10,00%	0,00%	0,00%
Profit Before Interest and Taxes	-6,87%	16,71%	18,83%	19,99%	20,22%
Main Ratios					
Current	0,61	1,42	1,91	2,22	2,35
Quick	0,61	1,42	1,91	2,22	2,35
Total Debt to Total Assets	28,16%	27,16%	26,64%	28,02%	29,86%
Pre-tax Return on Net Worth	-7,84%	19,82%	20,68%	21,52%	20,50%
Pre-tax Return on Assets	-5,63%	14,44%	15,17%	15,49%	14,38%
Additional Ratios	2008	2009	2010	2011	2012
Net Profit Margin	-8,54%	11,83%	13,59%	14,70%	14,84%
Return on Equity	-7,84%	14,86%	15,42%	16,14%	15,29%
Activity Ratios					
Accounts Payable Turnover	7,15	7,15	7,15	7,27	7,32
Total Asset Turnover	0,66	0,91	0,83	0,79	0,72
Debt Ratios					
Debt to Net Worth	0,39	0,37	0,36	0,39	0,43
Current Liab. to Liab.	0,81	0,87	0,90	0,92	0,93
Liquidity Ratios					
Net Working Capital	(€2.718.525)	€4.747.696	€13.339.754	€22.149.039	€30.436.122
Interest Coverage	-4,13	17,87	30,86	50,27	63,80
Additional Ratios					
Assets to Sales	1,52	1,09	1,20	1,27	1,38
Current Debt/Total Assets	23%	24%	24%	26%	28%
Acid Test	0,61	1,42	1,91	2,22	2,35
Sales/Net Worth	0,92	1,26	1,13	1,10	1,03
Dividend Payout	0,00	0,08	0,14	0,24	0,35

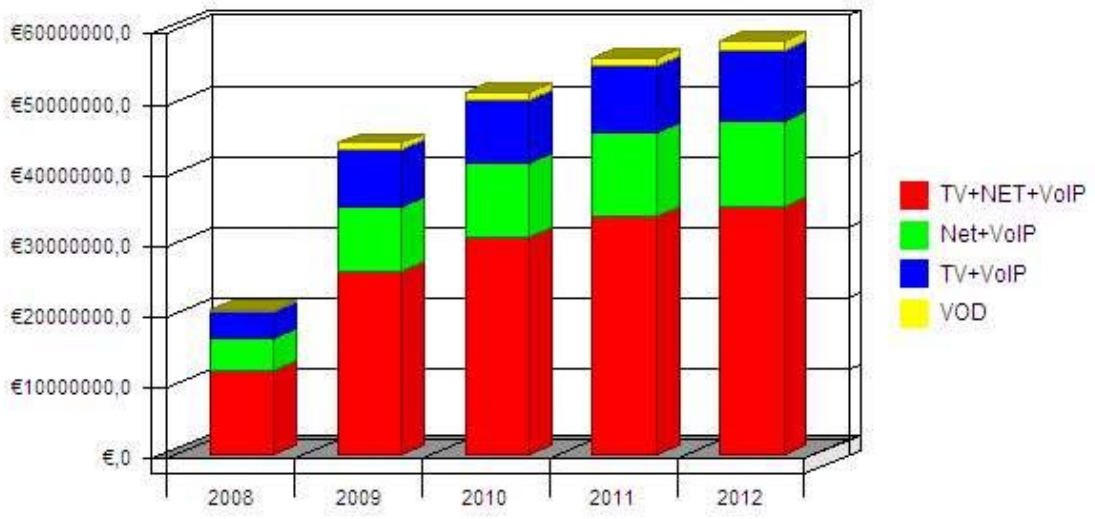
Long-term



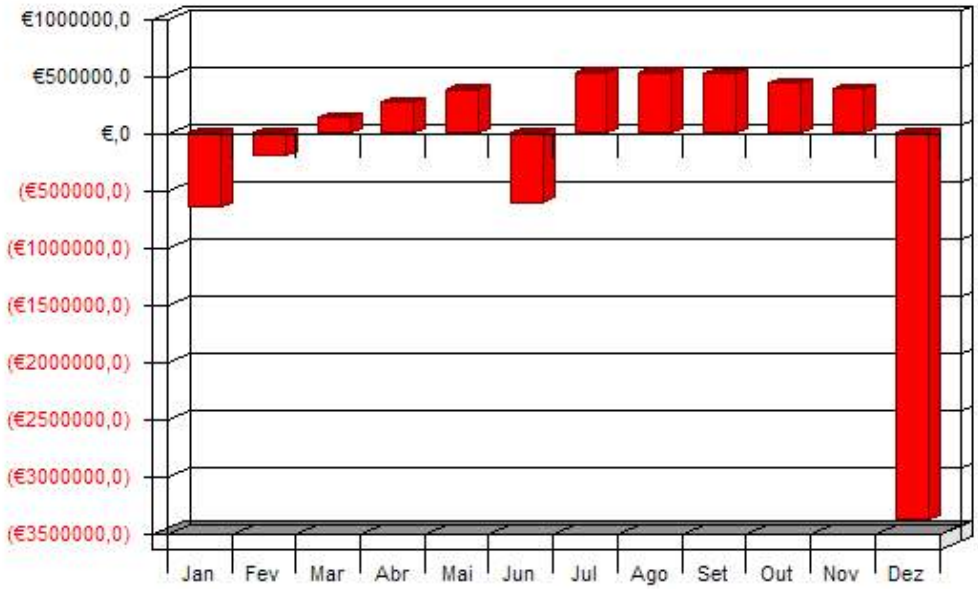
Profit Yearly



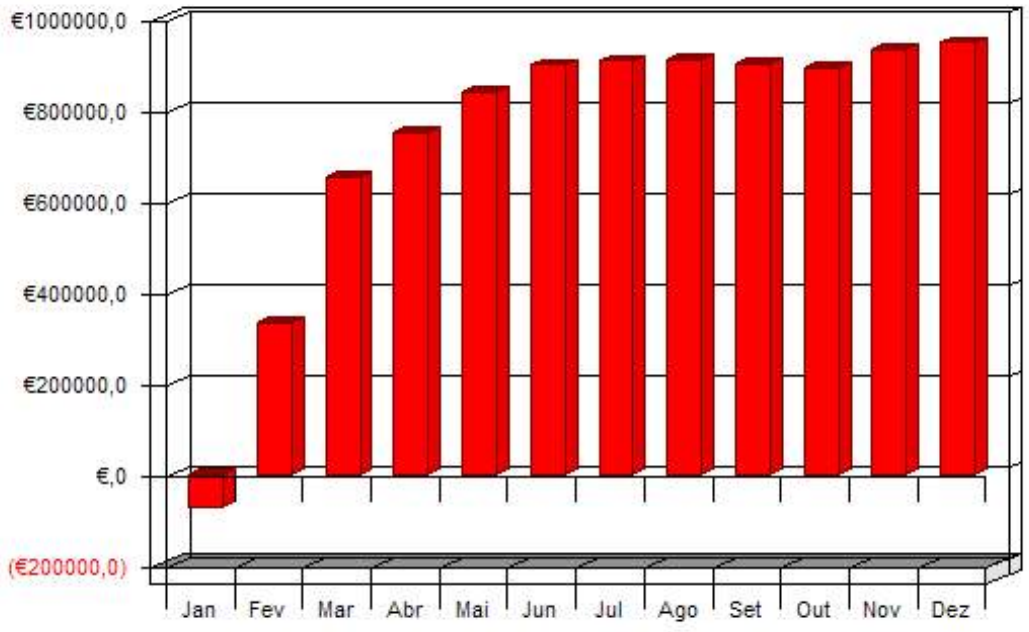
Sales by Year



Profit Monthly



Gross Margin Monthly


€1000000,0
€800000,0
€600000,0
€400000,0
€200000,0
€,0
(€200000,0)
Jan
Fev
Mar
Abr
Mai
Jun
Jul
Ago
Set
Out
Nov
Dez

