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Digital Multiprogram Distribution by Satellite

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Digital Multiprogram Distribution by Satellite

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Digital Multiprogram Distribution by Satellite

1 Introduction

NOTE: This document is identical to SCTE 56 2011 except for informative components such as the title page, NOTICE text, headers and footers. No changes have been made to any text in the document beyond this point, other than headers and footers.

Satellite Digital TV systems have shown their advantages with respect to the analog TV allowing a more efficient use of the satellite frequency spectrum available and establishing a more robust scenario with respect to interference protection.

With the aim to promote the convergence on a worldwide standard for satellite digital multi-program reception systems for television, sound and data services, the systems for the reception of Digital Multiprogram Distribution by Satellite are described. These descriptions configure the universal elements of the satellite Integrated Receiver Decoder (IRD).

The universal elements of the satellite IRD are capable of receiving emissions from System I, and System II.

The common and specific elements of each system have been analyzed and it has been concluded on the feasibility of the implementation of the universal elements of a Satellite IRD. This document analyses the common elements among existing systems, defines and describes the functions of a generic system model and identifies the processes and the minimum set of parameters of the various sub-systems of the universal elements of a Satellite IRD.

The feasibility of the implementation of the common elements in a satellite IRD has been demonstrated in consultation with the industry.

1.1 Compliance Notation

As used in this document, "*shall*" denotes a mandatory provision of the standard. "*Should*" denotes a provision that is recommended but not mandatory. "*May*" denotes a feature whose presence does not preclude compliance that may or may not be present at the option of the implementer.

2 Generic Reference Model for the common functional requirements of a satellite IRD

A Generic Reference Model for the Common Functional Requirements of a Satellite IRD has been produced in order to analyze the feasibility of the universal elements of a satellite IRD, identifying the applicability of the generic reference model to the two systems currently in use.

The Generic Reference Model has been defined based on the functions required for covering all layers of a typical IRD Protocol Stack. For reference, Fig. 1 presents the typical IRD Protocol Stack which is based on the following layers:

- **Physical and Link layers** covering the typical front-end functions: tuner, QPSK demodulator, convolutional decoding, deinterleaving, Reed Solomon decoding and energy dispersal removal.

- **Transport layer** responsible of the demultiplexing of the different programs and components as well as the depacketization of the information (video, audio and data)
- **Conditional Access** functions which control the operation of external decoder functions (Common Interface for Conditional Access as an option)
- **Network Services** performing the Video and Audio decoding as well as the management of EPG (Electronic Program Guide) functions and Service Information and, optionally, data decoding.
- **Presentation Layer** responsible, among other things, of the User Interface, operation of the remote control, etc.
- **Customer services** covering the different applications based on Video, Audio and Data.

