Return Channel Satellite

What is DVB-RCS and DVB-RCS2?

DVB-RCS and DVB-RCS2 are the technical ETSI standards, designed by the DVB Project, which define the complete air interface specification for two-way satellite broadband VSAT (very small aperture terminal) systems. Low cost VSAT equipment can provide highly dynamic, demand-assigned transmission capacity to a broad range of users. DVB-RCS2 provides users with a broadband Internet connection, without need for any local terrestrial infrastructure. Depending on specific satellite link characteristics and other system design parameters, implementations can provide several tens of Mbit/s down to terminals, and up to 10 Mbit/s or more from each terminal. The 1st generation DVB-RCS standard is published as EN 301 790, while the substantially more powerful 2nd generation DVB-RCS2 is published in three parts as TS 301 545-1 (OSL, overview), EN 301 545-2 (LLS, lower layers) and TS 301 545-3 (HLS, higher layers).

DVB-RCS2 was approved by DVB in 2011 and in 2012 mobility extensions (DVB-RCS2+M) were added, supporting mobile / nomadic terminals and direct terminal-to-terminal (mesh) connectivity. DVB-RCS2+M features include live handovers between satellite spot-beams, spread-spectrum features to meet regulatory constraints for mobile terminals, and continuous-carrier transmission for terminals with high traffic aggregation. It also includes link-layer forward error correction, used as a countermeasure against shadowing and blocking of the satellite link.

Background

The DVB-RCS specifications were developed in response to requests from several satellite and network operators who wanted to embark on large-scale deployment of such systems and who considered it essential to have an open standard in order to mitigate the risks associated with being tied to a single vendor. The standards were developed using state-of-the art techniques, allowing an optimized trade-off between performance and cost. As consensus-based standards, these DVB specifications also have a controlled evolutionary future, secured by global contributions to the system under an agreed and open framework.

How does it work?

In its basic form, DVB-RCS/RCS2 provides “hub-spoke” connectivity; i.e., all user terminals are connected to a central hub that controls the system and acts as a traffic gateway between users and the wider Internet. User terminals consist of a small indoor unit, and an outdoor unit with an antenna size not much bigger than a conventional direct-to-home TV receiver. Since the satellite terminal also transmits data, the outdoor unit includes an RF power amplifier.

User terminals offer an IP-over-Ethernet connection for wired (or wireless) interactive Internet connectivity for a local home or office network ranging from one to several users. In addition to providing interactive DVB services and IPTV, DVB-RCS/RCS2 systems can thus provide full IP connectivity anywhere there is suitable satellite coverage.

The core of DVB-RCS/RCS2 is a multi-frequency Time Division Multiple Access (MF-TDMA) transmission scheme for the return link, which provides high bandwidth efficiency for multiple users. The demand-assignment scheme uses several capacity mechanisms that allow optimization for different classes of applications, so that voice, video streaming, file transfers and web browsing can all be handled efficiently. DVB-RCS supports several access schemes making the system much more responsive, and thus more efficient than traditional demand-assigned satellite systems. These access schemes are combined with a flexible transmission scheme that includes state-of-the-art turbo coding, several burst size options and efficient IP encapsulation options. These tools allow systems to be fine-tuned for the best use of the power and bandwidth satellite resources. In addition, DVB-RCS2 also includes CPM for use with amplifiers in saturated mode.

The forward link is shared among a population of terminals using the highly efficient DVB-S2 standard (EN 302 307). Adaptive transmission to overcome variations in channel characteristics (e.g., rain fade) can be activated in both the forward and return links.

Beyond the basic hub-and-spoke architecture, the DVB-RCS air interface has also been deployed in systems that provide direct terminal-to-terminal “mesh” connectivity, either through satellite on-board processors that mirror the functions of a ground-based hub, or through transparent satellites, using terminals equipped with an additional demodulator.

Market Deployment

By mid 2007, there were already more than 150 DVB-RCS systems deployed worldwide, serving around 100,000 terminals at Ku-band, Ka-band, C-band and EHF. It can be expected that this number has significantly grown since then. Today DVB-RCS/RCS2 is the only multi-vendor VSAT standard. For this reason it is often mandated in systems procurements by customers who wish to ensure that their choice of terminal vendor remains open after the initial procurement. The maturity and capability of DVB-RCS systems is also well recognized. DVB-RCS/RCS2 is clearly growing in many markets, with a greater variety of applications worldwide. A mandate by the Russian government and usage by the United States Department of Defense are clear indicators that the DVB-RCS standard is the solution for multi-vendor VSAT broadband services.

There are several manufacturers of interoperable DVB-RCS/RCS2 hubs and terminals. Vendor independence is safeguarded by SatLabs, a non-profit organization of satellite operators, service providers and manufacturers devoted to the promotion of the DVB-RCS/RCS2 standard. SatLabs operates a qualification laboratory, where terminals can be tested to prove their operation in accordance with the standard. Furthermore, SatLabs defines supplementary recommendations that build upon the solid foundation of DVB-RCS/RCS2 and offers conformance testing.

Applications served by DVB-RCS/RCS2 systems are many and varied. Typical primary uses include cellular backhaul, corporate networking, voice over IP services, remote monitoring (SCADA), tele-medicine, tele-education and tele-government, as well as general Internet access in rural areas.

DVB-RCS2

DVB-RCS was first published in 2000. The much more efficient and flexible DVB-RCS2 specification was completed in 2011. A new version was published in 2012, adding support for mobility and meshed networks. As a market driven organization DVB will continue to support the satellite community with up to date technology.

Features:	**DVB-RCS**	**DVB-RCS2**
Harmonised management & control	None	Yes (optional)
Harmonised IP-level QoS	None	Yes
Multiple virtual network support	None	Yes
Security	Single solution	Support for multiple security systems, for applications with widely different requirements
Return link access scheme for traffic	TDMA, continuous carrier	TDMA, continuous carrier, random-access
Modulation schemes	QPSK	Linear: BPSK, QPSK, 8PSK, 16QAM, Constant-envelope: CPM
Channel coding	RS/convolutional, 8-state PCCC turbo code	16-state PCCC turbo code (linear modulation), SCCC (CPM)
Burst spread-spectrum	Burst repetition	Direct-sequence
Return link adaptivity	Limited support	Inherent in air interface (TDMA and continuous carrier)
Bandwidth efficiency	N/A	30% improvement over DVB-RCS

Links

www.dvb.org	The main website of the DVB Project
www.dvbservices.com	Register here to download all the DVB and DVB sub-brand logos.
www.satlabs.org	A not-for-profit association of companies committed to the promotion of DVB-RCS