PUBLIC

Personnel Plan

		Jan	Fev	Mar	Abr	Mai	Jun	Jul	Ago	Set	Out	Nov	Dez
CEO	0%	€13.000	€13.000	€13.000	€13.000	€13.000	€13.000	€13.000	€13.000	€13.000	€13.000	€13.000	€13.000
CFO	0%	€5.000	€5.000	€5.000	€5.000	€5.000	€5.000	€5.000	€5.000	€5.000	€5.000	€5.000	€5.000
CTO	0%	€6.000	€6.000	€6.000	€6.000	€6.000	€6.000	€6.000	€6.000	€6.000	€6.000	€6.000	€6.000
Maintenance Staff	0%	€105.000	€105.000	€105.000	€105.000	€105.000	€105.000	€105.000	€105.000	€105.000	€105.000	€105.000	€105.000
Office Manager	0%	€2.500	€2.500	€2.500	€2.500	€2.500	€2.500	€2.500	€2.500	€2.500	€2.500	€2.500	€2.500
Call Center Staff	0%	€5.000	€5.400	€5.832	€6.299	€6.802	€7.347	€7.934	€8.569	€9.255	€9.995	€10.795	€11.658
Other Personnel	0%	€1.167	€1.167	€1.167	€2.333	€2.333	€2.333	€2.333	€2.333	€4.000	€4.000	€4.000	€4.000
Total People		6	6	6	8	8	8	8	8	10	10	30	30
Total Payroll		€137.667	€138.067	€138.499	€140.132	€140.635	€141.180	€141.767	€142.402	€144.755	€145.495	€146.295	€147.158

Pro Forma Profit and Loss

		Jan	Fev	Mar	Abr	Mai	Jun	Jul	Ago	Set	Out	Nov	Dez
Sales		€810.080	€1.226.640	€1.560.068	€1.669.965	€1.773.691	€1.847.327	€1.869.034	€1.886.652	€1.892.903	€1.899.226	€1.953.463	€1.985.934
Direct Cost of Sales		€790.000	€797.900	€805.879	€813.938	€822.077	€830.298	€838.601	€846.987	€855.457	€864.011	€872.651	€881.378
Other		€90.000	€94.500	€99.225	€104.186	€109.396	€114.865	€120.609	€126.639	€132.971	€139.620	€146.601	€153.931
Total Cost of Sales		€880.000	€892.400	€905.104	€918.124	€931.473	€945.163	€959.210	€973.626	€988.428	€1.003.631	€1.019.252	€1.035.309
Gross Margin		(€69.920)	€334.240	€654.964	€751.841	€842.218	€902.164	€909.824	€913.026	€904.475	€895.595	€934.211	€950.626
Gross Margin %		-8,63%	27,25%	41,98%	45,02%	47,48%	48,84%	48,68%	48,39%	47,78%	47,16%	47,82%	47,87%
Expenses													
Payroll		€137.667	€138.067	€138.499	€140.132	€140.635	€141.180	€141.767	€142.402	€144.755	€145.495	€146.295	€147.158
Sales and Marketing and Other Expenses		€324.100	€242.700	€204.120	€153.420	€132.880	€106.620	€37.838	€37.838	€37.838	€114.420	€195.180	€245.120
Depreciation		€0	€0	€0	€0	€0	€0	€0	€0	€0	€0	€0	€2.666.000
Maintenance structure		€3.356	€15.360	€21.872	€22.592	€24.512	€25.904	€25.888	€25.712	€24.272	€21.856	€20.672	€28.048
Utilities		€800	€800	€1.600	€1.600	€1.600	€1.600	€1.600	€2.400	€2.400	€2.400	€2.400	€3.200
Energy		€100.000	€120.000	€130.000	€140.000	€140.000	€140.000	€140.000	€140.000	€140.000	€140.000	€140.000	€140.000
Call center		€1.500	€1.500	€3.000	€3.000	€3.000	€3.000	€3.000	€4.500	€4.500	€4.500	€4.500	€6.000
Payroll Taxes	15%	€3.762	€3.762	€3.762	€4.312	€4.312	€1.069.687	€5.062	€5.062	€5.987	€5.987	€5.987	€1.069.687
Other		€0	€0	€0	€0	€0	€0	€0	€0	€0	€0	€0	€0
Total Operating Expenses		€571.185	€522.189	€502.853	€465.056	€446.940	€1.487.991	€355.155	€357.914	€359.752	€434.658	€515.034	€4.305.213
Profit Before Interest and Taxes		(€641.105)	(€187.949)	€152.111	€286.785	€395.278	(€585.827)	€554.669	€555.112	€544.723	€460.937	€419.177	(€3.354.587)
Interest Expense		€13.750	€18.750	€21.250	€23.333	€24.583	€25.417	€34.583	€34.583	€34.583	€34.667	€35.083	€38.417
Taxes Incurred		€0	€0	€0	€0	€0	€0	€0	€0	€0	€0	€0	€0
Other Income													
Interest Income		€0	€0	€0	€0	€0	€0	€0	€0	€0	€0	€0	€0
Extraordinary Items		€0	€0	€0	€0	€0	€0	€0	€0	€0	€0	€0	€0
Total Other Income		€0	€0	€0	€0	€0	€0	€0	€0	€0	€0	€0	€0
Other Expense													
Account Name		€0	€0	€0	€0	€0	€0	€0	€0	€0	€0	€0	€0
Extraordinary Items		€0	€0	€0	€0	€0	€0	€0	€0	€0	€0	€0	€0
Total Other Expense		€0	€0	€0	€0	€0	€0	€0	€0	€0	€0	€0	€0
Net Other Income		€0	€0	€0	€0	€0	€0	€0	€0	€0	€0	€0	€0
Net Profit		(€654.855)	(€206.699)	€130.861	€263.451	€370.695	(€611.244)	€520.086	€520.529	€510.140	€426.270	€384.094	(€3.393.004)
Net Profit/Sales		-80,84%	-16,85%	8,39%	15,78%	20,90%	-33,09%	27,83%	27,59%	26,95%	22,44%	19,66%	-170,85%

6 Individual Exploitation Plans

Aligned with the SUIT business model as a whole as described in Section 5, where an Integrator is in the centre (see Section 4), SUIT partners have the following exploitation plans:

6.1 IT

- SUIT Terminal in collaboration with other partners (Vitec, UPM, IBBT)
- Some reception profiles (Building, Rural, STB) with Wavecom and Transcoder profile with Vitec.
- The DVB-T+WiMAX emulator in collaboration with UniS.
- One MDC (encoding) solution, i.e. MDC-3.
- A VoIP solution

6.2 IBBT

- Two MDC solutions, MDC-1 and MDC-2
- One extractor

6.3 URL

As a research and development centre located at the Universitat Ramon Llull, the Digital TV Centre is strongly involved in the deployment of the broadcasting and audiovisual technologies in Spain. URL is currently involved in projects related to technologies covered by SUIT such as SVC, RTP, DVB-H, DVB-T, MHP, MPEG-21, MPEG-7 and many others always related to the broadcasting, consumption and management of A/V content and data.

The results from SUIT will allow URL to perform exploitation in several ways:

- Knowledge about RTP encapsulation and signalling of H264 SVC will allow URL to adquire experience in networking, and to offer a wider technological perspective when collaborating with external companies.
- The know-how adquired with the implementation of a inteligent playout capable of serving broadcast/unicast/multicast services over DVB-T and WiMAX netwoks, and kwowledge of IPTV, will allow URL to face new projects.

To summarize, URL will have two exploitable software implementations:

- Playout managing software
- Video Server (RTP encapsulator+Extractor) in collaboration with IBBT.
- Intelligent multiplexer supporting fast hyperlinked video in collaboration with IT.

6.4 R&S

- **Control software for test set-up**
    - It is planned to validate the control software modules that control the test signal generators with potential costumers from the receiver industry. In such a case, the

receiver that initiates the handover in a DVB-T/H system is the DUT. Therefore, a receiver manufacturer needs to access QoS relevant information at an internal receiver interface, and integrate the respective control software modules into their testbed control software.

- **Test streams**
  - Test streams are required to provide input signals for the test signal generators of the testbed. These test streams are generated in pairs. They contain at least one service which is identical in both streams but the signalling (PSI/ SI in the respective tables) is different in both streams.
    Such pairs of test streams will be generated for various bit rates in such a way that they can be used with different modulation schemes and different code rates.

- **Wireless Network Emulator**
  A wireless network emulator is required to evaluate video performance over WiMAX and DVB-T/H under multipath channels. The network operators can decide parameters and configurations.

- **To summarise:**
  - Control SW for controlling test signal generators in a HO testbed;
    Decision on product development after validation with potential customers;
    Availability planned for early 2008.

