



Dunelm DVB-RCC Review

A Review of the European Activities Relevant to DVB-based Cable Modems

Summary

This 'magazine' provides a review of the standards, specifications, products and market opportunities in the European cable modem market. The particular emphasis is on activities that involve the Digital Video Broadcasting Return Channel for Cable (DVB-RCC) technology. The salient features of this second DVB-RCC review are:

- The historic perspective for cable data networks shows that in the last twelve months DVB-compliant cable modems have established themselves as a more suitable technology than DOCSIS, or perhaps EuroDOCSIS, within Europe and parts of Asia;
- The development of the DVB-RCC specification is currently co-ordinated by the European Telecommunications Standards Institute (ETSI). Formally, ETSI does not develop European standards - this is the responsibility of the CEN/CENELEC. If RiverDelta wish to establish a market within Europe then it is recommended that they consider participation in ETSI. ETSI is currently pursuing the adoption of the EuroDOCSISv1.1 and DOCSISv1.1 specifications;
- The European Union funds the development of novel technology through a series of Framework Programmes. The Fifth Framework Programme, adopted on 22nd December 1998, defines the Community activities in the field of research, technological development and demonstration. Again, if RiverDelta wish to establish a wide-based market within Europe then participation within either the Information Society Technologies (IST) initiative or TEN-Telecom is recommended.

The period from September 2000 to March 2001 will determine the relative success of the DVB-RCC and EuroDOCSIS technologies within Europe. UPC Chello has already committed to EuroDOCSIS technology but other operators are now aligning themselves to DVB-RCC. The success of EuroDOCSIS may well rest on the speed by which it is formally accepted by ETSI.

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Press Releases & Announcements (April, 2000 - June, 2000)

- Σ June 27, 2000 - Cisco Systems, Inc. announced that PrimaCom AG, Germany's third-largest private cable TV provider, has selected Cisco to provide the equipment which will enable it to adopt a EuroDOCSIS)-based open standard for transmission. The move will make PrimaCom the first German cable company to use the EuroDOCSIS standard, giving it the ability to deliver multiple services to a wide range of customer premises equipment. The agreement covers a range of cutting-edge cable router technologies, including Cisco uBR7246VXR Universal Broadband Routers and Cisco MC-16E cable modem cards. PrimaCom has also ordered 50,000 integrated, EuroDOCIS-compliant cable modem set-top boxes from Galaxis as part of a drive to increase its current coverage of 930,000-plus customers, predominantly in Leipzig, to include a further 200,000 to 225,000 households in Magdeburg, Chemnitz, Halle, Wiesbaden and Mainz by the end of 2000.
- Σ 22nd June 2000, Conexant Systems, Inc., a leader in semiconductor products and systems solutions for communications electronics, announce that it has joined the DDIC;
- Σ 14th June 2000, Thomson Multimedia and Alcatel announce that they are to establish a new joint group/company to focus on the provision of new products for MPEG, multimedia head-ends and HFC-based solutions cable networks. The new organisation has 500 employees and a projected turnover in 2000 of Euro150million. The Alcatel/Thomson DRC 7100 INA is one of the first of the range of new CATV products;
- Σ 31st May, 2000, EBC 2000 (Berlin) participants of EBC 2000 (European Broadband Communications) received live demonstrations of verified, fully interoperable, DVB compliant Interactive Network Adapters (INA) inter-operating both in-band and out-of-Band with a variety of cable modems and set-top boxes from members of the DDIC. The in-band capabilities of DVB-RCC technology are being demonstrated with a Thomson Broadcast Systems' INA and The industree, Terayon and Cisco Systems' cable modems, and also a Cisco Systems' INA inter-operating with cable modems from The industree, Terayon, Com21 and Hughes Network Systems, connected to PCs. The out-of-band demonstration focused on the use of a Thomson Broadcast Systems' INA inter-operating with set-top boxes from Sagem and Thomson Multimedia, connected to televisions. In a separate demonstration, DDIC member Harmonic Inc demonstrated a live, interactive video-on-demand service using the company's own INA, a Philips set-top box, SeaChange server and a Harmonic VS6800 platform;
- Σ 29th May, 2000, Berlin - During the European Broadband Communications (EBC) Conference, The industree B.V. officially introduced a new range of products, covering all elements of an end-to-end cable modem system: the CableDock® 200 INA, management software CablePilot® 200, and end-user equipment, the CableJet® 910. All products are scheduled for market release in the Autumn of this year;
- Σ 26th May, 2000, Eindhoven, The Netherlands, - The industree B.V. announced its collaboration with ClearBand LLC, to deliver full-screen video via The industree's DVB-based cable modem system. The industree is the first DVB-based cable modem system manufacturer to integrate ClearBand's software-based solution, which provides full- screen video streaming to the PC. The industree's CableFleet® DVB solution for broadband access is well suited for IP multicasting-based system, which enables a single video stream to serve a large number of viewers and reduce bandwidth demands on the provider's network;
- Σ 16th May, 2000. Broadcom announce the first single chip reference design for the EuroDOCSIS cable modem (the BCM3350 and the reference design BCM93350E). According to the European Telecommunications Over Cable Operators Forum (TOCOF), major European cable operators that have endorsed the EuroDOCSIS standards represent over 12 million subscriber homes in Europe, with plans to deploy 650,000 cable modems in 2000, and 2.3 million cable modems by 2002.
- Σ 8th May, 2000, NCTA at New Orleans, Cisco Systems, Inc. introduced the Cisco INA2320 Interactive Network Adapter and the Cisco DVB CAR100 Series Cable Access Router, both based on the DVB/DAVIC standards. The INA2320 also supports the CableLabs'® OpenCable™ initiative. The Cisco INA2320 INA is a head-end unit that with both in-band and out-of-band capabilities. The Cisco DVB CAR100