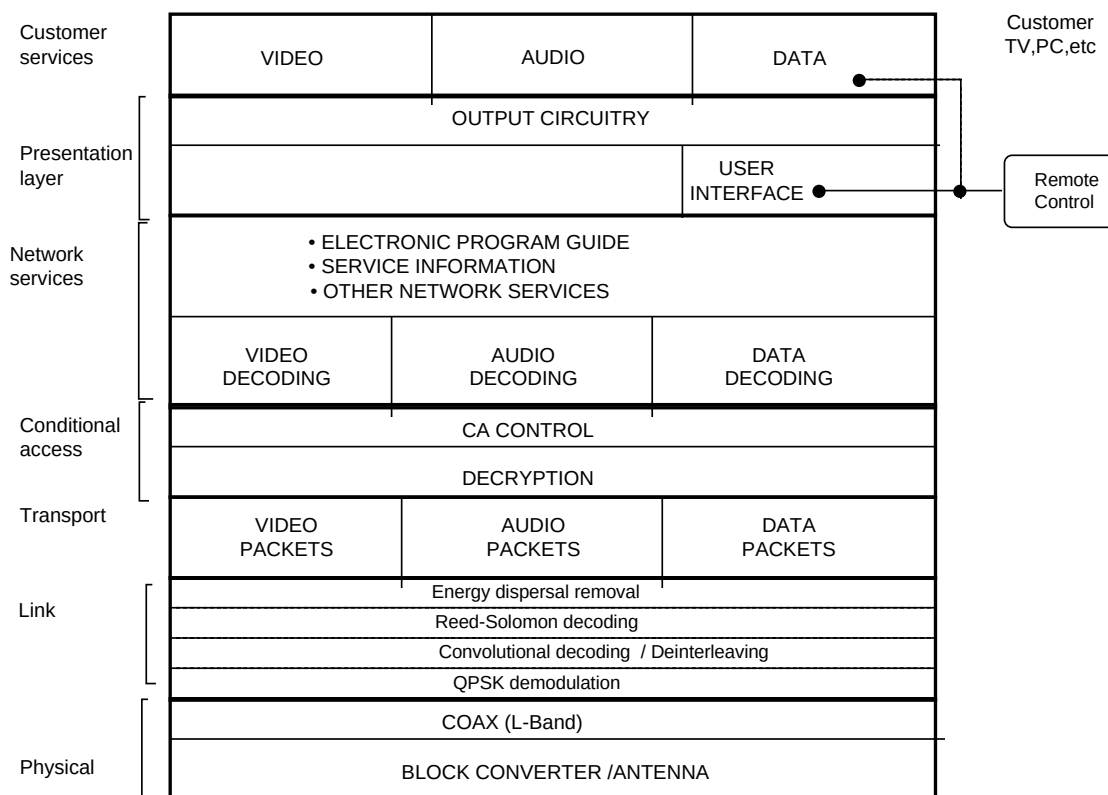


Figure 1 - Typical IRD protocol stack

Based on the Protocol Stack, the Generic Reference Model for the Satellite IRD (Fig. 2) is derived.

Two types of functions are identified in the Generic Reference Model: IRD Core functions and other additional essential functions.

- **The IRD Core functions** cover the key IRD functions which define the Digital TV system. IRD core functions include:

- Demodulation and decoding
 - Transport and Demultiplexing
 - Source decoding Video, Audio and Data
- **The additional essential functions** are required to perform the operation of the system and upgrade it with additional and/or complementary features. These functions are closely related to the service provision. The following functions and blocks could be considered as the additional essential functions and may differentiate one IRD from another:
- Satellite tuner
 - Output interfaces
 - Operative System and applications
 - EPG (Electronic Program Guide)
 - SI (Service/System Information)
 - CA (Conditional Access)
 - Display, remote control and different commands
 - ROM, RAM and FLASH memory
 - Interactive module
 - Microcontroller
 - Other functions as Teletext, Subtitling, etc.