  - Test streams for test signal generators as part of a stream library;
    Availability planned for early 2008

  - Emulator as part of our equipment portfolio. It can be an option of a test equipment
    Availability planned for 2008.

6.5 UniS

- The DVB-T+WiMAX emulator in collaboration with IT.
- Audio system for TV services

6.6 Vitec

VITEC Multimedia is developing and manufacturing original multimedia products in MPEG-digital video technology. VITEC's innovative and competitive products are sold worldwide through computer distributors, multimedia VAR's, system integrators and OEM's. VITEC has built an existing distribution network and direct sales in 24 countries and is exporting over 80% of its turnover.

VITEC has a full range of MPEG products. VITEC Multimedia has started the development of a DSP-based family of video multiprocessor platforms. They are designed to afford OEM customers with advanced means for developing real-time video applications based on MPEG technology (MPEG-1/2/4 up to SD/HD levels). VITEC provides the following services to OEM customers:

- SDK and source code for building OS drivers and DSP sample codes;
- Technical support with purchase of development kit;
- Production facilities to deliver boards in volume at reasonable cost;
- Board customization and FPGA implementation.

In its own field of expertise, VITEC is expecting to see the emerging of the following exploitable results from SUIT project:

- R-T HD H.264/MPEG-4 AVC Encoder;
- R-T H.264/MPEG-4 SVC Encoder;
- H.264/MPEG-4 SVC Stat-Mux;
- H.264/MPEG-4 MD-SVC Post-Processor;
- MD-SVC Combiner;
- SVC-AVC Transcoder.

In conjunction with a French RIAM research project named ArchiPEG, VITEC is expecting to soon provide the market with a real-time H.264/MPEG-4 AVC dedicated to HDTV. It will allow to encode and broadcast live feeds in 720p and 1080i formats. Experiments will be done to evaluate how 1080p live feeds could be encoded in real-time. DVB is promoting the use of MPEG-4 AVC for HDTV broadcasting because of the bandwidth savings that are provided by this technology in place of MPEG-2 currently used for DTV.

In parallel, relying on the same technology an SVC release of the same encoder should be available for testing the first live television broadcasts using scalable video formats. It will mainly interest telecommunication operators that will have soon to deal with huge uncontrolled video streams launched by the deployment of personal or community IPTV applications.

The playout proposed in SUIT project leads to develop a multiplexer that can usefully rely on the scalable structure of video streams and their related quality information. These efforts can be generalized to propose a convenient statistical multiplexer which performances can be compared to transraters arrays used concurrently to achieve the task of multiplexing several video programmes into a single channel of a given bandwidth.

For wireless applications, redundancy can afford the necessary robustness enabling to stream video over wireless networks. So, a second release of the SVC statistical multiplexer could be derived to satisfy wireless delivery of video content. But multiple descriptions should be multiplexed into a single stream to be proposed as a product itself. Among the three different schemes, the second based on redundant slices should be shipped as it for consumer applications.

The third scheme based on scalar quantization provides a finer control of redundancy and should satisfy high quality demanding applications for the professional market. It might then be proposed with an appropriate combiner that can retrieve information from lost packets in the remaining content.

Finally, in order to set up field tests without waiting the development of SVC-compliant terminals, it will be derived from the project bitstream extractor an SVC-to-AVC transcoder. It will enable to reuse the existing range of MPEG-4 AVC set-top boxes.

6.7 Runcom

RUNCOM regards collaboration in SUIT project with other partners as a unique opportunity for future commercial exploitation of OFDMA technology, which is poised as a promising candidate for nextG cellular mobile systems. The implications of the adaptive multi access OFDM (OFDMA) are profound which signifies a paradigm shift opening new business opportunities for operators, service providers, system-on-chip and equipment manufacturers. Runcom will exploit the tangible results of SUIT project together with other industrial and academic partners to commercialize technology assets developed within the project and reach mature products in the following areas:

1. **Dual mode User Terminal**- Runcom intends to exploit results and develop a converged dual mode system-on-chip combining 16e chip (WiMAX Chip) and DVB-T chip thus extending reach of the two converged networks.

2. **Upgrade to Mobile WiMAX Wave 2 requirements**- Runcom plans to develop a second generation SoC as an upgrade for its OFDMA based SoC for the User Terminal to comply with Mobile WiMAX Wave2 requirements. Wave 2 will support operation with variety of Base Stations equipped with MIMO capabilities (MIMO matrix A, MIMO matrix B and Beam-forming). Such product could take the form of a module sold to OEM`s and ODM manufacturers (Figure 6.7.1 Runcom roadmap for User Terminals)

3. **Pico Base Station**- Runcom has completed the design stage and will initiate a plan for the development of SoC for Pico Base Station complying with Wave 2 requirements which is viewed as a further step in the implementation of its roadmap). The rationale behind this development is the identified market need to introduce a low cost solution for the base stations and thus to contribute to the uptake of Mobile WiMAX mass market.

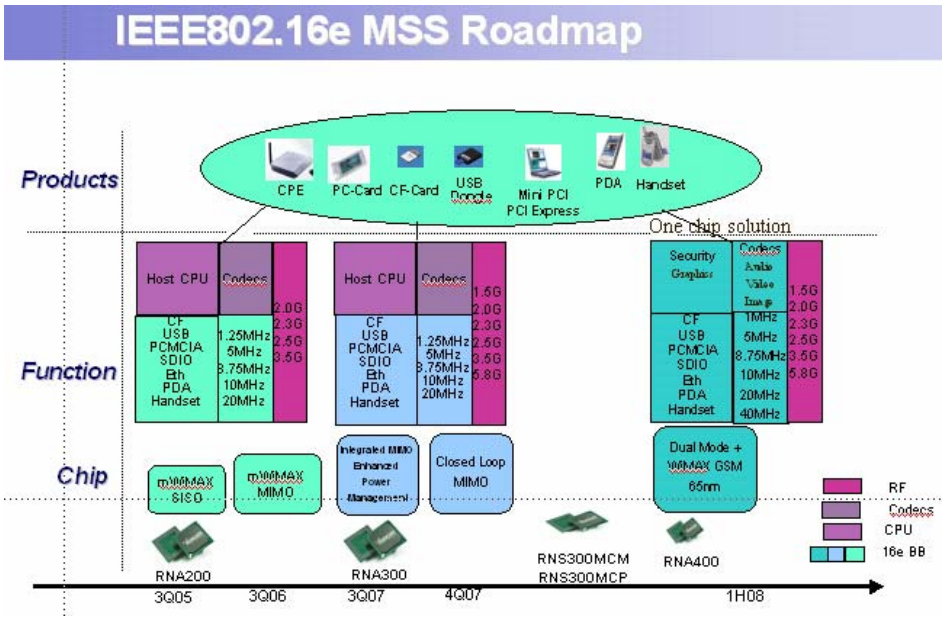


Fig. 8- Runcom Mobile Subscriber Station (MSS) roadmap

4. **Mobile Video Surveillance Systems**- Runcom intends to exploit its system capabilities and availability of SoCs solutions on both the base station and user side to introduce to the market a WiMAX based Mobile Video Surveillance system in addition to the existing DVB-RCT solution.

5. **SUIT concept validation with Cellcom**- Use of Mobile WiMAX Wave2 equipped with Matrix B, where two different data streams can be transmitted, simultaneously, from the Base Station to the user will offer the opportunity to validate SUIT concept of streaming scalable multiple descriptive visual contents. The plan is being negotiated with Cellcom and the test will be performed in Cellcom premises within the framework of Israel 4G consortium led by Runcom.

Collaboration in SUIT with offers further drive for future commercial exploitation of the OFDMA technology, which has been accepted as the basis for IEEE802.16, Mobile WiMAX and the new IEEE802.22 standard in the making phase. The implications of the OFDMA are profound in opening new business opportunities for broadcasters, broadband communication service providers and telecommunication companies in introducing new broadband access technology (OFDMA).

Runcom intends to introduce more enhancements on the second generation of "modem on chip" where OFDMA will be employed as the access scheme, enabling additional level of adaptivity through the dynamic allocation of sub-carriers within the same OFDM symbol to different users. This level of adaptivity can be equally applied to broadband wireless access systems operating in TDD or FDD modes.