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Series Cable Access Router compliant with EuroModem. With the Cisco INA2320 and uBR7200 series, the Cisco DVB CAR100 Series creates a complete cable modem system featuring interoperable head-end, router and customer premises equipment (CPE). In addition to DVB/DAVIC, the Cisco INA2320 is compliant with OpenCable™ and EuroModem specifications. The introduction of the Cisco INA2320 Interactive Network Adapter and Cisco DVB CAR100 Series Cable Access Router follows last year's acquisition of Denmark-based Cocom;

- Σ 3rd May, 2000, Sunnyvale, CA, Harmonic Inc. (Nasdaq: HLIT) announced the completion its acquisition of the DiviCom business of C-Cube Microsystems Inc. This acquisition was effected through the merger of Harmonic with C-Cube Microsystems after the spin off of C-Cube Microsystems' semiconductor business yesterday. Harmonic, including the DiviCom business, will provide open-systems solutions for delivering video, voice and data over cable, satellite, telco and wireless networks. C-Cube Microsystems stockholders received 0.5427 shares of Harmonic common stock for each share of C-Cube Microsystems common stock they owned as of March 22, 2000. C-Cube Microsystems stockholders also received shares of the semiconductor business in the spin-off effected yesterday;
- Σ 2nd May 2000, the DDIC announce that cable modem supplier Com21 (NASDAQ: CMTO) has joined the consortium;
- Σ 26th April 2000, the DDIC announced it had an independent verification process to ensure interoperability between all DVB/DAVIC products compliant with ES 300 800 and EuroModem specifications. Interoperability verification is carried out by the prestigious Technical University Braunschweig (TUB)(Germany). Additionally, a review board has been set-up by the DDIC that is composed of representatives from neutral cable operators whose task is to approve the TUB test conclusions. The approvals of the review board are submitted to the DDIC steering group which then publishes the list of qualified products;
- Σ 26th April 2000 the DDIC announce that the electronics manufacturer Samsung Electro-Mechanics Co. Ltd. has joined the consortium;
- Σ 26th April 2000 the DDIC announce that the European Telecommunications Standards Institute (ETSI) has officially accepted the DVB standard ETSI ES 200800 as the baseline specification for the provision of the interaction channel for Cable TV distribution systems (CATV). The scope of ETSI ES 200 800 covers both cable modems and set top boxes and meets the requirements set forth by the European Cable Communications Association (ECCA) specifications for the EuroModem and EuroBox. The ETSI ES 200 800 standard (Ref. RES/JTC-DVB-92) can be downloaded at the ETSI web-site: <http://www.etsi.org>.

A History of the Development of Data Systems for CATV Architectures

This brief history tracks the development of specifications and standards pertinent to the cable networks industry. Of particular interest is the DOCSIS work from CableLabs and the DVB-RCC developments within Europe.

- Sept, 93 The European Launching Group becomes reconstituted as Digital Video Broadcasting, with a commitment to look at CATV as part of DVB-C;
- July, 94 IEEE 802.14 CATV MAC and Physical Layer Protocols Working Group established;
- Aug, 94 Digital Audio Visual Council inaugurated;
- Dec, 95 DAVICv1.0 specifications released;
- Jan, 96 DOCSIS development is started by the Multimedia Cable Network Systems Consortium (MCNS);
- Sept, 96 DAVICv1.1 specification released;
- IETF establish the IP Over Cable data Networks (IPCDN) working group. This group looks at how to transfer IP packets across CATV networks using routers;
- Oct, 92 ECCA establish the ECCA Technical Cell (ETC);
- Dec, 96 DAVICv1.2 specification released and submitted to MCNS as candidate standard for DOCSIS;
- Jan, 97 The Institute of Communications Technology, Braunschweig Technical University, Braunschweig, Germany, is established as the ETC's Centre of Competence (ETC³);
- Mar, 97 Interim DOCSISv1.0 specification is released;
- May, 97 The European Commission's DGXIIIB decide to establish EuroCableLabs;
- July, 97 DVB announce that they will adopt DAVICv1.2 as the basis for their DVB-C specifications;
- Aug, 97 SCTE submit the MCNS/DOCSIS specification for standardisation by the ITU-T;
- Sept, 97 The ETC³ has its named changed to the EuroCableLabs;
- CableLabs launch the OpenCable project to establish open Set-top box solutions based upon DOCSIS cable modem technology;
- DAVIC 1.3 specifications released; CableLabs launch the PacketCable project to develop open solutions for the delivery of IP telephony;

