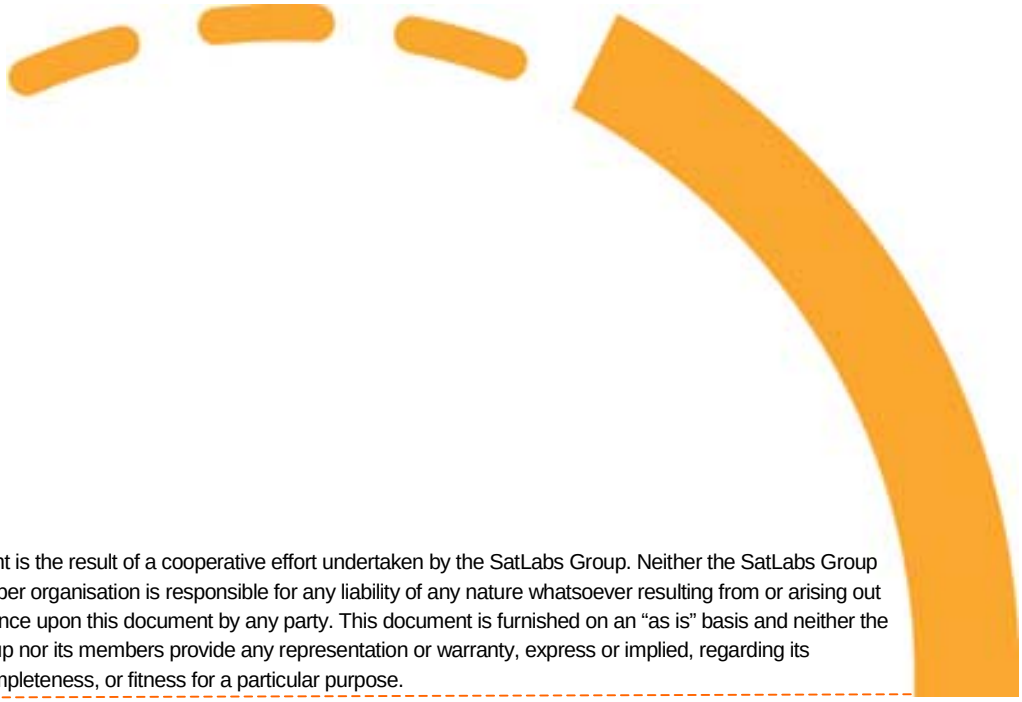
DVB-RCS MAC chip broad specification

Version 1.0



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Background

The first broad definition of the component functionality and performance was defined in a meeting involving the manufacturers of DVB-RCS systems and terminals. In that meeting a maximalistic approach was decided whereby the maximum functionality was specified, including functions of the MAC and PHY layers in order to optimise the usefulness of the new component and, therefore, the terminal cost. In order to determine the functions to be included, the DVB-RCS standard was reviewed, and options were included taking into account the different present implementations and planned versions for both transparent and regenerative satellite systems.

The chip vendors were asked for feedback and to answer a number of questions related to peripheral functions and performance. The general view of the chip vendors is that the MAC functionality should be separated from the PHY. In their roadmaps they contemplate different optimisation possibilities for the PHY or for the combination of MAC + PHY. However, the investments associated to these optimisations require further market development. It is, however, possible that some of the functionality associated to the PHY could be included in the MAC layer chip. They didn't see any major difficulty to implement the MAC layer functionality and to meet the target performance requirements.

Functionality

In order to cover the views of both the terminal manufacturers and chip vendors consists of specifying the functionality in two blocks: a block containing the basic functionality, which is compulsory; and a block containing desirable functionality, which is consequently optional. The decision of which of the optional functionality to include is left to the chip vendors in their development proposals.

Basic functionality (compulsory)

Below are listed the functions that shall be integrated in the MAC layer chip. The list only contains a reference to the DVB-RCS standard (normative document) and some comments to it when applicable. Therefore, the list should be read together with the DVB-RCS standard. In essence, the functions specified implement completely the MAC layer defined in the DVB-RCS standard, even though some priorities is given in case for some of the functions, based on the needs in systems presently existing or under development.

Burst Format: support for both ATM and MPEG formats
Guard time: programmable, network dependent, as required by DVB-RCS
MAC Messages: include all methods but DULM method is not the top priority (linked to some regenerative systems); contention based mini-slot method not required today

Multiple Access:

- Segmentation of the return link capacity: support multiple super-frames
    - Capacity request categories: All included

Synchronization procedures:

- Including the possibility of open loop synchronisation (no SYNC slots allocated)
- Including coarse synchronisation (configurable whether to use it)

Control and Management:

- **Protocol Stac**k:
    - RCST type A (optional RCST type B is included in the optional block)
    - AAL5 encapsulation mux method: support of LLC SNAP in addition to VC mux

- **RCST Addressin**g: supported by on-chip MAC address filtering (32 MAC addresses)
- **Forward Link Signalling:**
    - All included
- **Return Link Signalling**
    - SNMP is a higher layer function and therefore not needed to be defined at this level. The only important point is that the processor needs to have sufficient resources available to properly handle SNMP
    - All parameters of MIB as defined in DVB-RCS guidelines must be accessible at MAC layer.

Desirable functionality (optional)

The functions listed below are optional. It is desirable to include as many of the functions listed as possible, in order to optimise the component.

RCST Synchronisation: NCR recovery, supported by on-chip PID filtering (32 PIDs)

Coding:

- Turbo coding only (Viterbi/Reed-Solomon is a legacy coding scheme that will not be used anymore once Turbo coding is available everywhere)
- CRC Modulation:
- QPSK (it would be desirable to have a programmable logic core in the component to allow for a flexible implementation)

Output power control: 2 different power control loops should be supported:

- Power measurement in terminal (ODU): the IDU needs a DiseqC I/F.
- Power measurement in hub: calculation of correction in hub to be avoided since it can represent an important burden in systems with a large number of terminals

Multiple Access:

- **MF-TDM**A: support slow and fast hopping; dynamic MF-TDMA with lower priority.

Priorities:

1. Slow fixed MF-TDMA
2. Fast fixed MF-TDMA
3. Slow dynamic MF-TDMA
4. Fast fixed MF-TDMA

Control and Management:

- **Protocol Stac**k:
  - RCST type B (native ATM is foreseen in some regenerative systems)

Security, Identity, Encryption

- No authentication at this level
- Support for TBTP decryption

Other functions:

- AAL5 encapsulation/decapsulation
- DSM-CC encapsulation/decapsulation
- Frequency synthesiser: support for frequency hopping
- Support for software upgrades: separately for MAC layer and for upper layers

Performance

Forward data rate (pre-PID filtering): 150 Mbps (desirable) / 80 Mbps (min)

Forward IP throughput: 8-10 Mbps

Return IP throughput: 4 Mbps

Aggregate IP throughput: 10 Mbps

PID filtering: 32 PIDs

MAC address filtering: 32 addresses

Interfaces

The interfaces are left purposely unspecified. The choice is left to the chip vendors to propose interfaces adequate to their architectures but flexible enough to allow an easy integration into terminal IDUs.

End-of-document