6.8 IRT

SD&S metadata server/client

IRT's IPTV Metadata Server provides all necessary metadata information to run IPTV services compatible to the DVB IPI standard (ETSI-TS 102034 v. 1.2.1). It delivers all required Service Discovery and Selection (SD&S) records and EPG data for Broadcast Content Guides (BCG) via both delivery mechanisms, http and multicast. For integration into the SUIT playout, adaptation of the SD&S server was required. On the terminal side, a SD&S client will be developed.

IRT’s intent is to market the SD&S client possibly together with the SD&S Metadata server.

6.9 UPM

The contribution of UPM (Universidad Politécnica de Madrid to the SUIT project has enlarged its knowledge and experience in the areas of scalable and multiple description video coding, packet transmission over wireless networks under the all-IP paradigm, and rate control applied to scalable video coding over WLANs. The results are expected to cross-fertilise with current activities and to support future initiatives in these areas. It is an intrinsic role of any University to contribute to the dissemination of the results in any possible media.
The UPM will, thanks to the SUIT project, continue building its long and rich tradition in this field, focusing mainly on technical and research publications, and contributions to international standards. But besides its teaching, research and development activities, the UPM is highly interested to participate in the exploitation of the outcomes of the projects in which it is involved. This participation will depend on the type of result and each partner's contribution. The results obtained by the UPM will be used as background knowledge for other R&D projects, copyright and patent issues being properly handled through the Technology Transfer Offices of the UPM.
Particularly, UPM’s main expectative is focused on the technology applied to optimize video transmission over wireless networks. In this sense, exploitable results in the terms described above are:

- The Terminal in collaboration with other partners (Vitec, IT, IBBT)
- The gateway software in collaboration with other partners (Wavecom, URL, IBBT):
    - Synchronization module.
    - WLAN optimized transmission module (rate-control).

6.10 Wavecom

- Wavecom intends to create and exploit a standalone integrated version of the WiMAX/DVB-T/H dual access gateway.
- Wavecom considers integrating SUIT and sell it to the operators.

6.11 MCT

As a member of a media and broadcast Portuguese group, MCT is very interested in this SUIT type of service concept. Certainly, it will help Media Capital to explore new services and new business models on video content and interactivity. His collaboration is also a big and unique opportunity for gain expertise and knowledge on how to deploy a combined DVB-T/H and WiMAX coverage project. MCT is interested to acquire SUIT solutions in case all SUIT concept is technologically well designed and proven. Besides, MCT, in the framework of SUIT, would like to collaborate in elaborating business solution for operators as well as in demonstrating SUIT via real field trials.

7 Dissemination Report and Plans

7.1 General Dissemination

7.1.1 Web Page

A webpage in suit.av.it.pt has been created and maintained by IT. Public deliverables are placed in our web site.

7.1.2 Workshops

- SUIT was presented in two Concertation meetings organized by the Commission, one held in Brussels and another in Paris.

- SUIT will organize a special session on convergence of broadband wireless networks in the IEEE International Symposium on Consumer Electronics - www.isce.org

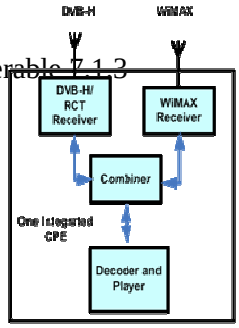
7.1.3 Exhibitions

- URL has also been present with its own booth at the New Technology Campus of the International Broadcasting Convention, held in Amsterdam during September 2006, showing a demonstration of media and metadata delivery over IPTV and DVB-T/H networks using MPEG-21 technologies.
- In March 2007, SUIT prototype was shown in the SUIT 1st Review,
- In March 2007, SUIT prototype was shown to the President of the Portuguese Republic
- In July 2007 and in the context of the Portuguese Presidency of the European Union, SUIT was shown during the workshop on Mobile TV organized by the Portuguese Spectrum Regulator and Digitag, http://www.anacom.pt/template2.jsp?categoryId=244542
- In the above workshop, SUIT members organized all audio-visual facilities for broadcasting the event on-line. There is also a DVD.
- IRT presented SUIT to the Board of Directors
- The error patterns and emulators have been demonstrated to visitors to UniS's labs. These visitors include a high level official from the UK Ministry of Defence, and a team of researchers from Hewlett Packard.
- In December 2006 UPM disseminated the SUIT results to Spanish companies (Telefonica I+D) and to Spanish administration authorities (Ministerio de Industria)
- Elaboration of the local-UPM SUIT web page
- SUIT prototype was exhibited in IBC-Amsterdam at Booth 2.108 on Sept 6-11, 2007.
- SUIT partners plan to demonstrate SUIT platforms in top expositions like 3GSM 2008, IBC2008 and IST Summit.

7.1.4 Leaflets

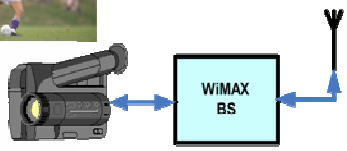
The following leaflet has been publicised in many workshops and exhibitions.

University of Aveiro
Telecommunications Institute
University Campus
3810 Aveiro-Portugal
Ph: +351 234 377900
Fax: +351 234 377901
suit.av.it.pt
navarro@av.it.pt



SUIT

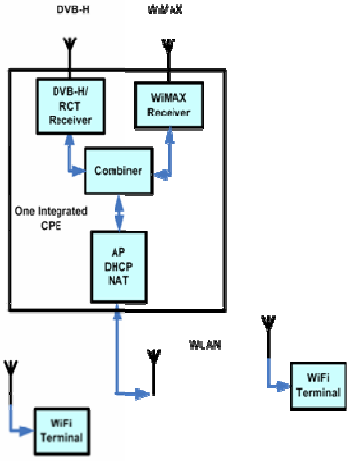
Scalable, Ultra-fast and Interoperable Interactive Television

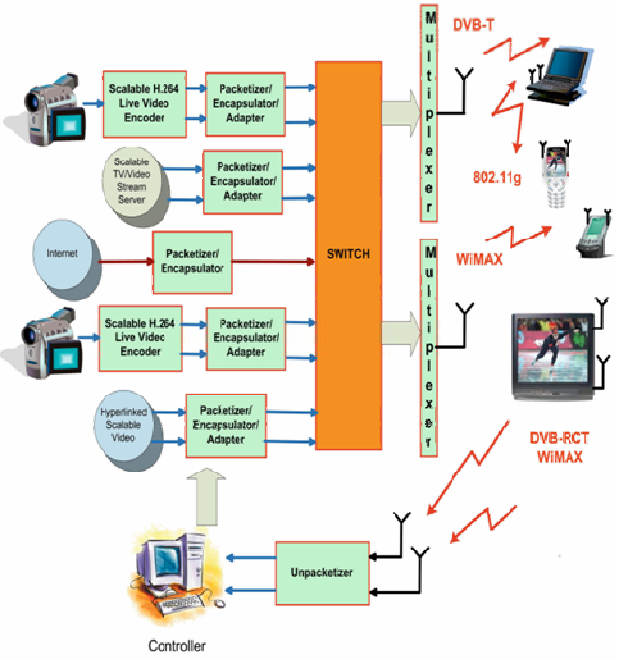


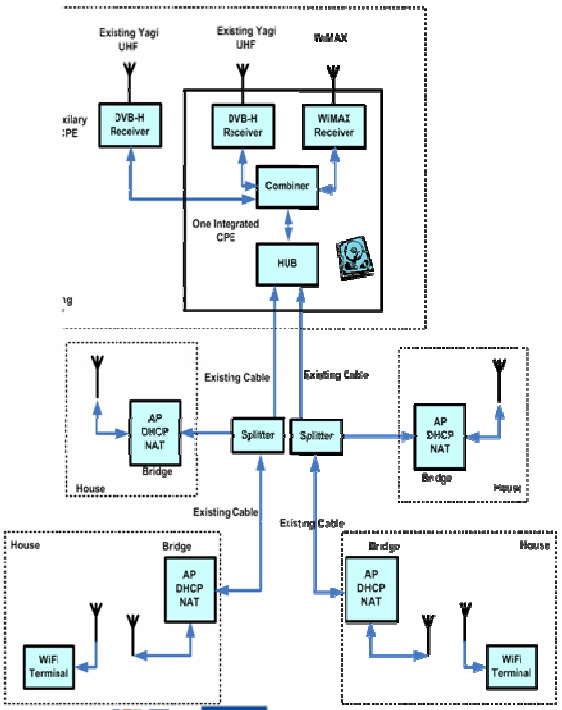
SUIT considers an end-to-end chain composed of a playout, last mile networks, and terminals of different computational and display capacities.