	videoconferencing, video and other packet-based services across CATV infrastructures;		services over HFC and LMDS networks based upon DVB-RCCL and DAVIC standards. The nine initial members of the consortium are Alcatel, COCOM, DiviCom, Hughes Network Systems, Nokia Multimedia Terminals, Sagem, Simac (later being re-launched as The industree B.V.), Thomson Broadcast Systems and Thomson Multimedia;
Nov, 97	CableLabs formalisation of the DOCSIS modem certification plan;		DVB/DAVIC Interoperability Consortium, <i>Overview of DVB-RCCL/DAVIC vs. MCNS/DOCSIS</i> , White paper released;
	First silicon based DOCSISv1.0 modems available;		Broadcom announces EuroDOCSISv1.1 ready single-chip cable modem solution for Europe (BCM 3300);
	IETF accept responsibility for developing the DOCSIS Management Information Base (MIB) and release an Internet memorandum;		IEEE 802.14 release Draft 3 Revision 3 of the IEEE 802.14a Cable TV access method and physical layer specification. This is the first complete version of the full specification;
	IEEE 802 establish the IEEE 802.14a High Capacity Physical Layer (HI-PHY) working group PAR;		
Mar, 98	ITU approval of the ETS 300800 standard as ITU-T J.112 Annex A;		
	ITU approval of the DOCSIS modem standard as ITU-T J.112 Annex B;		
	General Instrument (GI) and Broadcom announce partnership for DOCSIS OpenCable STB;		
	DOCSISv1.1 development proposed (to address QoS features);	Nov, 98	ITU approval of information supplement 1 to ITU-T J.112 setting out EuroDOCSIS additions to the DOCSIS standard (to align to DVB-C standard);
	EuroCableLabs established as an international association under Belgian law;		CableLabs invite Terayon and Broadcom to develop a suitable specification that could form a part of a DOCSISv1.2 specification. They will develop the Frequency Agile-Time Division Multiple Access/ Synchronous-Code Division Multiple Access (FA-TDMA/S-CDMA) as an advanced physical layer;
May, 98	First draft of the OpenCable specifications issued to suppliers;		
June, 98	DAVICv1.4 specifications released;		
	EuroCableLabs released a request for proposal for bi-directional communications system across CATV networks;	Dec, 98	CableLabs announcement of PacketCable specifications for delivery of multimedia services over DOCSIS;
July, 98	CableLabs announce royalty-free IPR pool to enable DOCSIS roll-out;		ECCA Release Version 3.1 of the EuroBOX (Integrated Receiver Decoder, or Set-top box) specification; EuroBOX project becomes part of the EuroCableLabs initiative;
	Cable & Wireless Communications (UK) announces initial order with PACE for DOCSIS based DVB-C STBs (using Broadcom chipset);		EuroCableLabs launch the EuroModem project;
	ETSI formal release of the ETS 300800 standard (conforms to DAVICv1.2);	Jan, 99	Philips (Digital Video Systems) join the DVB/DAVIC Interoperability Consortium;
	The ATM Forum's Residential Broadband working group release their Residential Broadband Architectural Framework (AF-RBB-0099.000);	Feb, 99	Telewest (UK) announces initial order with PACE for DOCSIS-based DVB-C STBs;
Aug, 98	Update of the ETS 300800 standard;		UPC (Pan European) announces selection of GI's DOCSIS-based DVB-C STB;
Sept, 98	Further update of the ETS 300800 standard (conforms to DAVICv1.3);	Mar, 99	Interim DOCSISv1.1 specification is released; IEEE 802.14 release Draft 1 Revision 2 of the FA-TDMA/ S-CDMA Upstream HI-PHY Proposal;
Oct, 98	European Cable Modem Consortium formed to support ITU-compliant DOCSIS standard for Europe;		CableLabs qualifies first DOCSIS CMTS (Cisco Systems);
	DVB/DAVIC Interoperability Consortium launched to support product interoperability for interactive		CableLabs certifies first DOCSISv1.0 (retail ready) cable modems (Thomson and Toshiba);

	CableLabs issues interim specification of the DOCSISv1.1 cable modem (including Baseline Privacy Plus, BPI+ and supporting digital certificate-based authentication);		Supplement to ETS300800 is released - this defines the extensions of the DVB-RCC MAC to support session-based connections for applications such as low-latency telephony;
	Updated release of ETS 300800 (conforms to DAVIC 1.5);		CableLabs announce that they would use their own resources to develop the advanced PHY for DOCSISv1.2 instead of using the IEEE 802.14 Working-group specification;
Apr, 99	CableLabs certify 3Com cable modem;		
May, 99	Launch of the EuroDOCSIS (the DOCSIS medium access control protocol on top of the DVB/DAVIC physical layer) specification;	Oct, 99	COCOM (now Cisco) launch the first commercially available Class A EuroModem complaint cable modem;
	Cable & Wireless Communications start trials of PACE EuroDOCSIS DVB-C STBs in UK;		Cisco confirm their membership of the DAVIC/DVB Interoperability Consortium;
	CableLabs certify GI and Nortel Networks cable modems;		University of New Hampshire (USA) launch the DOCSIS component of their Interoperability Laboratory;
	Formal release of the ECCA EuroModem specification Version 1.0;		Motorola acquire General Instruments;
	Broadcentric <i>DOCSIS MCNS vs DVB/DAVIC DVB-RCC</i> White paper released;		EuroDOCSIS Interoperability Laboratory announced at ECC 99 (University of Ghent).
	Pace Microsystems, UK based set-top box manufacturer, join the DVB/DAVIC Interoperability Consortium;	Nov, 99	ETSI release draft ES200800 v1.2.1 specification;
	7 th Meeting of the EuroCableLabs Technical Committee took place - 22 attendees;		FA-TDMA specification released by Broadcom, Terayon, Conexant and Texas Instruments for consideration as an upgrade to the DOCSISv1.1 specification;
	45 th annual meeting of ECCA;	Dec, 99	ECCA release v1.2 of the EuroLoader Technical Specification i.e. the ECCA EuroLoader Specification;
June, 99	DAVIC 1.5 specifications released;		CableLabs released five OpenCable 1.0 Interim Specifications (Unidirectional Functional Requirements, Bi-directional Functional Requirements, Unidirectional Terminal Requirements, OpenCable Network Interface and Host-POD Interface) and a draft specification (Host-POD Copy Protection System). These provide vendors with build-to-requirements OpenCable compliant products and removable security devices (PODs);
	CableLabs host the first of their PacketCable Interoperability testing events;		
July, 99	CableLabs issue a request for information pertaining to OpenCable Interoperability testing events;		
Aug, 99	ECCA release the 'User and Market Requirements' and 'Functional Requirements' for the EuroBox 4.0 specification;		
	The EuroModem recommended supplier short-list was announced. The 13 (of the 24 applicants) in order of preference are: Thomson, Com21, Hughes, Cocom (Cisco), The industree (Simac), Netgame, DeltaKabel, ECI telecom, Hirschmann, Kongsung, Kathrein, telsey and Sagem.	Feb, 2000	CableLabs release a statement on the development of an advanced physical layer for DOCSIS. The release states that at present DOCSIS 1.2 is NOT underway but that the adoption of a frequency agile TDMA technology will probably be undertaken when a prototype solution becomes available. The S-CDMA technology also awaiting successful prototyping by Terayon before probable adoption within DOCSIS;
Sept, 99	Cisco acquire COCOM;		
	DAVIC formally disbanded due to completion of its role;		
	Combox, cable modem supplier, join the DVB/DAVIC Interoperability Consortium;	Mar, 2000	Terayon acquire Combox. This provides Terayon with DVB-compliant cable modems and INA;
	DVB/DAVIC Interoperability Consortium launch their web-site (http://www.dvb-davic.org);		

