Return Channel Satellite

The open standard for two-way satellite broadband VSAT systems

What is DVB-RCS?

DVB-RCS is a technical standard, designed by the DVB Project, that defines a 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 residential and commercial/institutional users. DVB-RCS provides users with the equivalent of an ADSL or cable Internet connection, without the need for local terrestrial infrastructure. Depending on satellite link budgets and other system design parameters, DVB-RCS implementations can dynamically provide anywhere up to 20 Mbit/s to each terminal on the outbound link, and up to 5 Mbit/s or more from each terminal on the inbound link. The standard is published by ETSI as EN 301 790.

DVB's Technical Module approved the DVB-RCS+M specification in 2008, providing support for mobile and nomadic terminals as well as enhanced support for direct terminal-to-terminal (mesh) connectivity. DVB-RCS+M includes features such as 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

Today there are several vendors of DVB-RCS standard compliant systems as well as proprietary VSAT systems that provide services of the same general nature as DVB-RCS, but without full compliance with the standard. DVB-RCS was developed in response to a request from several satellite and network operators who wanted to embark on large-scale deployment of such systems considering it essential to have an open standard in order to mitigate the risks associated with being tied to a single vendor. The standard was developed using state-of-the art techniques, allowing an optimised trade-off between performance and cost. As a consensus based standard DVB-RCS also has 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 provides "hub-spoke" connectivity; i.e., all user terminals are connected to a central hub that both controls the system and acts as a traffic gateway between the users and the wider Internet. The user terminal consists 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 DVB-RCS terminal also transmits data the outdoor unit includes an RF power amplifier.

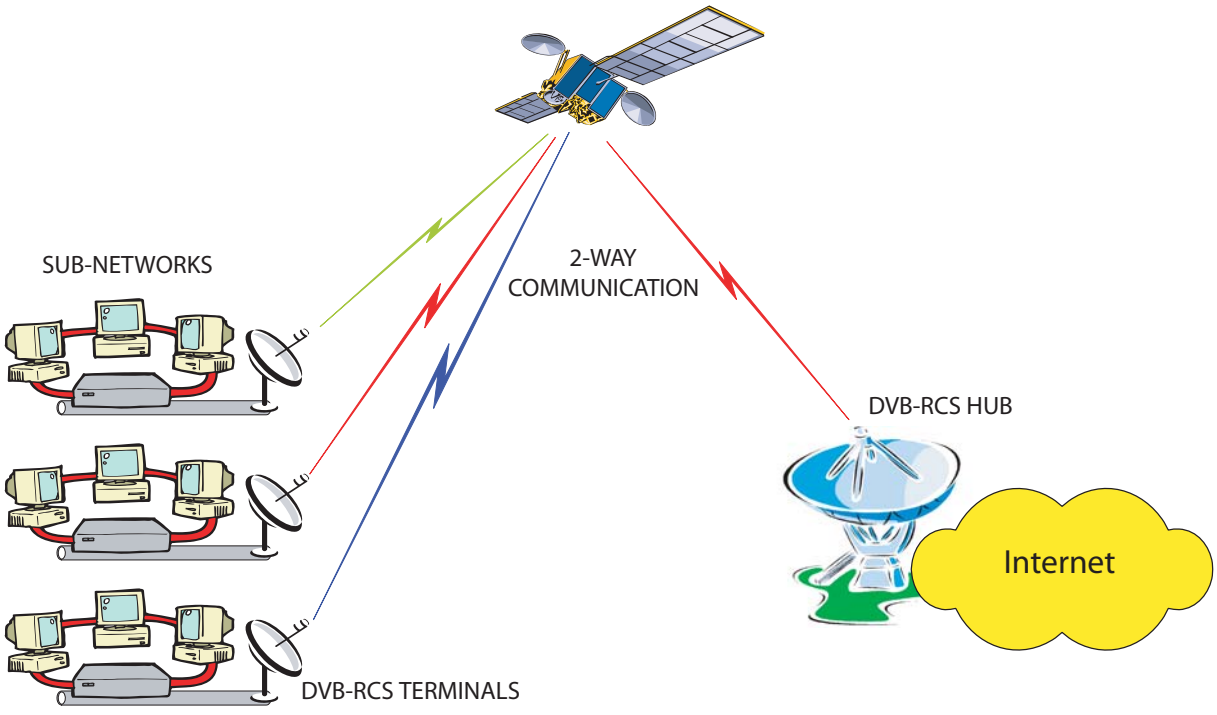

Figure 1. Network Architecture for DVB-RCS

[continued: How does it work?]
The user terminal offers an IP over Ethernet connection that can be used 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 systems can thus provide full IP connectivity anywhere there is suitable satellite coverage, which in turn means most places on earth including areas not covered by other solutions.

The core of DVB-RCS 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 optimisation 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.

The forward link is shared among a population of terminals using either the highly efficient DVB-S2 standard (EN 302 307) or the widely deployed DVB-S (EN 300 421). Adaptive transmission to overcome variations in channel characteristics (e.g., rain fade) can be implemented 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 had been more than 150 DVB-RCS systems deployed worldwide, serving around 100,000 terminals at Ku-band, Ka-band, C-band and EHF. DVB-RCS is today 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 recognised. DVB-RCS 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 hubs and terminals. Vendor independence is safeguarded by SatLabs, a non profit organisation of satellite operators, service providers and manufacturers devoted to the promotion of the DVB-RCS standard. SatLabs operates a qualification laboratory, where terminals can be tested to prove their operation in accordance with the standard. Furthermore, SatLabs defines supplementary standards that build upon the solid foundation of DVB-RCS and offers conformance testing against these supplementary standards.

Applications served by DVB-RCS systems are many and varied; typical primary uses include voice over IP services and general Internet access in rural areas, tele-medicine, tele-education and tele-government, as well as more conventional and generic Internet access services (e-mail, web browsing, etc...).

Next Steps for DVB-RCS

DVB-RCS was first published in 2000 and has been relatively stable. Until the introduction of DVB-RCS+M, changes have mainly been for maintenance, such as inclusion of support for the DVB-S2 forward link standard. Late in 2008 the Commercial Module approved the start of work for the Next Generation system. This will in addition to a significantly more powerful RCS2 specification also include specifications for the IP layers and for management. A Call for Technologies was issued inviting contributions worldwide.

Links

www.dvb.org — the website of the DVB Project, developer of the DVB-RCS standard
www.etsi.org — all DVB standards can be downloaded directly from ETSI
www.satlabs.org — a not-for-profit association of companies committed to the promotion of DVB-RCS