Firstly, video contents, either live or pre-recorded is encoded in a scalable way to be delivered simultaneously to a variety of devices from HD flat displays to handheld devices. Secondly, as the viewer expects that the interactive system responds to a request quickly, SUIT will optimally manage at the playout, the DVB-T/H and WiMAX (16e-mobile profile) resources, thereby, the requested content will be delivered as fast as possible through the available TDMA/FDMA slots in both networks. As SUIT is using scalable video contents, the playout system is able to increase, for short time, the bandwidth to support high priority contents, e.g. hyperlinked interactive video contents. Thirdly, scalable multiple descriptions, possibly unbalanced, are delivered through DVB-T/H and WiMAX in order to support high speed mobility.

To achieve the objectives related to scalable video, will make use of the most recent technologies like scalable MPEG-4 AVC/H.264 and MPEG-21 DIA. The former will allow encoding digital video contents in a scalable manner. In order to optimally meet the network conditions, joint source-channel-modulation schemes are being investigated. Finally, the latter will support terminal descriptions and negotiations between the terminal and the playout. Several reception profiles have been defined to support many practical scenarios as possible.



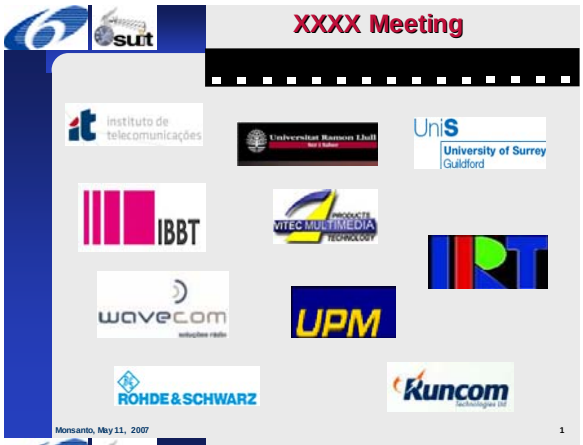


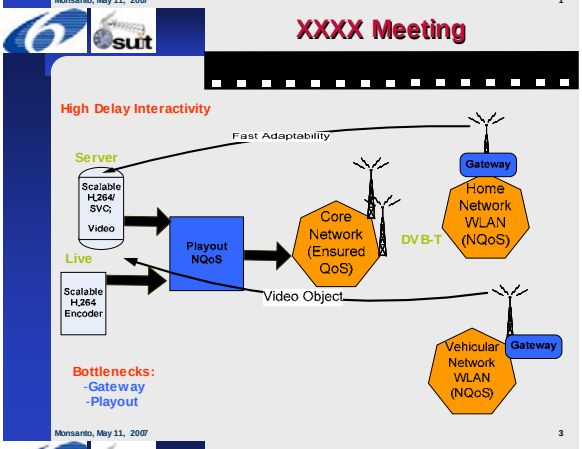


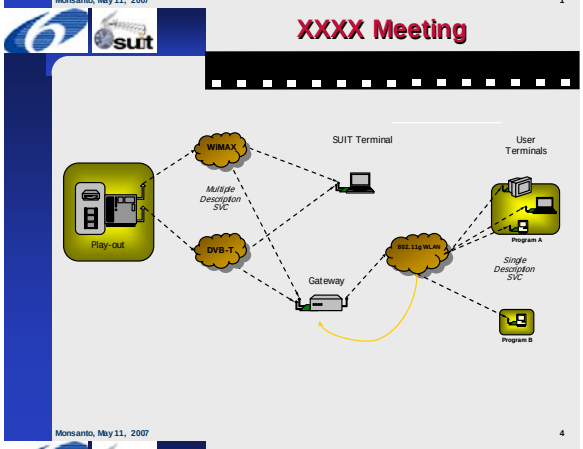
7.1.5 PowerPoint Presentations

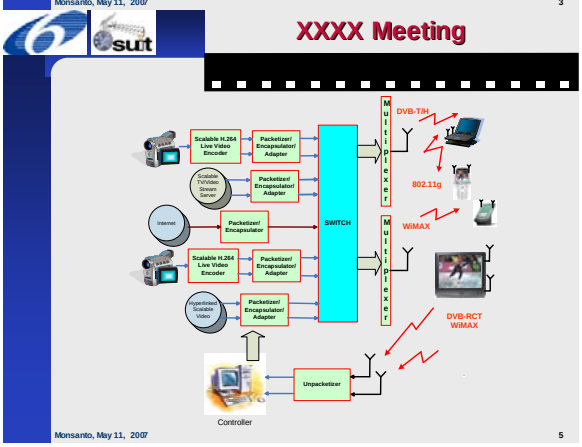
The following presentation has been shown to several operators mentioned in Section 3.

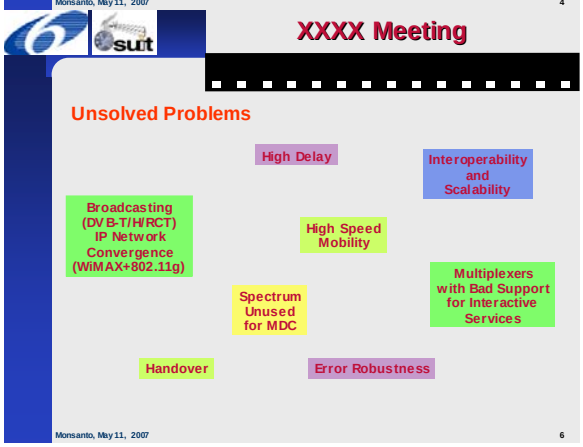
During the presentation, there are a lot of discussions around the main ideas of SUIT which somehow tailor our system.