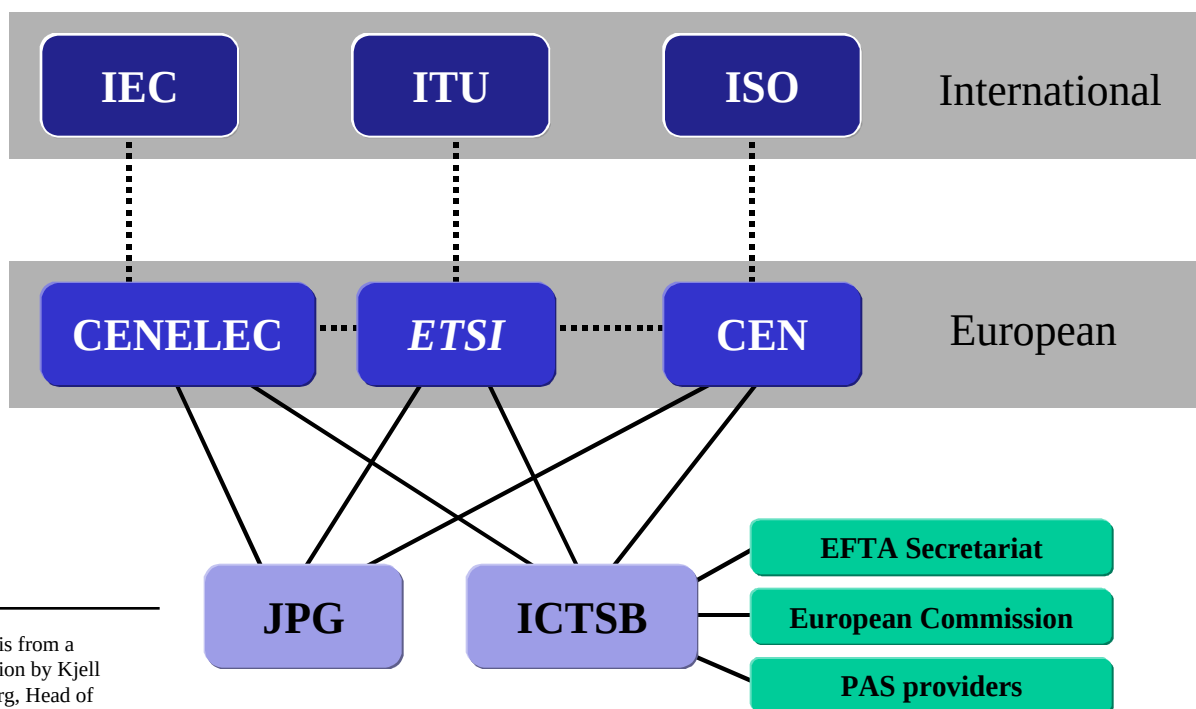
- Apr, 2000 European Telecommunications Standards Institute (ETSI) officially accept the DVB-RCCL v1.2.1 specification as a standard and release it as ETSI ES 200 800;
- Samsung Electro-Mechanics Co. Ltd. Join the DVB/DAVIC Interoperability Consortium;
- May, 2000 Com21 join the DVB/DAVIC Interoperability Consortium;
- Broadcom release the first single chip EuroDOCSIS solution and an accompanying reference design kit;
- June, 2000 Conexant Systems Inc., a semiconductor products and systems solutions for communications electronics joins the DVB/DAVIC Interoperability Consortium;
- July, 2000 Thomson/Alcatel INA and The industree cable modem receive approval from DVB/DAVIC Interoperability Consortium;
- CableLabs announce re-qualification of the Motorola CMTS (five companies have qualified CMTSs, namely: Broadband Access Systems, Arris Interactive, 3Com, Cisco Systems and Motorola). Thus far, 70 cable modems from 30 manufacturers have received DOCSIS interoperability certification.
- Oct, 2000 The first wave of DOCSISv1.1 devices undergo interoperability testing at CableLabs.

Telecommunication Standardisation within the European Union

The development of the DVB-RCC specification is currently coordinated by the European Telecommunications Standards Institute (ETSI). Formally, ETSI does not develop European standards - this is the responsibility of the CEN/CENELEC. The relationship between these standards and specification organisations is shown in Figure 1.