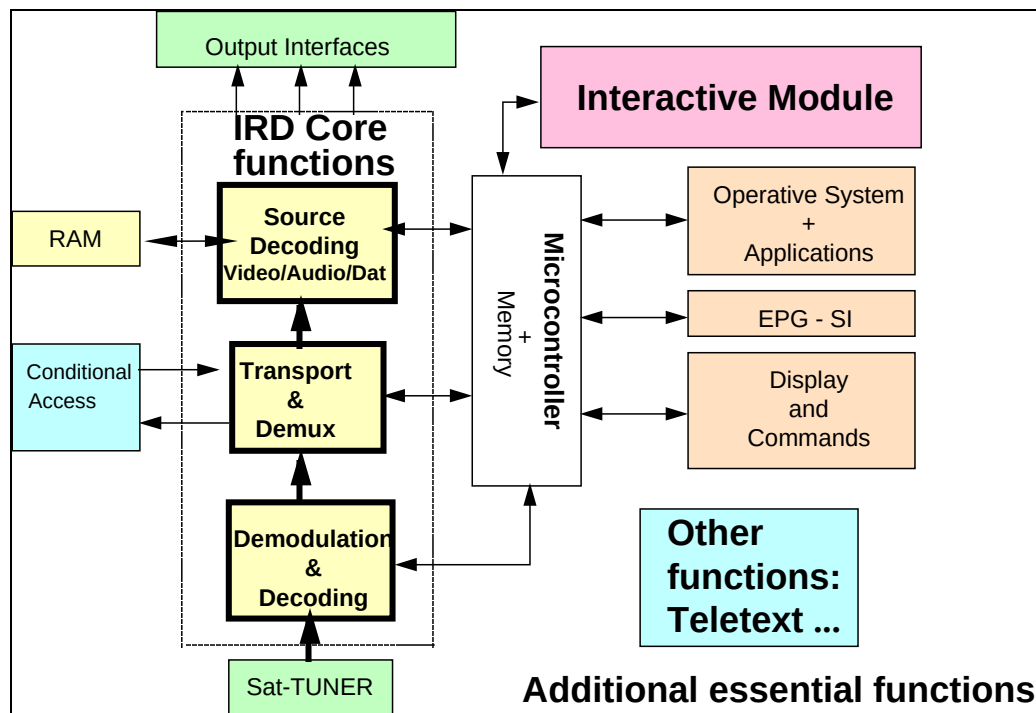


Figure 2 - Generic reference model for a satellite IRD

3 Universal elements of a satellite IRD

An analysis of the core and essential functions of the two systems, as provided in § 4, validated the feasibility to define universal elements for a satellite IRD.

The universal elements of a satellite IRD perform the following functions:

- Demodulation and decoding
- Transport and Demultiplexing
- Source decoding of Video, Audio and Data

It is understood that definition of additional essential functions is out of the scope of this standard because these functions would be specific to each service and very close to the specific implementation by each manufacturer, subject to a number of external and service conditions. Therefore the potential diversity of additional essential functions among satellite IRD's does not impact on the universal elements of the satellite IRD.

3.1 Demodulation and decoding

The block diagram of the demodulation and decoding functions for the universal elements of a satellite IRD is presented in Fig. 3. Overlapped blocks represent functions with common elements for the two systems although with different characteristics. Dashed blocks represent functions not utilized by both systems.

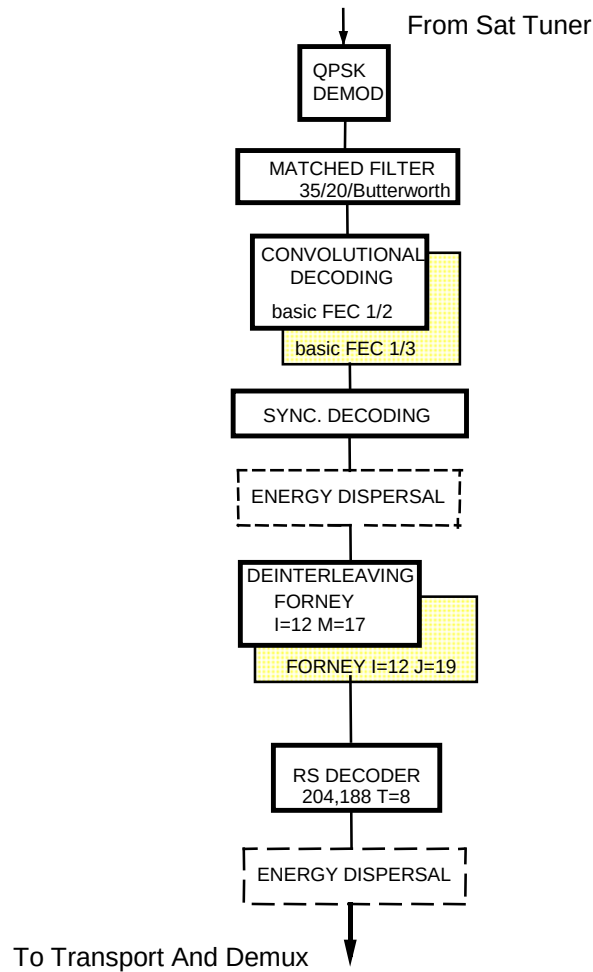


Figure 3 – Block diagram for demodulation and channel decoding

3.1.1 QPSK demodulator

This universal element of a satellite IRD performs the quadrature coherent demodulation function and the analog to digital conversion, providing “soft decision” I and Q information to the inner decoder.

This universal element of a satellite IRD shall be capable of demodulating a signal employing conventional Gray-coded QPSK modulation with absolute mapping (no differential coding).

Bit mapping in the signal as given on Fig. 4 shall be used.