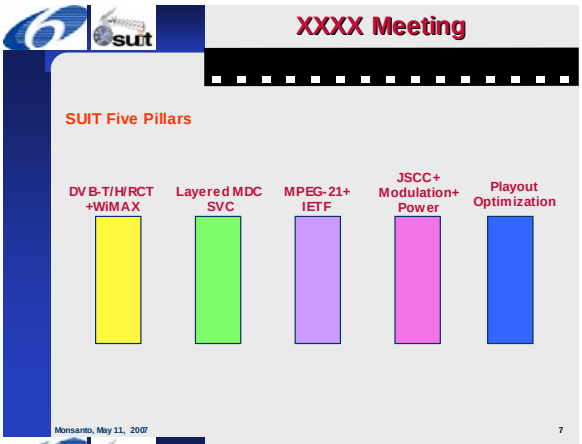


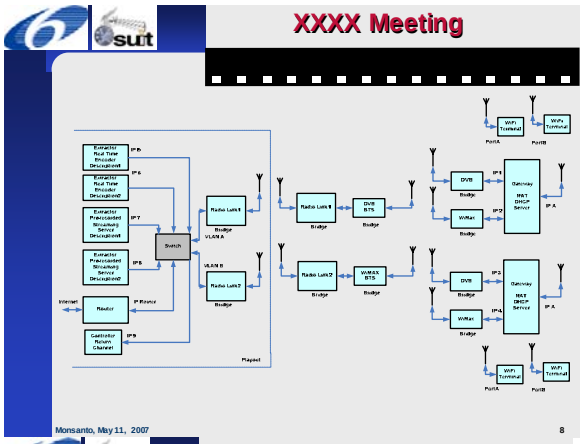


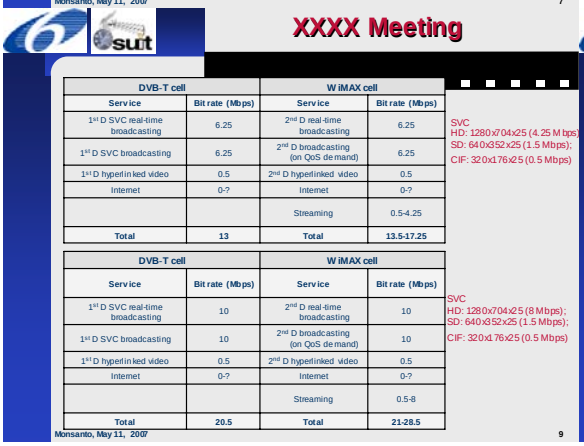


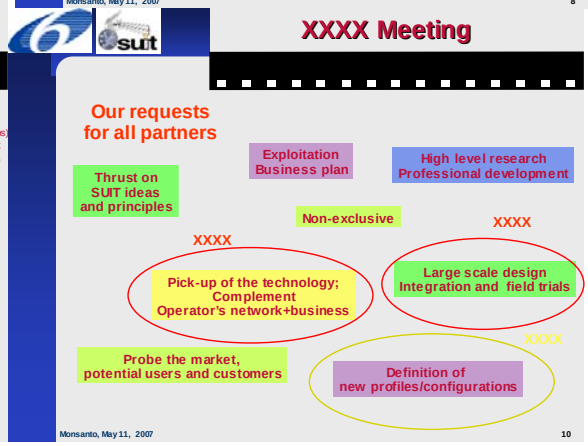






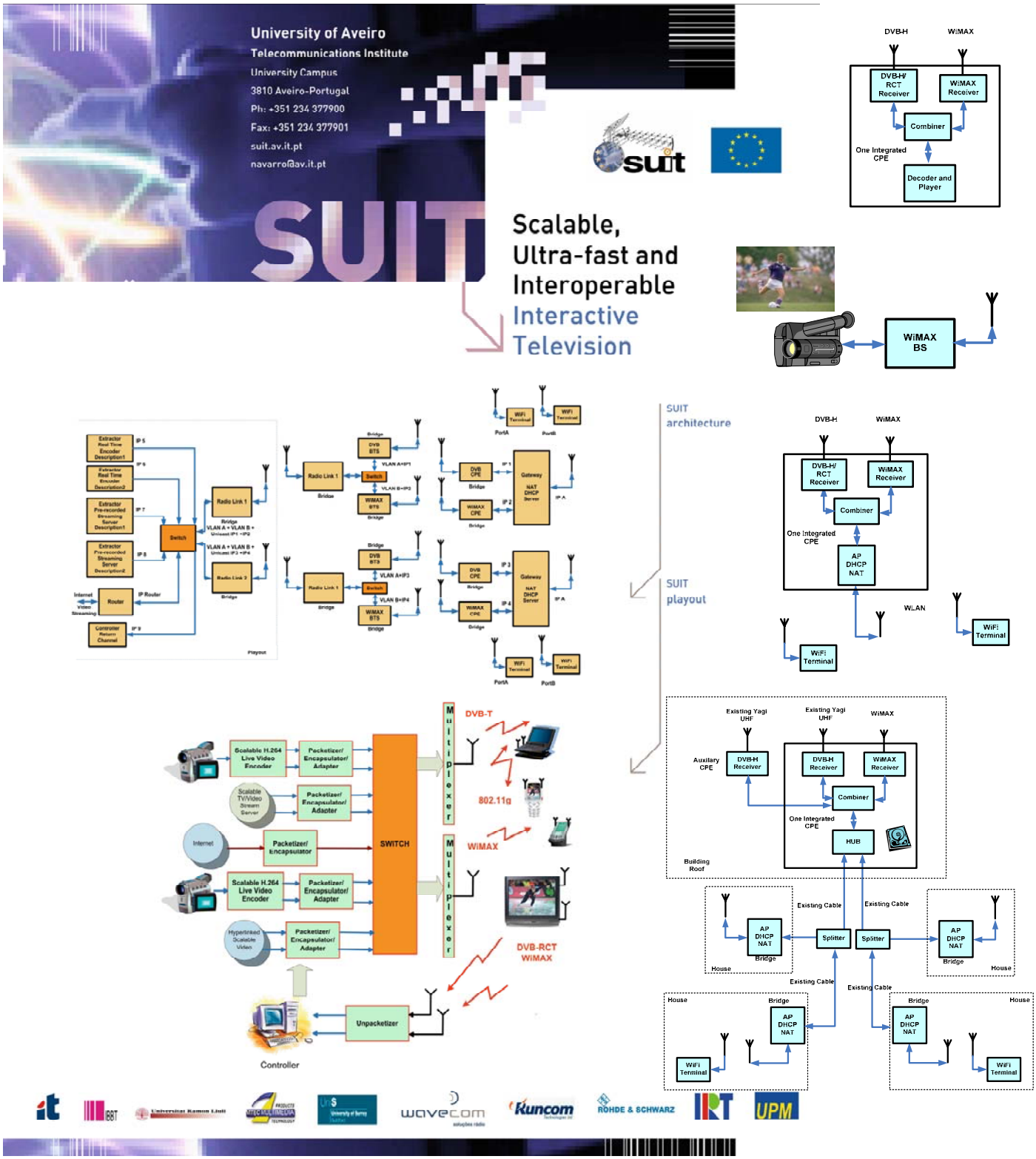






7.1.6 Posters

The following poster have been exhibited in several places, such as in the workshop organized by ANACOM+DIGITAG and in IBC.



7.2 Individual Dissemination and Plans

The following paragraphs report the dissemination activities including contribution to the standards carried out by partners of SUIT so far. It also includes SUIT partners' plans from now on. Thus, each sub-section is divided into **Published papers**, **Standardization**, **Other activities** and **Future plans**.

7.2.1 IT

Published papers:

- A. Navarro and V. Silva, “Fast Conversion between DCT and Wavelet Transform Coefficients,” 3rd International Workshop on Mathematical Techniques and Problems in Telecommunications, Leiria-Portugal, Sept 4-8, 2006.
- B. Gabriel and A. Navarro, “Multi-carrier Optimization for Compressed Video Streaming,” EEE Int. Conf. on Consumer Electronics, Las Vegas, Jan 10-13, 2007.
- P. Schelkens, Y. Dhondt, O. Guye, A. Navarro, R. Van de Walle, S. Warroll, Error-resilient Transmission of MPEG-4 SVC Streams over DVB-T/H and WiMAX Channels with Multiple Description Coding Techniques, Eurasip.
- A. Navarro, SUIT- Scalable, Ultra-fast and Interoperable Interactive Television - (SUIT architecture as defined in the proposal), IEEE ISCE 2007- Dallas-USA.
- C. H. Liew, S. Worrall, M. A. Mota and A. Navarro, Hybrid WiMAX and DVB-H Emulator for Scalable Multiple Descriptions Video Coding Testing, IEEE ISCE 2007- Dallas-USA.
- S. Moiron, S.M.M. Faria, P.A. Assunção, V. Silva and A. Navarro, "Fast Interframe Transcoding from H.264 to MPEG-2 ", Proc IEEE International Conf. on Image Processing - ICIP, San Antonio- USA, September , 2007 .
- S. Moiron, S.M.M. Faria, P.A. Assunção, V. Silva and A. Navarro, "Low-complexity Video Content Adaptation for Legacy User Equipment", Proc International Conf. on Multimedia Communications , Nafpaktos-Greece, August , 2007.
- Navarro et al, “Error-resilient Transmission of MPEG-4 SVC streams over DVB-T/H and WiMAX Channels with multiple description coding techniques, EURASIP 2007.
- S. Moiron, P. Assunção, S. Faria, V. Silva, A. Navarro, 2007, ”Mode Conversion for H.264 to MPEG-2 Video Transcoder”, Accepted for PCS 2007
- S. Moiron, P. Assunção, S. Faria, V. Silva, A. Navarro, 2007, ”Mode Conversion for H.264 to MPEG-2 Video Transcoder”, Accepted for ICCE 2008
- R. Marques, V. Silva, S. Faria, A. Navarro, P. Assunção, 2007, “H.264 to MPEG-2 Conversion of Intra Coded Video”, VI Conf. on Telecommunications, Peniche-Portugal.
- S. Moiron, P. Assunção, S. Faria, V. Silva, A. Navarro, 2007, “H.264/AVC to MPEG-2 Video Transcoding Architecture”, VI Conf. on Telecommunications, Peniche-Portugal.