Support for the CEN, CENELEC and ETSI is provided by the Joint Programme Group who ensure commonality of purpose between the three organisations in areas of overlap and the Information and Communications Technology Standards Board (ICTSB). The three formal European standardization bodies - CEN, CENELEC and ETSI - created the ICT Standards Board in 1995. The ICTSB is open to the providers of publicly available specifications as full partners. It is intended to be a light structure and "fast on its feet" in response to market requirements.

In addition to the three European standardization bodies, current membership of ICTSB includes ATM Forum, Digital Audio Visual Council (DAVIC), Digital Video Broadcasting (DVB) project, European Association of Consumer Electronics Manufacturers (EACEM), European Board for EDI/EC Standardization (EBES), European Broadcasting Union (EBU), European Committee for Banking Standards (ECBS), European



(a) Figure 1 is from a presentation by Kjell Strandberg, Head of Department for Standards Making Support at ETSI.

Figure 1 A standards organisations taxonomy.

Computer Manufacturers Association (ECMA), Network Management Forum (NMF), The Open Group, etc. The European Commission and the EFTA Secretariat are observers.

The European Telecommunication Standards Institute (ETSI)

ETSI is a non-profit making organisation whose mission is to produce the telecommunications standards that will be used throughout Europe and beyond. Based in Sophia Antipolis - a high tech research park in southern France - ETSI unites 773 members from 52 countries inside and outside Europe, and represents administrations, network operators, manufacturers, service providers, research bodies and users. ETSI was formed in 1988 in response to an evaluation of need undertaken by the Conference Europeen des Posts et Telecommunications (CEPT) in the early 80's.

Any European organisation proving an interest in promoting European telecommunications standards has the right to represent that interest in ETSI and thus to directly influence the standards making process. It is ETSI members that fix the standards work programme in function of market needs. Accordingly, ETSI produces voluntary standards - some of these may go on to be adopted by the EC as the technical base for Directives or Regulations - but the fact that the voluntary standards are requested by those who subsequently implement them, means that the standards remain practical rather than abstract.

ETSI promotes the world-wide standardisation process whenever possible. Its Work Programme is based on, and co-ordinated with, the activities of international standardisation bodies, mainly the ITU-T and the ITU-R. The internal organisation of ETSI is shown in Figure 2. ETSI consists of a General Assembly, a Board, a Technical Organisation and a Secretariat. The Technical Organisation produces and approves technical standards. It encompasses ETSI Projects (EPs), Technical Committees (TCs) and Special Committees. More than 3500 experts are at present working for ETSI in over 200 groups. At present, there are about 25 Specialist Task Forces (STFs) with around 60 experts. Up to now, over 5000 ETSI deliverables have been published.

The ETSI Technical Committee responsible for the development of the DVB standards is 'JTC Broadcast'. Within this committee the DVB-RCC work is a subset of the DVB for Cable (DVB-C) activities.

The ETSI Standardisation Process

Work in ETSI is undertaken on the basis of ETSI work items, approved by the Technical Body and adopted by the ETSI membership. A work item results in one or more deliverables, which can be a standard, specification, a guide or a report. ETSI has a suite of specifications, standards and reports that fulfil the various needs of the market, namely:

- Σ Technical Specifications (ETSI TS) - for early delivery to the appropriate market;
- Σ Technical Reports (ETSI TR but previously refereed to as ETSI ETR) - adopted by the responsible Technical Body;
- Σ ETSI Standard (ETSI ES but previously ETSI ETS) - adopted after ETSI membership weighted voting;
- Σ Guide (ETSI EG) - adopted after ETSI membership weighted voting;
- Σ European Standard (ETSI EN) - telecommunications series and adopted after ETSI membership national weighted voting. This promotes European harmonization;
- Σ Special Report (ETSI SR) - an information document used for various purposes, including giving public availability to information not produce within a Technical Body.

The documents released under ETSI have a particular numbering scheme. This scheme is based upon the following structure:

{AB n}{KK KKK} {VX.Y.Z} e.g. ES 300 800 V1.2.1

where:	{AB n}=	SR 0 - Special Report TS 1 - Technical Specification TR 1 - Technical Report ES 2 - ETSI Standard EG 2 - Guide EN 3 - European Standard
	X=	Major version
	Y=	Technical version
	Z=	Editorial version

The TS, ES and EN document numbers can exist simultaneously. In the case of DVB-RCC this means that both the ES 200 800 and EN 300 800 exist with the first referring to the ETSI Standard and the second acting as the draft European Standard.

Adoption of a deliverable by the Technical Committees is normally by consensus. If consensus cannot be reached then a vote is taken in which the 71% support from the voters must be reached for adoption to succeed.

ETSI Membership

Participation in the technical activities of ETSI requires membership. There are three levels of membership, namely:

- Σ Full member - this may be obtained by a legal person, be it an association, a company, a grouping, an organisation or a public authority, which is established in a country falling within the geographical area of CEPT and which commits itself to comply with the Statutes and Rules of Procedure of ETSI. Full Members have the right to attend meetings of Technical Bodies and to participate in their work with the right to vote;

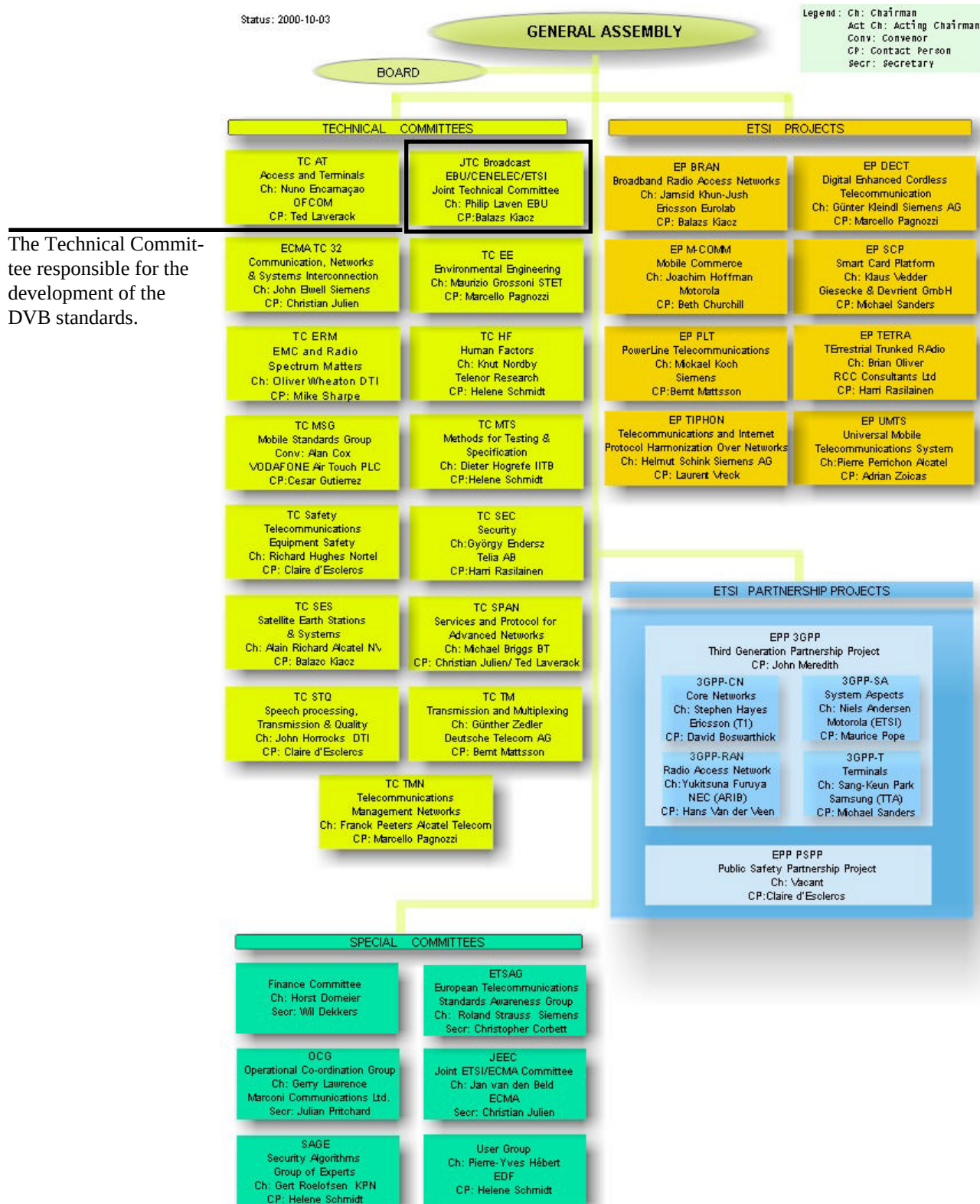


Figure 2 The structure of the European Telecommunications Standards Institute (ETSI).

- Σ Associate member - this may be obtained by a legal person, be it a company, a grouping, an organisation which is not established in a country falling within the geographical area of CEPT and not eligible for Full membership. Associate Members have the right to attend meetings of Technical Bodies and to participate in their work with the right to vote on all matters except those concerning ENs or matters concerning documents exclusively intended for regulatory use by the European Union;
- Σ Observer - this may be obtained by a legal person entitled to become a Full member. Observers do not have the right to attend meetings of a Technical Body, but may attend the General Assembly meetings without the right to vote.

The annual cost of membership is based on a sliding scale determined by the telecommunications-related turn-over of the company. This cost is based upon a unit contribution of 4,985euro (approximately \$4,000). There are eleven cost categories ranging from 1 unit (turnover up to 70 million euros) to 45 units (in excess of 8 billion euros).

From the perspective of RiverDelta, they would be advised to become *Associate Members* of ETSI, costing approximately \$4,000. This would give RiverDelta access to all of the DVB-RCC and EuroDOCSIS specification development activities within ETSI.

European Projects & Technology Funding

The EU funds the development of novel technology through a series of Framework Programmes. For telecommunications projects Framework III was termed RACE and Framework IV named ACTS (Advanced Communications & Technologies Services). The Fifth Framework Programme, adopted on 22nd December 1998, defines the Community activities in the field of research, technological development and demonstration (hereafter referred to as “RTD”) for the period 1998-2002. The Fifth Framework Programme differs from its predecessors. It has been conceived to help *solve problems* and to respond to major *socio-economic challenges* facing the European Union. Framework V consists of seven Specific Programmes, of which four are Thematic Programmes and three are Horizontal Programmes. The Thematic Programmes are:

- Σ Quality of life and management of living resources;
- Σ User-friendly information society - referred as the Information Society theme. It is this theme that most of the data communications and telecommunications activities are focused;
- Σ Competitive and sustainable growth;
- Σ Energy, environment and sustainable development.