Standardization:

- M. Santos, A. Silva, A. Navarro, “H.264 Deblocking Filter Implementation on a Virtex-II,” ISO/IEC JTC1/WG11 Doc. M13620, Jul 2006.
- A. Navarro, “Crosscheck report on fixed-point DCT/IDCT algorithms,” ISO/IEC JTC1/WG11 Doc. M13701, Jul 2006.
- Yury Reznik, Arianne Hinds and A. Navarro, “On Complexity Criteria and Metrics for MPEG Fixed-Point IDCT Standard,” ISO/IEC JTC1/WG11 Doc. M13703, Jul 2006.
- M. Santos, A. Silva, A. Navarro, “MPEG-4 VLD+IQ+IDCT Implementation on a Virtex-II,” ISO/IEC JTC1/WG11 Doc. M13139, April 2006.
- Silva, J. Tavares, A. Navarro, “MPEG-4 Testbed for Video IDCT Specification,” ISO/IEC JTC1/WG11 Doc. M13140, April 2006.
- Silva, J. Tavares, A. Navarro, “MPEG-4 Test Results for Video IDCT Specification,” ISO/IEC JTC1/WG11 Doc. M13141, April 2006.

- Arianne T. Hinds, Yuriy A. Reznik, Phoom Sagetong, Honggang Qi, Siwei Ma, Antonio Navarro, “MPEG-4 Test Results for Video IDCT Specification,” ISO/IEC JTC1/WG11 Doc. M13311, April 2006.
- A. Navarro, “Cross-check of Improved Fixed-Point DCT/IDCT Implementation Scheme with Low Complexity and High Fidelity (M13256),” ISO/IEC JTC1/WG11 Doc. M13376, April 2006.
- M. Santos, A. Silva, A. Navarro, “H.264 Deblocking Filter Implementation on a Virtex-II,” ISO/IEC JTC1/WG11 Doc. M13620, Jul 2006.
- Navarro, “Crosscheck report on fixed-point DCT/IDCT algorithms,” ISO/IEC JTC1/WG11 Doc. M13701, Jul 2006.
- Yuriy Reznik, Arianne Hinds and A. Navarro, “On Complexity Criteria and Metrics for MPEG Fixed-Point IDCT Standard,” ISO/IEC JTC1/WG11 Doc. M13703, Jul 2006.
- A. Navarro, Y. Reznik and A. Silva, “Improved IDCT”, ISO/IEC JTC1/WG11 Doc. M13800, Oct 2006.
- A. Navarro, Y. Reznik and A. Silva, “Improved IDCT-Replacing M13800”, ISO/IEC JTC1/WG11 Doc. M13803, Oct 2006.
- A. Navarro, M. Santos, “Hardware implementation of full search H.264 motion estimation”, ISO/IEC JTC1/WG11 Doc. M13989, Oct 2006.
- A. Navarro, A. Silva, “Performance in MPEG-4 of five submitted integer IDCTs for CD”, ISO/IEC JTC1/WG11 Doc. M13990, Oct 2006.
- A. Navarro, “Crosschecking an integer 16 bit IDCT (M13791)”, ISO/IEC JTC1/WG11 Doc. M13992, Oct 2006.
- A. Navarro, “Cross check of proposed additional (CE-stage) IDCT designs”, ISO/IEC JTC1/WG11 Doc. M14003, Oct 2006.
- A. Navarro, A. Silva and Y. Reznik, “A Correction on Scalable Fixed-Point 8x8 FDCT/IDCT for CD selection”, ISO/IEC JTC1/WG11 Doc. M14078, Jan 2007.
- A. Navarro, “Cross-checking 9 LLM11-based scaled algorithms from the CE”, ISO/IEC JTC1/WG11 Doc. M14254, Jan 2007.
- A. Navarro, “Comments on Evaluation Procedure for CD Selection in Hangzhou”, ISO/IEC JTC1/WG11 Doc. M14255, Jan 2007.

Other activities:

- IT organized the 3rd International Workshop on Mathematical Techniques and Problems in Telecommunications (http://www.mtpt.it.pt/). Thus, SUIT supported this scientific event. Five tutorials were presented:

1. CROSS-LAYER ISSUES IN WIRELESS NETWORKS, Vincent Poor.
2. ENCRYPTION, Joachim Rosenthal.
3. MATHEMATICAL NEEDS FOR BEHAVIOURAL MODELLING OF TELECOMMUNICATION CIRCUITS AND SYSTEMS, José Carlos Pedro.
4. A MULTIOBJECTIVE ROUTING OPTIMISATION FRAMEWORK FOR MULTISERVICE NETWORKS - A HEURISTIC APPROACH, José Craveirinha.
5. JOINT SOURCE CHANNEL TURBO TECHNIQUES FOR WIRELESS COMMUNICATION, Christine Guillemot.

- Participation in MPEG meeting- Marrakech, Jan 2007.
- Paper presentation in IEEE ICCE, July 2007.

- In Jan 24, 2007, there was a seminar organized by IT and R&S in held in Aveiro-Portugal: 70 attendees, mostly from operators and broadcasters. There was a talk: A. Navarro and D. Hagemeier ," DVB-H Playout", Instituto de Telecomunicações.

Future plans:

- G. Fernandez, A. Navarro, F. Enrich, V. Domingo, F. Pinyol, An Advanced Playout Architecture for Delivering Two IP Scalable Video Descriptions.
- J. Lauterjung, A. Zistler, A. Navarro, M. Goldshtein, Handover and Delay Issues in the Context of IP Broadcasting over Convergent DVB-T/H and WiMAX Networks.
- J. Ferreira, P. Pratas, J. Cabrera, J. Plaza, F. Enrich, V. Domingo, A. Navarro, A DVB-T/H and WiMAX Platform for Broadcasting Scalable MDC of Video.

7.2.2 IBBT

Published papers:

- F. Verdicchio, A. Munteanu, A. Gavrilescu, J. Cornelis, and P. Schelkens, "Embedded Multiple-description Coding of Video, " accepted for publication in IEEE Transactions on Image Processing, 2006.
- P. Schelkens, Y. Dhondt, O. Guye, A. Navarro, R. Van de Walle, S. Warroll, Error-resilient Transmission of MPEG-4 SVC Streams over DVB-T/H and WiMAX Channels with Multiple Description Coding Techniques, Eurasip.

7.2.3 URL

As an academic and research partner, Universitat Ramon Llull will focus its dissemination activities on the publication of articles in national and international conferences and workshops, as well as in specialised scientific journals. As another goal of this non-profit organisation is to collaborate with the local industries in order to facilitate the deployment of audiovisual technologies, a dissemination activity will be made by showing them the results of SUIT.

Published papers:

- A. López, G Fernàndez, "Efficient media delivery over mobile terminals using DVB-H ," Proceedings of the 10th IEEE International Symposium on Consumer Electronics (ISCE 2006) , pp: 357-362, July 2006, Saint Petersburg
- A. López, G Fernàndez, "Efficient IP encapsulation in a DVB-H platform," Proceedings of the International Broadcasting Convention, IBC 2006, pp: 132-139, Sept 2006, Amsterdam

Future Plans:

For the time being of the SUIT project, URM will contribute to the dissemination of the SUIT project in the terms of Playout management, RTP encapsulation and signalling.
URL will try to be present in new forthcoming conferences and workshops.

URL is currently working on the preparation of technical papers:

- G. Fernandez, A. Navarro, F. Enrich, V. Domingo, F. Pinyol, An Advanced Playout Architecture for Delivering Two IP Scalable Video Descriptions.
- Zistler, M. Probst, K. Vermeirsch, V. Domingo, F.Enrich, Announce and Feedback Protocols Design for Scalable MDC Video over DVB-T/H and WiMAX.
- J. Ferreira, P. Pratas, J. Cabrera, J. Plaza, F. Enrich, V. Domingo, A. Navarro, A DVB-T/H and WiMAX Platform for Broadcasting Scalable MDC of Video.

7.2.4 R&S

Future Plans:

- J. Lauterjung, A. Zistler, A. Navarro, M. Goldshtein, Handover and Delay Issues in the Context of IP Broadcasting over Convergent DVB-T/H and WiMAX Networks.

7.2.5 UniS

Published papers:

- P. Schelkens, Y. Dhondt, O. Guye, A. Navarro, R. Van de Walle, S. Warroll, Error-resilient Transmission of MPEG-4 SVC Streams over DVB-T/H and WiMAX Channels with Multiple Description Coding Techniques.
- C. H. Liew, S. Worrall, M. A. Mota and A. Navarro, Hybrid WiMAX and DVB-H Emulator for Scalable Multiple Descriptions Video Coding Testing, IEEE ISCE 2007- Dallas-USA.

Future Plans:

UniS will continue to seek publication of papers in conferences and journals. In addition, UniS intends to make contact with industry to disseminate SUIT results. UniS plans to contact British Telecom, the BBC, and Thales Research and Technology UK.