Participation in these projects is normally based upon:

- *Research and technological development (R&D) projects* – projects obtaining new knowledge intended to develop or improve products, processes or services and/or to meet the needs of Community policies (financial participation: 50% of total eligible costs);
- *Demonstration projects* – projects designed to prove the viability of new technologies offering potential economic advantage but which cannot be commercialised directly (financial participation: 35% of total eligible costs);
- *Combined R&D and demonstration projects* – projects combining the above elements (financial participation: 35 to 50% of total eligible costs);
- *Support for access to research infrastructures* (only implemented under “Improving the human research potential and the socio-economic knowledge base”) – actions enhancing access to research infrastructures for Community researchers. Support will cover a maximum of 100% of the eligible costs necessary for the action;
- *“SME Co-operative” research projects* – projects enabling at least three mutually independent SMEs from at least two Member States or one Member State and an Associated State to jointly commission research carried out by a third party (financial participation: 50% of total eligible project costs);
- *“SME Exploratory” awards* – support of 75% of total eligible costs for an exploratory phase of a project of up to 12 months (e.g. feasibility studies, validation, partner search).

The two initiatives directly relevant to telecommunications and data networking in general, and cable networks are:

- Σ Information Society Technologies Programme;
- Σ TEN-Telecom.

Information Society Technologies Programme

The Information Society theme in the 5th Framework Programme of EU RTD (as defined in the Commission’s proposal for *Creating a User Friendly Information Society*, now called the *Information Society Technologies (IST) Programme*) was agreed at the Council of Research Ministers on 22nd December 1998. The IST Programme is implemented through a series of annual work-programmes, each of which is developed in close co-operation with industry, academia and user organisations.

The work-programme follows the structure of work as defined in Annex I to the Specific Programme Decision (namely “The General Outlines, the Scientific and Technological Objectives and the Priorities”). The 2000 work-programme thus lays out the

Action Lines for the Calls for Proposals to be published in calendar year 2000 and structures them in a way that reflects the nature of the Programme and its Key Actions. As a result of the first Call for proposals in 1999, over 2500 proposals were received, requesting a budget of over 5.3BEuro. Following independent expert evaluation, 550 proposals were selected for support from an available budget of around 920MEuro. The revised work-programme for 2000 (WP2000) builds on experience gained from this Call, and takes into account the projects now being launched. A second 1999 call for proposals was launched on 1 October 1999, and the results of this will be taken into account in future revisions of the work-programme. The work-programme 2000 priorities are:

- Σ To improve natural and personalised interactions with IST applications and services. This includes multi-lingual/multi-modal interaction systems that are adaptable to the user's preferences and lifestyle (e.g. sensitivity to gender, age and culture);
- Σ To foster the development and convergence of networking infrastructures and architectures including the integration of fixed, mobile, on-line and broadcasting technologies;
- Σ To develop embedded technologies, their interconnections and their full integration into the service infrastructure, the workplace and business processes. To develop applications and services that take advantage of such systems;
- Σ To reconsider service provisioning in the context of anywhere/any-time access to services and ambient dialogue modes including public services and, mediation and commercial transaction systems;
- Σ To improve the openness of software and systems;
- Σ To improve the tools and methodologies that enable creativity in content production and presentation, in the context of converging access and delivery systems;
- Σ To emphasise trust and confidence as a general requirement for all technologies, applications and services.

From the perspective of RiverDelta, the marketing of their technology within Europe could be significantly enhanced through participation in an appropriate Framework V project. While no funding would go to RiverDelta, unless they establish a manufacturing or R&D facility within Europe (at which point 50% funding for the project would be available), this could provide a European-focused demonstration platform for their technology.

TEN Telecom Initiative

The purpose of the TEN-Telecom action is to provide financial support to the rollout of services and applications of common interest in situations where the commercial prospects appear, at the origin, uncertain or too long term. In these cases, Community

intervention reduces the financial risk associated with these uncertainties and encourages the public/private initiative. The TEN-Telecom areas of interest are:

- Σ Trans-European Generic Telecommunications Services;
- Σ Trans-European Telecommunications Applications in areas such as Education and Training; Access to Europe's Cultural Heritage; Applications for SMEs; Transport and Mobility; Environment and Emergency Management; Health; City and Regional Information networks; New Work Methods and Services for the job market;
- Σ Trans-European Telecommunications Basic Networks.

From the perspective of RiverDelta involvement in a TEN-Telecom project could provide an opportunity for the roll-out of their technology as part of the establishment of new market opportunities.

Project Activities Derived from EU Funding

Several core European activities have been started through EU Framework projects. Some of the key examples are:

- Σ The Trans-European Asynchronous Transfer Mode (ATM) and Optical Network fabrics;
- Σ The Digital Audio-Visual Council (DAVIC);
- Σ The Motion Picture Encoding Group (MPEG) two, four and seven activities;
- Σ DVB/DAVIC Interoperability Consortium - proposed by the IBCoBN project (ACTS AC101);
- Σ EuroCableLabs - also proposed by the IBCoBN project (ACTS AC101).

The IBCoBN project has had a significant effect on the thinking behind the development of the cable standards with Europe. This demonstrates the potential influence that such projects can have within the standards framework within Europe.

Integrated Broadband Communication on Broadcast Networks (IBCoBN)

The Final Report of the IBCoBN project states that:

There were three main objectives for IBCoBN. The first was to verify by the use of experiments scenarios for transforming both mature and new cable networks to Integrated Broadband Communication Networks i.e. Full Service Networks (FSN). The second was to initiate longer term R&D into the IBC needs of Cable TV sector and create an organisation to continue this R&D after the project had concluded (i.e. a European Cable Labs). The third was to encourage the deployment of cable modems for broadband interactive services.

The Research activities ensured a stable cable modem standard that is DVB and DAVIC compliant. This was achieved by winning the fight for symmetrical services in DAVIC with a 3 Mbps return path. IBCoBN was influential in clarifying the issues for Cable Operators concerning IP on Cable and Wireless and by providing tools for planning FSN. The project had a high impact on the standards for the very important area of using cable modems for data services (DVB, ETSI and ITU). Much of the input and information provided to these groups and the DVB/DAVIC Interoperability Consortium was derived from the project results. The project clarified in the main standardisation groups of CENELEC and SCTE, the requirements for Outside Plant Management and the Return Path performance for advanced Tele-services on HFC networks, as used in IBCoBN. A work item was proposed for DAVIC, on the management of Data Services and in particular Videotelephony over HFC networks.

The seven experiments with 12 sites, 140 terminals and 1000's of users created considerable interest in broadband applications on cable networks for the residential market. All experimental sites provided numerous demonstrations of digital symmetrical broadband services for residential users, both over HFC and wireless networks. These are providing strong results from the applications and services that are stretching the capabilities of today's network technologies. However, these are applications which when seen by the users they want them and the network operators wish to provide them. IBCoBN was demonstrated at EXPO '98 to many VIPs, the press and broadcasters.

A world first in 40GHz IP LMDS platforms was achieved with the Burgess Hill wireless test-bed. It has attracted worldwide interest.

Thirteen suppliers (nine European), will offer EuroModem systems for deployment by Cable Operators, as a direct result of the project's work on interoperability verification. COCOM was recognised as leading the R&D and manufacture of these modems.

IBCoBN has contributed to 15 guidelines for the Cable Sector and worked closely with ACTS projects, including OPTIMUM, TOBASCO, ATHOC, FLEXIMACS, CATVDC and TERA. It has raised the awareness of ACTS technology and the R&D needs of the Cable TV sector. It has also specifically raised the sustainability issue and the possible role of cable operators as residential broadband access operators.

It has successfully brought a major Russian research institution into the European Union's R&D Programme. It included the setting up of the first Russian Certification Institution for Cable TV Systems and Equipment in St. Petersburg and their participation in the collaborative Multi-media Interoperability Testing Laboratories. The project hosted two Russian Visiting Scientists. It supported the development of a 40GHz Russian designed and built transceiver and for its testing within the UK-based wireless IP LMDS platform.

It was instrumental in the creation of not one but two collaborative "Cable Labs" for the European cable sector: - ECCA Technical Cell (EuroCableLabs) and EUROFACT.

Dunelm DVB-RCC Review

A Review of the European Activities Relevant to DVB-based Cable Modems

List of Abbreviations

ACTS	Advanced Communications Technologies & Services
ATM	Asynchronous Transfer Mode
CATV	Community Antenna Television
CEN	Comite Europeen de Normalisation
CENELEC	Comite Europeen de Normalisation ELECTrotechnique
CEPT	Conference Europeen des Postes et Telecommuni-cations
CMTS	Cable Modem Termination System
CPE	Customer Premises Equipment
DAVIC	Digital Audio Visual Council
DDIC	DVB/DAVIC Interoperability Consortium
DOCSIS	Data Over Cable Service Interface Specification
DVB	Digital Video Broadcasting
DVB-RCC	DVB Reverse Channel for Cable
EACEM	European Association of Consumer Electronics Manufacturers
EBES	European Board for EDI/EC Standardisation
EBU	European Broadcasting Union
ECBS	European Committee for Banking Standards
ECCA	European Cable Communications Association
ECMA	European Computer Manufacturers Association
EP	ETSI Project
ETC	ECCA Technical Cell
ETSI	European Telecommunication Standards Institute
ETSI-EG	ETSI Guide
ETSI-EN	ETSI European Standard
ETSI-ES	ETSI Standard
ETSI-SR	ETSI Special Report
ETSI-TR	ETSI Technical Report
ETSI-TS	ETSI Technical Specification
EU	European Union
FA-TDMA	Frequency Agile Time Division Multiple Access
FSN	Full Service Network
HFC	Hybrid Fibre Coax
IBCoBN	Integrated Broadband Communications over Broadcast Networks
ICTSB	Information & Communication Technology Stand-ards Board
IEC	International Electromechanical Committee
IEEE	Institute of Electronic & Electrical Engineers
IETF	Internet Engineering Task Force
INA	Integrated Network Adapter
IPCDN	Internetwork Protocol over Cable data Networks

IPR	Intellectual Property Rights
ISO	International Standards Organisation
IST	Information Society Technologies
ITU	International Telecommunications Union
ITU-R	ITU Radio Standards
ITU-T	ITU Telecommunication Standards
LMDS	Local Multichannel Distribution System
MAC	Medium Access Control
MCNS	Multimedia Cable Network Systems
MIB	Management Information Base
MPEG	Motion Picture Encoding Group
NMF	Network Management Forum
QoS	Quality of Service
S-CDMA	Synchronous Code Division Multiple Access
SCTE	Society of Cable Telecommunication Engineers
SME	Small, Medium Enterprise
STB	Set-Top Box
TC	Technical Committee

Contact Addresses

Further information is available from the following web-sites:

ACTS	http://www.infowin.org/ACTS/
Alcatel	http://www.alcatel.com
Cisco Systems Inc.	http://www.cisco.com
Conexant Inc.	http://www.conexant.com
DDIC	http://www.dvb-davic.org
ETSI	http://www.etsi.org
Harmonic Inc.	http://www.harmonicinc.com
Pace Micro Technology	http://www.pace.co.uk
Philips Digital Networks	http://www.broadcast.philips.com
The industree	http://www.industree.nl
Thomson Broadcast Sys	http://www.thomsonbroadcast.com
Thomson Multimedia	http://www.thomson-multimedia.com

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Inside the EuroBox, EuroModem and EuroLoader specifications

ETSI & DVB Standardisation