The following paper is planned:

- C. H. Liew, J. Cabrera, J. Plaza, F. Jaureguizar, G. Narciso, IEEE802.11g Emulator for Scalable Video Coding Testing.

7.2.6 Vitec

Published papers:

- P. Schelkens, Y. Dhondt, O. Guye, A. Navarro, R. Van de Walle, S. Warroll, Error-resilient Transmission of MPEG-4 SVC Streams over DVB-T/H and WiMAX Channels with Multiple Description Coding Techniques.

Future Plans:

After the development of the first technological bricks, it is planned to evaluate the SVC technology under the umbrella of a EUREKA project where should participate firms belonging the broadcast and telecommunication fields and evolving in the professional and consumer markets. Experiments should be led in order to compare present and emerging technologies like SVC in order to assess by usage domains the benefit that can be found out by using them.

Apart from this future assessment, VITEC is expecting to progressively launched products on the market based on AVC and SVC technology and promote them on commercial fairs. VITEC is used to plan its products commercialization according to the following steps:

- technological demonstration at the IBC or NAB fairs (Vitec yearly exhibits at this two shows);
- design of a preliminary datasheet;
- direct presentation to a selected set of potential clients;
- improvement or adaptation of the product if needed;
- final market launching at the next IBC or NAB events.

At each step, Vitec carries out a plan of communication towards some selected journals or qualified potential clients by floor or electronic mailing and direct contact.

The main market for these products should stand in IPTV applications. It would provide to telecommunication operators efficient tools to master the huge increase of bandwidth consumption required by personal and community pear-to-pear applications. Concerning professional applications, some significant improvements in quality should be observed in wireless environments and would allow to provide new solutions for existing markets like video-surveillance or emerging markets like crisis management.

7.2.7 Runcom

Standardization:

- "Deployment scenarios with reuse1", Eli Sofer, Peretz Shkalim,Moti Goldstein, IEEE 802.22 Wireless RAN, June 2006.
- "OFDMA Single Channel Parameters", Eli Sofer, Ramon Khalona, Wendong HU, IEEE.802.22 Wireless RAN, June 2006.
- "SuperFrame and PHY Single Channel". Eli Sofer, Doron Ezri, Zion Hadad IEEE802.22 Wireless RAN August 2006.
- “OFDMA single Channel Harmonization” Eli Sofer, Yossi Segal, doron Ezri, Michael Erlichson, IEEE802.16.22, 11 February 2007

Other activities:

- Attending IEEE802.16e working group meetings on March, May and July 2006.
- Attending IEEE802.22 workgroup meetings and submitting 3 contributions on OFDMA based PHY layer. The meeting were held on March, May, July and early Sept 06.

Future Plans:

- J. Lauterjung, A. Zistler, A. Navarro, M. Goldshtein, Handover and Delay Issues in the Context of IP Broadcasting over Convergent DVB-T/H and WiMAX Networks.

7.2.8 IRT

Other activities:

- Attendance at the WIMAX World Europe Conference (22nd to 24th May 2006) in Vienna and submission of an abridged report to the "Broadcast systems Management Committee" (BMC) - which is the broadcast systems research and development co-ordination platform within the EBU. Furthermore, the document has been forwarded to the Public Broadcasters of Germany, Austria, and Switzerland, as well as to the SUIT Consortium.
- Presentation at the "International Press Club of Munich" about WiMAX technique, the standards and information about the WiMAX license auction in Germany finished in December 2006. Another presentation held was focussing on WLAN techniques, trends and innovations.

Future Plans:

- Zistler, M. Probst, K. Vermeirsch, V. Domingo, Announce and Feedback Protocols Design for Scalable MDC Video over DVB-T/H and WiMAX.
- J. Lauterjung, A. Zistler, A. Navarro, M. Goldshtein, Handover and Delay Issues in the Context of IP Broadcasting over Convergent DVB-T/H and WiMAX Networks.

7.2.9 UPM

UPM has contributed to the dissemination of SUIT results through a variety of activities. According to the research and academic nature of UPM, these activities target mainly the technical (peer) community although some efforts have been done to present the SUIT concept to public bodies and technical companies with areas of interest within the broad range of technologies addressed by SUIT. Dissemination activities include the preparation and presentation of conference papers, the attendance at both national and international exhibitions and conferences, and the preparation of information sources such as a local project website.

Published papers:

As our work in the project has progressed, we have concentrated on the preparation of technical papers related to the main results of UPM work. Two papers have already been submitted and accepted:

- J. C. Plaza, J. Cabrera, F. Juareguizar, N. García, "A new class partitioned discrete model for the characterization of RTP multicast transmission through IEEE 802.11 channels", IEEE VTC2007 (IEEE Vehicular Technology Conference 2007), accepted for publication.
- J.C. Plaza, J. Cabrera, F. Jaureguizar, N. García. "Gateway para la transmisión optimizada de vídeo escalable y multi-descripción a través de redes de área local inalámbricas", Telecom I+D 2007, accepted for publication.

Other activities:

At the first stage of the project, the dissemination work was mainly focused on the dissemination of the SUIT concept:

- Dissemination of results to Spanish administration authorities (Ministerio de Industria)
- Dissemination of results to Spanish companies: Telefonica I+D, Alcatel - Lucent, Sapec.
- Elaboration of the UPM local SUIT web page.

In addition, UPM has continued its tradition of participating in standardization efforts:

- Attendance to the 24th JVT Meeting (Geneva, 29-Jun – 06-Jul, 2007)

Future Plans:

For the time being of the SUIT project, UPM will contribute to the dissemination of the SUIT project in the terms described before.
On one hand, UPM will continue to present the SUIT concept in new forthcoming conferences and workshops. More specifically, the attendance to the following events is foreseen:

- 2007 IEEE 66th Vehicular Technology Conference, 30 September - 3 October 2007, Baltimore, USA.
- XVII JORNADAS TELECOM I+D, 29-31 Octubre 2007, Valencia, Spain.
- IEEE Int. Symposium on Consumer Electronics, April 2008, Algarve, Portugal.
- 25th JVT Meeting, 21-26, October, 2007 in Shenzhen, China.

On the other hand, UPM is currently working on the preparation of technical papers related to the ongoing work in WP3 and WP5 about the rate control optimization for transmission of scalable video over Wi-Fi networks.

- C. H. Liew, J. Cabrera, J. Plaza, F. Jaureguizar, G. Narciso, IEEE802.11g Emulator for Scalable Video Coding Testing.
- J. Ferreira, P. Pratas, J. Cabrera, J. Plaza, F. Enrich, V. Domingo, A. Navarro, A DVB-T/H and WiMAX Platform for Broadcasting Scalable MDC of Video.

7.2.10 Wavecom

Future Plans:

Wavecom is interesting in dissemination SUIT to Wavecom clients. Wavecom would like to participate in some exhibitions sowing SUIT technologies. The following paper is also in our plans:

- J. Ferreira, P. Pratas, J. Cabrera, J. Plaza, F. Enrich, V. Domingo, A. Navarro, A DVB-T/H and WiMAX Platform for Broadcasting Scalable MDC of Video.

7.2.11 MCT

Future Plans:

MCT is a new SUIT partner and therefore we have not disseminating anything yet. However, as we are leading WP6, we envisage several demonstrations of SUIT during the field trials. We intend to invite several European operators as well as the European project officers to attend the field trials. We also support SUIT exhibition in IEEE ISCE 2008.

8 Conclusions

As a conclusion, let us focus on market positive points:

Section 4.2 (Quad-play) described a market opportunity for Quad-play, expecting the number of subscribers to rise from 88.1 millions in 2005 to 438.2 millions in 2012.

Section 4.4 (Mobile TV) mentions that 83% of the participants in a trial would pay for mobile TV services. That figure is much lower in USA. Why ? Are they more interested in HDTV than watching in a small device ?

Section 4.5 (Europe) describes an expectation of the number of HD-ready households to grow to 94m at end 2011.

Section 5.3 (Operator business plan) is profitable after the second year.

From the above positive points, SUIT is in the right way providing even high resolution (HD) on the move.

Our participation in IBC was great since some operators heard us and we realized that SUIT fulfils their needs.

Our dissemination activities and plans are outstanding, around 20 published papers, 25 standardization contributions and 10 planed papers.